E21B  EARTH DRILLING, e.g. DEEP DRILLING (mining, quarrying E21C; making shafts, driving galleries or tunnels E21D); OBTAINING OIL, GAS, WATER, SOLUBLE OR MELTABLE MATERIALS OR A SLURRY OF MINERALS FROM WELLS

**WARNINGS**

1. The following IPC groups are not in the CPC scheme. The subject matter for these IPC groups is classified in the following CPC groups:

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2. In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

**Methods or apparatus for drilling**

- **Perception drilling** (drives used in the borehole E21B 4/00; rotary drilling machines in general B23B)
- **Rotary drilling** (drives used in the borehole E21B 4/00; rotary drilling machines in general B23B)

**Adaptation of rotary draw works to drive rotary tables (connecting or disconnecting couplings or joints E21B 19/16; rope, cable, or chain winding mechanisms, capstans B66D)**

**Drives used in the borehole**

- Bearing, sealing, lubricating details (for roller bits E21B 10/22; bearings in general F16C; sealing in general F16J; lubricating in general F16N)
- Mechanical motion converting means, e.g. reduction gearings (E21B 4/10 takes precedence; gearings in general F16H)
- Fluid rotary type drives (hydraulic turbines for drilling wells F03B 13/02)

**Electric drives** (E21B 4/12 takes precedence)

- Down-hole impacting means, e.g. hammers (perussion drill bits E21B 10/36; boring rams E21B 11/02; releasing-jars E21B 31/107)

**Impact being obtained by gravity only, e.g. with lost-motion connection**

- Continuous unidirectional rotary motion of shaft or drilling pipe effecting consecutive impacts

**Electrically operated hammers**
Methods or apparatus for drilling

E21B

4/14 . . . Fluid operated hammers
4/145 . . . [of the self propelled-type, e.g. with a reverse mode to retract the device from the hole]
4/16 . . . Plural down-hole drives, e.g. for combined percussion and rotary drilling (E21B 4/10 takes precedence); Drives for multi-bit drilling units
4/18 . . . Anchoring or feeding in the borehole
4/20 . . . combined with surface drive (E21B 4/10 takes precedence)

6/00 Drives for combined percussion and rotary drilling (drives used in the borehole E21B 4/00)
6/02 . . . the rotation being continuous
6/04 . . . Separate drives for percussion and rotation
6/06 . . . the rotation being intermittent, e.g. obtained by ratchet device
6/08 . . . Separate drives for percussion and rotation

7/00 Special methods or apparatus for drilling
7/001 . . . (Drilling a non circular hole (excavating trenches E02F 5/02; cutting machines for slitting E21C 25/00))
7/002 . . . (Drilling with diversely driven shafts extending into the borehole simultaneously drilling and casing E21B 7/20; plural down-hole drives E21B 4/16; E21B 7/001 takes precedence)
7/003 . . . (Drilling with mechanical conveying means (bailers, e.g. buckets, buckets E21B 27/00; tunnelling E21D))
7/005 . . . (with helical conveying means (E21B 7/201 takes precedence; augers E21B 10/44; drilling rods or pipes with helical structure E21B 17/22))
7/006 . . . (combined with a bucket-type container (bailers with helical conveying means E21B 27/04))
7/008 . . . (Drilling ice or a formation covered by ice)
7/02 . . . Portable drilling rigs, truck-or skid-mounted, with their own drive (portable drilling rigs for use on underwater floors E21B 7/124)
7/021 . . . (With a rotary table, i.e. a fixed rotary drive for a relatively advancing tool (rotary tables E21B 3/04))
7/022 . . . (Control of the drilling operation; Hydraulic or pneumatic means for activation or operation (control circuits for drilling masts E21B 15/045))
7/023 . . . (the mast being foldable or telescopically retractable)
7/024 . . . (having means for adapting to inclined terrain; having means for stabilizing the vehicle while drilling)
7/025 . . . (Rock drills, i.e. jumbo drills)
7/026 . . . (having auxiliary platforms, e.g. for observation purposes)
7/027 . . . (Drills for drilling shallow holes, e.g. for taking soil samples or for drilling postholes)
7/028 . . . (the drilling apparatus being detachable from the vehicle, e.g. hand portable drills)
7/04 . . . Directional drilling (derricks or masts specially adapted thereto E21B 15/04)
7/043 . . . (for underwater installations)
7/046 . . . (horizontal drilling (drilling with mechanical conveying means E21B 7/003))
7/06 . . . Deflecting the direction of boresholes ([directional window cutting E21B 29/06; deflecting the direction of fishing tools E21B 31/14])
7/061 . . . (the tool shaft advancing relative to a guide, e.g. a curved tube or a whipstock)
7/062 . . . (the tool shaft rotating inside a non-rotating guide travelling with the shaft (E21B 7/067 and E21B 7/068 take precedence))
7/064 . . . (specially adapted drill bits therefor)
7/065 . . . ( [using oriented fluid jets]
7/067 . . . (with means for locking sections of a pipe or a guide for a shaft in angular relation, e.g. adjustable bent sub)
7/068 . . . (drilled by a down-hole drilling motor (down-hole drives per se E21B 4/00, E21B 7/067 takes precedence)
7/10 . . . Correction of deflected boreholes
7/12 . . . Underwater drilling (derricks or masts specially adapted thereto E21B 15/02; telescoping joints E21B 17/02; using heave compensators E21B 19/00)
7/122 . . . (with submersible vertically movable guide)
7/124 . . . with underwater tool drive prime mover, e.g. portable drilling rigs for use on underwater floors
7/1245 . . . (using explosive means (anchors driven in by explosive charges B63B 21/28))
7/128 . . . from floating support with independent underwater anchored guide base { (guide line systems E21B 41/10) }
7/132 . . . from underwater buoyant support
7/136 . . . from non-buoyant support (E21B 7/124 takes precedence)
7/14 . . . Drilling by use of heat, e.g. flame drilling [(by use of explosives E21B 7/007)]
7/143 . . . (underwater)
7/146 . . . (Thermal lances)
7/15 . . . (of electrically generated heat)
7/16 . . . Applying separate balls or pellets by the pressure of the drill, so-called shot-drilling
7/18 . . . Drilling by liquid or gas jets, with or without entrained pellets (E21B 7/14 takes precedence ; obtaining a slurry of minerals E21B 43/29); hydraulic monitors E21C 45/00)
7/185 . . . (underwater)
7/20 . . . Driving or forcing casings or pipes into boreholes, e.g. sinking; Simultaneously drilling and casing boreholes (surface means for applying to-and-fro rotation movements to the casing E21B 3/025; pushing means outside of the borehole E21B 19/08; placing piles E02D 7/00; sinking shafts while moving the lining downwards E21D 1/08 ; making galleries by forcing prefabricated elements through the ground E21D 9/005))
Drilling tools

10/00 Drill bits (specially adapted for deflecting the direction of boring E21B 7/064; with means for collecting substances E21B 27/00)

10/003 . . (with cutting edges facing in opposite axial directions)

10/006 . . (providing a cutting edge which is self-renewable during drilling)

10/02 . . Core bits (characterised by wear resisting parts E21B 10/46; obtaining undisturbed cores E21B 25/00)

10/04 . . with core destroying means

10/06 . . Roller core bits

10/08 . . Roller bits (roller core bits E21B 10/06; with leading portion E21B 10/26; characterised by wear resisting parts E21B 10/46)

10/083 . . (with longitudinal axis, e.g. wobbling or nutating roller bit (longitudinal axis roller reamers E21B 10/30))

10/086 . . (with eccentric movement)

10/10 . . with roller axle supported at both ends (with disc-cutters E21B 10/12)

10/12 . . with discs cutters

10/14 . . combined with non-rolling cutters other than of leading-portion type

10/16 . . characterised by tooth form or arrangement

10/18 . . characterised by conduits or nozzles for drilling fluids (drilling fluid supply to the bearings E21B 10/23)

10/20 . . characterised by detachable or adjustable parts, e.g. legs or axles (cross axle roller bits E21B 10/10)

10/22 . . characterised by bearing, lubrication or sealing details

2010/225 . . . (scaling details)

10/23 . . with drilling fluid supply to the bearings

10/24 . . characterised by lubricating details

2010/243 . . . (with drilling fluid supply to the bearing)

10/246 . . . (with pumping means for feeding lubricant)

10/25 . . characterised by sealing details

10/26 . . Drill bits with leading portion, i.e. drill bits with a pilot cutter; Drill bits for enlarging the borehole, e.g. reamers (percussion drill bits with leading portion E21B 10/40; augers with leading portion E21B 10/44)

10/28 . . with non-expansible roller cutters

10/30 . . Longitudinal axis roller reamers, e.g. reamer stabilisers

10/32 . . with expansible cutting tools

10/322 . . . (cutter shifted by fluid pressure (E21B 10/45 takes precedence))

10/325 . . . (the cutter being shifted by a spring mechanism)

10/327 . . . (the cutter being pivoted about a longitudinal axis (E21B 10/34 takes precedence))

10/34 . . . of roller-cutter type

10/345 . . . . (cutter shifted by fluid pressure)

10/36 . . Percussion drill bits (characterised by wear resisting parts E21B 10/46 (with helical conveying portion E21B 10/445))

10/38 . . . characterised by conduits or nozzles for drilling fluids

10/40 . . . with leading portion

10/42 . . Rotary drag type drill bits with teeth, blades or like cutting elements, e.g. fork-type bits, fish tail bits (characterised by wear resisting parts E21B 10/54, by conduits or nozzles for drilling fluid E21B 10/60, by detachable or adjustable parts E21B 10/62)

2010/425 . . . (characterised by teeth or cutter arrangement)

10/43 . . . characterised by the arrangement of teeth or other cutting elements

10/44 . . . Bits with helical conveying portion, e.g. screw type bits; Augers with leading portion or with detachable parts ((Rotary drag type drill bits E21B 10/42); drilling rods with helical structure E21B 17/22)

10/445 . . . (percussion type, e.g. for masonry (percussion drill bits in general E21B 10/36))

10/46 . . . characterised by wear resisting parts, e.g. diamond inserts ((drill bits with self-renewable cutting edge E21B 10/066)

10/48 . . . the bit being of core type ((saw cylinders having their cutting rim equipped with abrasive particles for drilling stone or glass E28D 10/41))

10/485 . . . (with inserts in form of chisels, blades or the like)

10/50 . . . the bit being of roller type

10/52 . . . with chisel or button type inserts

10/54 . . . the bit being of the rotary drag type, e.g. fork-type bits

2010/545 . . . (with blades having performed cutting elements mounted on a distinct support, e.g. polycrystalline inserts)

10/55 . . . with preformed cutting elements (with blades having preformed cutting elements mounted on a distinct support, e.g. polycrystalline inserts)
Drilling tools

Other equipment or details for drilling: Well equipment or well maintenance

15/00  Derricks; Masts; (Other supports (drill rigs with movable understructures E21B 7/02))

15/003  (adapted to be moved on their substructure, e.g. with skidding means; adapted to drill a plurality of wells (slant-hole rigs E21B 15/04))

15/006  (Means for anchoring the drilling machine to the ground)

15/02  specially adapted for underwater drilling (E21B 15/04 takes precedence; floating drilling platforms B63B 35/44; drilling platforms on legs E02B 17/00 (; with skidding means E21B 15/003))

15/04  specially adapted for directional drilling, e.g. slant hole rigs (with skidding means E21B 15/003)

15/045  (Hydraulic, pneumatic or electric circuits for their positioning)

17/00  Drilling rods or pipes; Flexible drill strings; Kellies; Drill collars; Sucker rods (Cables); Casings; Tubings (rod couplings in general F16D; tubes or tube couplings in general F16L)

17/003  (with electrically conducting or insulating means E21B 17/028 and E21B 17/023 take precedence)

17/006  (Accessories for drilling pipes, e.g. cleaners (wear protectors E21B 17/10; handling drilling pipes E21B 19/02; thread protectors B65D 59/00))

17/01  Risers (connections between riser sections E21B 17/085; supporting a riser from a drilling or production platform E21B 19/004; riser connectors (on well heads) E21B 33/038)

17/012  (with buoyancy elements (E21B 17/015 takes precedence))

17/015  (Non-vertical risers, e.g. articulated or catenary-type)

17/017  (Bend restrictors for limiting stress on risers)

17/02  Couplings, joints (expandable couplings or joints E21B 43/106)

17/021  (Devices for subsurface connecting or disconnecting by rotation (connecting or disconnecting pipe couplings or joints E21B 19/16; fishing tools for frozen rods, casings, ropes, bits or the like E21B 31/00))

17/023  (Arrangements for connecting cables or wirelines to downhole devices)

17/025  (Side entry subs)

17/026  (Arrangements for fixing cables or wirelines to the outside of downhole devices (protectors and centralisers for cables and control lines E21B 17/1035))

17/028  (Electrical or electro-magnetic connections)

17/03  between drilling rod or pipe and drill motor, e.g. between drilling rod and hammer

17/04  between rod [or the like] and bit or between rod and rod [or the like]

17/042  (threaded (readily releasing joints E21B 17/066)

17/0423  (with plural threaded sections, e.g. with two-step threads)

17/0426  (with a threaded cylindrical portion, e.g. for percussion rods)

17/043  (with locking means)

17/046  with ribs, pins or jaws, and complementary grooves or the like, e.g. bayonet catches
17/05 . . . Swivel joints
17/06 . . . Releasing-joints, e.g. safety joints
17/07 . . . Telescoping joints for varying drill string lengths; Shock absorbers (heave compensators in the derrick E21B 19/09; releasing-jars E21B 31/107 ; shock-absorbers in general F16F)
17/073 . . . [with axial rotation]
17/076 . . . [between rod or pipe and drill bit]
17/08 . . . Casing joints
17/085 . . . [Riser connections (connectors for wellhead E21B 33/038)]
17/10 . Wear protectors; Centralising devices, e.g. stabilisers; pipes used in the borehole with anchoring means E21B 4/18; guiding or centralising devices outside the borehole E21B 17/24
17/1007 . . . [for the internal surface of a pipe, e.g. wear bushings for underwater well-heads]
17/1014 . . . [Flexible or expansible centering means, e.g. with pistons pressing against the wall of the well (E21B 17/1042 takes precedence)]
17/1021 . . . [with articulated arms or arcuate springs (measuring the diameter E21B 47/08)]
17/1028 . . . [with arcuate springs only, e.g. baskets with outwardly bowed strips for cementing operations]
17/1035 . . . [for plural rods, pipes or lines, e.g. for control lines]
17/1042 . . . [Elastomer protector or centering means]
17/105 . . . [split type]
17/1057 . . . [Centralising devices with rollers or with a relatively rotating sleeve (E21B 17/1014 takes precedence)]
17/1064 . . . [Pipes or rods with a relatively rotating sleeve]
17/1071 . . . [specially adapted for pump rods, e.g. sucker rods]
17/1078 . . . [Stabilisers or centralisers for casing, tubing or drill pipes (devices for off-center positioning E21B 17/10; E21B 17/1007 - E21B 17/1064 take precedence)]
17/1085 . . . [Wear protectors; Blast joints; Hard facing (wear protection included in centralising devices, see relevant subgroups)]
17/1092 . . . [Gauge section of drill bits]
17/12 . . . Devices for placing or drawing out wear protectors
17/14 . . . Casing shoes [for the protection of the bottom of the casing]
17/16 . . . Drill collars
17/18 . . . Pipes provided with plural fluid passages ([E21B 17/203 takes precedence;] circulation of drilling fluid by means of such pipes E21B 21/12 ; general F16L 39/00)]
17/20 . . . Flexible or artificed drilling pipes, e.g. flexible or artificed rods, pipes or cables (risers E21B 17/01; swivel joints E21B 17/05)
17/203 . . . [with plural fluid passages]
17/206 . . . [with conductors, e.g. electrical, optical (hoses with electrically conducting means in general F16L 11/27)]
17/22 . . . Rods or pipes with helical structure (drill bits with helical conveying portion E21B 10/44)
19/00 Handling rods, casings, tubes or the like outside the borehole, e.g. in the derrick (surface drives E21B 1/02, E21B 3/02)
19/002 . . . [specially adapted for underwater drilling (E21B 19/09, E21B 19/143 take precedence; risers with buoyancy elements E21B 17/012, E21B 17/015)]
19/004 . . . . [supporting a riser from a drilling or production platform]
19/006 . . . . [including heave compensators]
19/008 . . . . [Winding units, specially adapted for drilling operations (capstans, winches B66D; catheads actuated pipe wrenches or spinners E21B 19/162)]
19/02 . . . Rod or cable suspensions (load-engaging elements for hoisting or lowering purposes in general B66C 100; crown blocks or pulley blocks B66D; cable guides B66D 1(36)]
19/04 . . . . . . Hooks
19/06 . . . . . . Elevators, i.e. rod or tube gripping devices
19/07 . . . . . . Slip-type elevators (slips E21B 19/10)
19/08 . . . . . Apparatus for feeding the rods or cables (E21B 19/22 takes precedence; automatic feed E21B 44/02; hoisting drums B66D; Apparatus for increasing or decreasing the pressure on the drilling tool; Apparatus for counterbalancing the weight of the rods)
19/081 . . . . . . Screw-and-nut feed mechanisms
19/083 . . . . . . Cam, rack or like feed mechanisms
19/084 . . . . . . [with flexible drawing means, e.g. cables]
19/086 . . . . . . [with a fluid-actuated cylinder (E21B 19/084, E21B 19/087, E21B 19/09 take precedence)]
19/087 . . . . . . . by means of a swinging arm
19/089 . . . . . . . [with a spring or an additional weight]
19/09 . . . . . . . specially adapted for drilling underwater formations from a floating support using heave compensators supporting the drill string (drilling-pipe telescoping joints E21B 17/07 ; heave compensators for supporting a riser E21B 19/006)]
19/10 . . . Slip; Spiders; Catching devices (rotary tables with master bushing or kelly bushing E21B 3/04; slip-type elevators E21B 19/07; casing heads with slips E21B 33/0422)]
19/12 . . . Rope clamps (rope clamps in general F16G 11/00 ) [rod, casings or tube clamps not secured to elevators]
19/14 . . . . . . . Racks, ramps, troughs or bins, for holding the lengths of rod singly or connected; Handling between storage place and borehole (E21B 19/20, E21B 19/22 take precedence ; storing elongated articles in general B65G 1/0421)]
19/143 . . . . . . . [specially adapted for underwater drilling]
19/146 . . . . . . . [Carousel systems, i.e. rotating rack systems]
19/15 . . . . . . . . Racking of rods in horizontal position; Handling between horizontal and vertical position
19/155 . . . . . . . . [Handling between horizontal and vertical position]
19/16 . . . . . . . Connecting or disconnecting pipe couplings or joints (E21B 19/20 takes precedence ; pipe wrenches or the like B25B)
19/161 . . . . . . [using a wrench or a spinner adapted to engage a circular section of pipe (E21B 19/168 takes precedence)]
19/162 . . . . . . [cathead actuated]
Other equipment or details for drilling; Well equipment or well maintenance

E21B

- Methods or apparatus for flushing boreholes, by use of exhaust air from motor (freeing objects stuck in boreholes by flushing E21B 31/03; well drilling compositions C09K 8/02)
- Arrangements for handling drilling fluids or cuttings outside the borehole, e.g. mud boxes
- Means engaging the bore entrance, e.g. hoods for collecting dust
- Swivel joints in hose-lines (hose connections in general F16L 31/00, F16L 33/00)
- Arrangements for treating drilling fluids outside the borehole (treatment steps per se, see the relevant subclasses)
- (setting tool actuated by explosion or gas generating means)
- Introducing or running tools by fluid pressure, e.g. through-the-flow-line tool systems (tool diverters E21B 33/02): special provisions on heads therefor E21B 33/06; cementing plugs E21B 33/16; scrapers operated by fluid pressure E21B 37/04
- Tools specially adapted therefor
- Disabling or coupling tool for wire-line tools (E21B 23/03)
- Tool diverters, e.g. for through-the-flow-line tool systems (E21B 23/03 takes precedence; drilling E21B 7/06)
- Indexing systems for guiding relative movement between telescoping parts of downhole tools
- (“J-slot” systems, i.e. lug and slot indexing mechanisms)
- Self propelling system or apparatus, e.g. for moving tools within the horizontal portion of a borehole
- for anchoring the tools or the like (E21B 23/02 - E21B 23/06 take precedence; anchoring of drives in the borehole E21B 4/18; packers E21B 33/12)
- for locking the tools or the like in landing nipples or in recesses between adjacent sections of tubing (E21B 23/03 - E21B 23/06 take precedence)
- for setting the tools into, or removing the tools from, laterally offset landing nipples or pockets
- operated by fluid means, e.g. actuated by explosion (E21B 23/06, E21B 23/08 take precedence)
- for setting packers
- (setting tool actuated by explosion or gas generating means)
- Introducing or running tools by fluid pressure, e.g. through-the-flow-line tool systems (tool diverters E21B 33/02): special provisions on heads therefor E21B 33/06; cementing plugs E21B 33/16; scrapers operated by fluid pressure E21B 37/04
- Tools specially adapted therefor
- Disabling or coupling tool for wire-line tools (E21B 23/03)
- for disabling a cable or cable-operated tool, e.g. for logging or perforating operations in deviated wells (side entry sub E21B 17/025; control line protectors E21B 17/035): by fluid pressure E21B 23/08; provision on well heads for introducing or removing cable-operated tools E21B 33/072, E21B 33/076

21/08 . Controlling or monitoring pressure or flow of drilling fluid, e.g. automatic filling of boreholes, automatic control of bottom pressure (valve arrangements therefor E21B 21/10)
21/10 . Valves arrangements in drilling fluid circulation systems (valves in general F16K)
21/103 . (Down-hole by-pass valve arrangements, i.e. between the inside of the drill string and the annulus)
21/106 . (Valve arrangements outside the borehole, e.g. Kelly valves)
21/12 . using drilling pipes with plural fluid passages, e.g. closed circulation systems (pipes with plural fluid passages E21B 17/18)
21/14 . using liquids and gases, e.g. foams
21/16 . using gaseous fluids (E21B 21/14 takes precedence; arrangements for handling drilling fluids outside the borehole E21B 21/01; arrangements for treating drilling fluids E21B 21/06)
21/18 . Preventing exhaust air from the drill motor from blowing-off towards the working face
23/00 Apparatus for displacing, setting, locking, releasing, or removing tools, packers or the like in the boreholes or wells (setting of casings, screens or liners E21B 43/10)
23/002 . (Tool diverters, e.g. for through-the-flow-line tool systems or for wire-line tools (E21B 23/03 takes precedence; for drilling E21B 7/06)
23/004 . (Indexing systems for guiding relative movement between telescoping parts of downhole tools)
23/006 . (“J-slot” systems, i.e. lug and slot indexing mechanisms)
23/008 . (Self propelling system or apparatus, e.g. for moving tools within the horizontal portion of a borehole)
23/01 . for anchoring the tools or the like (E21B 23/02 - E21B 23/06 take precedence; anchoring of drives in the borehole E21B 4/18; packers E21B 33/12)
23/02 . for locking the tools or the like in landing nipples or in recesses between adjacent sections of tubing (E21B 23/03 - E21B 23/06 take precedence)
23/03 . for setting the tools into, or removing the tools from, laterally offset landing nipples or pockets
23/04 . operated by fluid means, e.g. actuated by explosion (E21B 23/06, E21B 23/08 take precedence)
23/06 . for setting packers
23/065 . (setting tool actuated by explosion or gas generating means)
23/08 . Introducing or running tools by fluid pressure, e.g. through-the-flow-line tool systems (tool diverters E21B 33/02): special provisions on heads therefor E21B 33/06; cementing plugs E21B 33/16; scrapers operated by fluid pressure E21B 37/04
23/10 . (setting tool actuated by explosion or gas generating means)
23/14 . for disabling a cable or cable-operated tool, e.g. for logging or perforating operations in deviated wells (side entry sub E21B 17/025; control line protectors E21B 17/035): by fluid pressure E21B 23/08; provision on well heads for introducing or removing cable-operated tools E21B 33/072, E21B 33/076)
25/00 Apparatus for obtaining or removing undisturbed cores, e.g. core barrels, core extractors (core bits E21B 10/02; using explosives or projectiles in boreholes E21B 49/04; side-wall sampling or coring E21B 49/06)

25/005 . [Above ground means for handling the core, e.g. for extracting the core from the core barrel]

25/02 . the core receiver being insertable into, or removable from, the borehole without withdrawing the drilling pipe (retrievable drill bits E21B 10/64)

25/04 . . the core receiver having a core forming cutting edge or element, e.g. punch type core barrels

25/06 . the core receiver having a flexible liner or inflatable retaining means

25/08 . Coating, freezing, consolidating cores (E21B 25/06 takes precedence); Recovering uncontaminated cores or cores at formation pressure

25/10 . Formed core retaining or severing means (E21B 25/06, E21B 25/08 take precedence)

25/12 . . of the sliding wedge type

25/14 . . mounted on pivot transverse to core axis

25/16 . . for obtaining oriented cores

25/18 . the core receiver being specially adapted for operation under water

27/00 Containers for collecting or depositing substances in boreholes or wells, e.g. bailers, [baskets or buckets] for collecting mud or sand; Drill bits with means for collecting substances, e.g. valve drill bits

27/005 . (Collecting means with a strainer)

27/02 . Dump bailers, i.e. containers for depositing substances, e.g. cement or acids

27/04 . where the collecting or depositing means including helical conveying means (drilling with helical conveying means combined with bucket-type container E21B 7/006)

28/00 Vibration generating arrangements for boreholes or wells, e.g. for stimulating production (for drilling E21B 7/24; for fishing for or freeing objects E21B 31/005); for transmitting measuring-signals E21B 47/14; for geophysical measurements G01V 1/02)

WARNING

Group E21B 28/00 is not complete. See also E21B 43/003

29/00 Cutting or destroying pipes, packers, plugs, or wire lines, located in boreholes or wells, e.g. cutting of damaged pipes, of windows (perforators E21B 43/11); Deforming pipes in boreholes or wells; Reconditioning of well casings while in the ground (by enlarging drilled holes or counterboring E21B 7/228)

29/002 . [Cutting, e.g. milling, a pipe with a cutter rotating along the circumference of the pipe]

29/005 . . [with a radially-expansible cutter rotating inside the pipe, e.g. for cutting an annular window]

29/007 . . [with a radially-retracting cutter rotating outside the pipe]

29/02 . by explosives or by thermal or chemical means (freeing stuck objects by explosives E21B 31/002); destroying objects in boreholes or wells by explosives E21B 31/16)

29/04 . Cutting of wire lines or the like (E21B 29/02 takes precedence)

29/06 . Cutting windows, e.g. directional window cutters for whipstock operations (E21B 29/005 and E21B 29/08 take precedence; whippers E21B 7/061)

29/08 . Cutting or deforming pipes to control fluid flow (shear type blow-out preventers E21B 33/063)

29/10 . Reconditioning of well casings, e.g. straightening

29/12 . specially adapted for underwater installations (E21B 29/08 takes precedence)

31/00 Fishing for or freeing objects in boreholes or wells ([using junk baskets or the like E21B 27/00]; provisions on well heads for introducing or removing objects E21B 33/068; locating or determining the position of objects in boreholes or wells E21B 47/09)

31/002 . [Destroying the objects to be fished, e.g. by explosive means (cutting by explosives E21B 29/02)]

31/005 . [using vibrating or oscillating means (vibration generating arrangements for boreholes or wells E21B 28/00)]

31/007 . [fishing tools with means for attaching comprising fusing or sticking]

31/03 . Freeing by flushing [] ; Controlling differential pipe sticking]

31/06 . using magnetic means

31/07 . using impact means for releasing stuck parts, e.g. jars (telescoping joints E21B 17/07)

31/075 . . [using explosives]

31/113 . . hydraulically-operated

31/115 . . [Jars with a hydraulic impedance mechanism, i.e. a restriction, for initially delaying escape of a restraining fluid]

31/12 . Grappling tools, e.g. tongs or grabs

31/125 . . [specially adapted for parted wire line or ropes]

31/14 . . with means deflecting the direction of the tool, e.g. by use of knuckle joints (apparatus for deflecting the boring E21B 7/006)

31/16 . . combined with cutting or destroying means (cutting or destroying means per se E21B 29/00)

31/18 . . gripping externally, e.g. overshot

31/20 . . gripping internally, e.g. fishing spear

33/00 Sealing or packing boreholes or wells

2033/005 . [Seals characterised by their shape]

33/02 . Surface sealing or packing

33/03 . . Well heads; Setting-up thereof (valve arrangements therefor E21B 34/02)

33/035 . . . specially adapted for underwater installations (E21B 33/043, E21B 33/064, E21B 33/076 take precedence)

33/0355 . . . . . . [Control systems, e.g. hydraulic, pneumatic, electric, acoustic, for submerged well heads]

33/037 . . . Protective housings therefor

33/0375 . . . . . . (Corrosion protection means (in general C23E))

33/038 . . . . . . Connectors used on well heads, e.g. for connecting blow-out preventer and riser (connecting a production flow-line to an underwater well head E21B 43/013)

33/0385 . . . . . . (electrical connectors (underwater electrical connections in general H01R 13/523))
Other equipment or details for drilling; Well equipment or well maintenance

33/04 . . . Casing heads; Suspending casings or tubings in well heads (setting of casings in wells E21B 43/10)
33/0407 . . . (with a suspended electrical cable)
33/0415 . . . [rotating or floating support for tubing or casing hanger]
33/0422 . . . (a suspended tubing or casing being gripped by a slip or an internally serrated member (slips in rotary table E21B 19/10))
33/043 . . . specially adapted for underwater well heads ((E21B 33/0407, E21B 33/047) take precedence)
33/047 . . . for plural tubing strings
33/05 . . . Cementing-heads, e.g. having provision for introducing cementing plugs
33/06 . . . Blow-out preventers (i.e. apparatus closing around a drill pipe, e.g. annular blow-out preventers (rotating blow-out preventers E21B 33/085; valves E21B 34/00))
33/061 . . . [Ram-type blow-out preventers, e.g. with pivoting rams]
33/062 . . . (with sliding rams)
33/063 . . . (for shearing drill pipes (cutting of wireline E21B 29/04; cutting pipe E21B 29/08))
33/064 . . . specially adapted for underwater well heads (connectors therefor E21B 33/038; control systems for submerged well-heads E21B 33/0355)
33/068 . . . having provision for introducing objects or fluids into, or removing objects from, wells (cementing heads E21B 33/05; wipers, oil savers E21B 33/08)
33/072 . . . for cable-operated tools (E21B 33/076 takes precedence)
33/076 . . . specially adapted for underwater installations
33/08 . . . Wipers; Oil savers
33/085 . . . (Rotatable packing means, e.g. rotating blow-out preventers)
33/10 . . . in the borehole ([sealing the junction between main bore and laterals E21B 41/0042])
2033/105 . . . (characterised by sealing the junction between a lateral and a main bore)
33/12 . . . Packers; Plugs ((locking packers or plugs in landing nipples E21B 23/02); used for cementing E21B 33/134, E21B 33/16)
33/1204 . . . [permanent; drillable]
33/1208 . . . (characterised by the construction of the sealing or packing means (E21B 33/127 takes precedence))
33/1212 . . . (including a metal-to-metal seal element)
33/1216 . . . (Anti-extrusion means, e g. means to prevent cold flow of rubber packing)
33/122 . . . Multiple string packers
33/124 . . . Units with longitudinally-spaced plugs for isolating the intermediate space
33/1243 . . . (with inflatable sleeves)
33/1246 . . . (inflated by down-hole pumping means operated by a pipe string)
33/126 . . . with fluid-pressure-operated elastic cup or skirt (E21B 33/122, E21B 33/124 take precedence)
33/1265 . . . (with mechanical slips)
33/127 . . . with inflatable sleeve (E21B 33/122, E21B 33/124 take precedence)
33/1272 . . . (inflated by down-hole pumping means operated by a pipe string)
33/1275 . . . (inflated by down-hole pumping means operated by a down-hole drive)
33/1277 . . . (characterised by the construction or fixation of the sleeve)
33/128 . . . with a member expanded radially by axial pressure (E21B 33/122, E21B 33/124, E21B 33/129) take precedence; (characterised by the construction of the sealing means E21B 33/1208)
33/1285 . . . (by fluid pressure)
33/129 . . . with mechanical slips for hooking into the casing (E21B 33/122, E21B 33/124 take precedence)
33/1291 . . . (anchor set by wedge or cam in combination with frictional effect, using so-called drag-blocks (E21B 33/1295 takes precedence))
33/1292 . . . (with means for anchoring against downward and upward movement)
33/1293 . . . (with means for anchoring against downward and upward movement (E21B 33/1291, E21B 33/1295 take precedence))
33/1294 . . . (characterised by a valve, e.g. a by-pass valve)
33/1295 . . . actuated by fluid pressure
33/12955 . . . (using drag blocks frictionally engaging the inner wall of the well)
33/13 . . . Methods or devices for cementing, for plugging holes, crevices, or the like (dump bailers E21B 27/02; methods or apparatus for grouting offshore structures E02B 17/0008) chemical compositions therefor C09K 8/00)
33/134 . . . Bridging plugs (E21B 33/12)
33/136 . . . Baskets, e.g. of umbrella type
33/138 . . . Plastering the borehole wall; Injecting into the formations (packers E21B 33/12; consolidation of loose sand or the like round the wells without excessively decreasing the permeability thereof E21B 43/025; compositions therefor C09K 8/56)
33/14 . . . for cementing casings into boreholes (using special cement compositions C09K 8/42; control of cementation quality or level E21B 47/0005)
33/143 . . . (for underwater installations)
33/146 . . . (Stage cementing, i.e. discharging cement from casing at different levels)
33/16 . . . using plugs for isolating cement charge; Plugs therefor (spacer compositions C09K 8/424; stage cementing E21B 33/146)

34/00 Valve arrangements for boreholes or wells (in drilling fluid circulation systems E21B 21/10; [tool diverters E21B 23/002;] blow-out preventers E21B 33/06; oil flow regulating apparatus E21B 43/12; valves in general E16K)
2034/002 . . . (Ball valves)
2034/005 . . . (Flapper valves)
2034/007 . . . (Sleeve valves)
34/02 . . . in well heads
34/04 . . . in underwater well heads
Other equipment or details for drilling; Well equipment or well maintenance

34/06 . . . in wells
34/063 . . . Valve or closure with destructible element, e.g. fragile disc (E21B 34/103 takes precedence)
34/066 . . . [electrically actuated]
34/08 . . . responsive to flow or pressure of the fluid obtained (E21B 34/10 takes precedence)
34/085 . . . [with time-delay systems, e.g. hydraulic impedance mechanisms]
34/10 . . . operated by control fluid supplied from above ground (by a dropped ball or piston E21B 34/10; above-ground control means E21B 34/16)
34/101 . . . [with means for equalizing fluid pressure above and below the valve]
34/102 . . . [with means for locking the closing element in open or closed position (E21B 34/105 and E21B 34/108 take precedence)]
34/103 . . . [with a shear pin]
34/105 . . . [retrievable, e.g. wire line retrievable, i.e. with an element which can be landed into a landing nipple provided with a passage for control fluid]
34/106 . . . [the retrievable element being a secondary control fluid actuated valve landed into the bore of a first inoperative control fluid actuated valve]
34/107 . . . [the retrievable element being an operating or controlling means retrievable separately from the closure member, e.g. pilot valve landed into a side pocket (E21B 34/106 takes precedence)]
34/108 . . . [with time delay systems, e.g. hydraulic impedance mechanisms]
34/12 . . . [operated by movement of casings or tubings]
34/125 . . . [with time delay systems, e.g. hydraulic impedance mechanisms]
34/14 . . . [operated by movement of tools, e.g. sleeve valves operated by pistons or wire line tools (E21B 34/066 takes precedence)]
34/16 . . . Above-ground control means therefor (control systems for submersed well heads E21B 33/0355)
35/00 Methods or apparatus for preventing or extinguishing fires (cutting or deforming pipes to control fluid flow E21B 29/08; controlling flow of fluid to or in wells E21B 43/12; fire fighting in general E62C, A62D)
36/00 Heating, cooling, insulating arrangements for boreholes or wells, e.g. for use in permafrost zones (drilling by use of heat E21B 7/14; secondary recovery methods using heat E21B 43/24)
36/001 . . . (Cooling arrangements)
36/003 . . . (Insulating arrangements)
36/005 . . . (Heater surrounding production tube)
36/006 . . . [Combined heating and pumping means]
36/008 . . . [using chemical heat generating means]
36/02 . . . using burners
36/025 . . . [the burners being above ground or outside the borehole]
36/04 . . . using electrical heaters

37/00 Methods or apparatus for cleaning boreholes or wells (E21B 21/00 takes precedence; bailers E21B 7/00; cleaning pipes in general B08B 9/02)
37/02 . . . Scrapers specially adapted therefor
37/04 . . . operated by fluid pressure, e.g. free-piston scrapers (operating other tools by fluid pressure E21B 23/08)
37/045 . . . [Free-piston scrapers]
37/06 . . . using chemical means for preventing, limiting [or eliminating] the deposition of paraffins or like substances (chemical compositions therefor C09K 8/52)
37/08 . . . cleaning in situ of down-hole filters, screens, e.g. casing perforations, or gravel packs (E21B 37/06 takes precedence)
37/10 . . . Well swabs (pistons in general F16J)
40/00 Tubing catchers, automatically arresting the fall of oil-well tubing (preventing small objects from falling into the borehole E21B 41/0021)
41/00 Equipment or details not covered by groups E21B 15/00 - E21B 40/00
41/0007 . . . (for underwater installations E21B 41/005, E21B 41/04, E21B 41/06, E21B 41/08, E21B 41/10 take precedence)]
41/0014 . . . [Underwater well locating or reentry systems]
41/0021 . . . [Safety devices, e.g. for preventing small objects from falling into the borehole]
2041/0028 . . . [Fuzzy logic, artificial intelligence, neural networks, or the like]
41/0035 . . . [Apparatus or methods for multilateral well technology, e.g. for the completion of or workover on wells with one or more lateral branches (whipstocks E21B 7/061; tool diverters E21B 23/002; cutting casing windows E21B 29/06; specific well pattern E21B 43/30)]
41/0042 . . . [characterised by sealing the junction between a lateral and a main bore]
41/005 . . . [Waste disposal systems (treatment of drilling fluid outside the borehole E21B 21/06; collecting oil or the like from a submerged leakage E21B 43/0122)]
41/0057 . . . [Disposal of a fluid by injection into a subterranean formation]
41/0064 . . . [Carbon dioxide sequestration (storing fluids in porous layers B66G 5/005)]
41/0071 . . . [Adaptation of flares, e.g. arrangements of flares in offshore installations (flares of waste gases or noxious gases E23G 7/08)]
41/0078 . . . [Nozzles used in boreholes (drilling by liquid or gas jets E21B 7/18; drill bits with nozzles E21B 10/66; perforators using direct fluid action E21B 43/114; obtaining a slurry of minerals using nozzles E21B 43/29; nozzles in general B05B)]
41/0085 . . . [Adaptations of electric power generating means for use in boreholes (generation of electric power per se H02)]
41/0092 . . . [Methods relating to program engineering, design or optimisation]
41/02 . . . in situ inhibition of corrosion in boreholes or wells (dump bailers E21B 27/02; chemical compositions therefor C09K 8/54; inhibiting corrosion in general C23F)
41/04 . . . Manipulators for underwater operations, e.g. temporarily connected to well heads (manipulators in general B25J)
43/08 Work chambers for underwater operations, e.g. temporarily connected to well heads (in general B63C 11/00)

43/08 Underwater guide bases, e.g. drilling templates; Levelling therefor

**WARNING**

This group was introduced in January 2000. Patent documents are continuously being reclassified to this group from groups E21B 7/12, E21B 33/035, E21B 43/017

43/08 Guide posts, e.g. releasable; Attaching guide lines to underwater guide bases

### Obtaining fluids from wells

43/00 Methods or apparatus for obtaining oil, gas, water, soluble or meltable materials or a slurry of minerals from wells (applicable only to water E03B; obtaining oil-bearing deposits or soluble or meltable materials by mining techniques E21C 41/00; pumps F04)

43/003 (Vibrating earth formations (vibration generating arrangements for boreholes or wells E21B 28/00))

43/006 (Production of coal-bed methane (E21B 43/243 takes precedence; methods or devices for drawing-off gases for safety purposes in mines E21F 7/00))

43/01 specially adapted for obtaining from underwater installations (underwater well heads E21B 33/035)

43/0107 (Connecting of flow lines to offshore structures (E21B 43/013 takes precedence))

2043/0115 (Drilling for or production of natural gas hydrate reservoirs; Drilling through or monitoring of formations containing gas hydrates)

43/0122 (Collecting oil or the like from a submersed leakage (cleaning or keeping clear the surface of open water from oil or the like E02B 15/04))

43/013 Connecting a production flow line to an underwater well head

43/0135 (using a pulling cable)

43/017 Production satellite stations, i.e. underwater installations comprising a plurality of satellite well heads connected to a central station (underwater separating arrangements E21B 43/36)

43/02 Subsoil filtering (E21B 43/11 takes precedence, chemical compositions for consolidating loose sand or the like around wells C09K 8/56)

43/025 (Consolidation of loose sand or the like round the wells without excessively decreasing the permeability thereof (sealing borehole walls E21B 33/138))

43/04 Gravelling of wells

43/045 (Crossover tools)

43/08 Screens or liners (expandable screens or liners E21B 43/108; obtaining drinking water; filters 03B 3/18)

43/082 (Screens comprising porous materials, e.g. prepacked screens)

43/084 (Screens comprising woven materials, e.g. mesh or cloth)

43/086 (Screens with preformed openings, e.g. slotted liners (comprising porous materials E21B 43/082))

43/088 (Wire screens (comprising porous materials E21B 43/082; comprising woven materials E21B 43/084))

43/10 Setting of casings, screens, liners (or the like) in wells (driving or forcing casings into boreholes, simultaneously drilling and casing boreholes E21B 7/20; setting of tools, packers or the like E21B 23/00; suspending casings in wells heads E21B 33/04)

43/101 (for underwater installations)

43/103 (of expandable casings, screens, liners, or the like)

43/105 (Expanding tools specially adapted therefor)

43/106 (Couplings or joints therefor)

43/108 (Expandable screens or liners)

43/11 Perforators; Permeators

43/112 (Perforators with extendable perforating members, e.g. actuated by fluid means)

43/114 (Perforators using direct fluid action (on the wall to be perforated), e.g. abrasive jets)

43/116 (Gun or shaped charge perforators (projectiles with shaped or hollow charge E42B 12/10))

43/117 (Shaped charge perforators (E21B 43/118 takes precedence))

43/118 (characterised by lowering in vertical position and subsequent tilting to operating position)

43/1185 Ignition systems

43/11852 (hydraulically actuated)

43/11855 (mechanically actuated, e.g. by movement of a wireline or a drop-bar (E21B 43/1185 takes precedence))

43/11857 (firing indication systems)

43/119 Details, e.g. for locating perforating place or direction

43/1195 (Replacement of drilling mud; decrease of undesirable shock waves)

43/12 Methods or apparatus for controlling the flow of the obtained fluid to or in wells (E21B 43/25 takes precedence; valve arrangements E21B 24/00)

43/121 (Lifting well fluids (survey of down-hole pump systems E21B 47/0007))

43/122 (Gas lift)

43/123 (Gas lift valves)

43/124 (Adaptation of jet-pump systems)

2043/125 (Adaptation of walking-beam pump systems)

43/126 (Adaptations of down-hole pump systems powered by drives outside the borehole, e.g. by a rotary or oscillating drive (powered by fluid E21B 43/129))

43/127 (Adaptations of walking-beam pump systems)

43/128 (Adaptation of pump systems with down-hole electric drives)

43/129 (Adaptations of down-hole pump systems powered by fluid supplied from outside the borehole (gas-lift E21B 43/122; jet pumps E21B 43/124))

43/14 Obtaining from a multiple-zone well

43/16 Enhanced recovery methods for obtaining hydrocarbons (fracturing E21B 43/26; obtaining slurry E21B 43/29; reclamation of contaminated soil in situ B09C (chemical compositions therethrough C09K 8/58))
Obtaining fluids from wells

E21B

43/162 . . . [Injecting fluid from longitudinally spaced locations in injection well]
43/164 . . . [Injecting CO₂ or carbonated water (in combination with organic material C09K 8/594)]
43/166 . . . [Injecting a gaseous medium; Injecting a gaseous medium and a liquid medium (CO₂ injection E21B 43/164; steam injection E21B 43/24)]
43/168 . . . [Injecting a gaseous medium]
43/17 . . . Interconnecting two or more wells by fracturing or otherwise attacking the formation ([E21B 43/2405], E21B 43/247 take precedence)
43/18 . . . Repressing or vacuum methods
43/20 . . . Displacing by water
43/24 . . . using heat, e.g. steam injection (heating, cooling or insulating wells E21B 36/00) (; in combination with organic material C09K 8/592)]
43/2401 . . . [by means of electricity]
43/2403 . . . [by means of nuclear energy (nuclear reactors G21)]
43/2405 . . . [in association with fracturing or crevice forming processes (E21B 43/247 takes precedence)]
43/2406 . . . [Steam assisted gravity drainage [SAGD]]
43/2408 . . . [SAGD in combination with other methods]

WARNING
Not complete pending a reorganisation. See also E21B 43/24 and subgroups

43/241 . . . combined with solution mining of non-hydrocarbon minerals, e.g. solvent pyrolysis of oil shale
43/243 . . . Combustion in situ
43/247 . . . in association with fracturing processes (or crevice forming processes)
43/248 . . . . . . using explosives
43/25 . . . Methods for stimulating production (dump bailers E21B 27/02; vibration generating arrangements E21B 28/00 (; by vibrating earth formations E21B 43/003); chemical compositions therefor C09K 8/60)]
43/255 . . . (including the injection of a gaseous medium as treatment fluid into the formation)
43/26 . . . by forming crevices or fractures (chemical compositions therefor C09K 8/62)]
43/261 . . . [Separate steps of (1) cementing, plugging or consolidating and (2) fracturing or attacking the formation]
43/263 . . . using explosives ([combustion in situ using explosives E21B 43/248)]
43/2635 . . . (by means of nuclear energy (peaceful applications of nuclear explosive devices in general G21J 3/00)]
43/267 . . . reinforcing fractures by propping (chemical compositions therefor C09K 8/80)]
43/28 . . . Dissolving minerals other than hydrocarbons, e.g. by an alkaline or acid leaching agent (E21B 43/241 takes precedence (; using steerable or laterally extendable nozzles E21B 43/292)]
43/281 . . . [using heat (heating, cooling or insulating wells E21B 36/00)]
43/283 . . . [in association with a fracturing process]
43/285 . . . Melting minerals, e.g. sulfur (E21B 43/24 takes precedence; heating, cooling or insulating arrangements for wells E21B 36/00)
43/29 . . . Obtaining a slurry of minerals, e.g. by using nozzles
43/292 . . . [using steerable or laterally extendable nozzles]
43/295 . . . Gasification of minerals, e.g. for producing mixtures of combustible gases (E21B 43/243 takes precedence)
43/30 . . . Specific pattern of wells, e.g. optimizing the spacing of wells (production satellite stations E21B 43/017)
43/305 . . . [comprising at least one inclined or horizontal well]
43/32 . . . Preventing gas- or water- coning phenomena, i.e. the formation of a conical column of gas or water around wells
43/34 . . . Arrangements for separating materials produced by the well (separating apparatus per se, see the relevant subclasses)
43/36 . . . Underwater separating arrangements (E21B 43/38 takes precedence)
43/38 . . . in the well
43/385 . . . [by reinjecting the separated materials into an earth formation in the same well]
43/40 . . . Separation associated with re-injection of separated materials ([E21B 43/385 takes precedence])

Automatic control, surveying or testing

44/00 Automatic control systems specially adapted for drilling operations, i.e. self-operating systems which function to carry out or modify a drilling operation without intervention of a human operator, e.g. computer-controlled drilling systems (for non-automatic drilling control, see the operation controlled; automatic feeding from rack and connecting of drilling pipes E21B 19/20; controlling pressure or flow of drilling fluid E21B 21/08; control systems in general G05); Systems specially adapted for monitoring a plurality of drilling variables or conditions (means for transmitting measuring-signals from the well to the surface E21B 47/12)
44/005 . . . [Below-ground automatic control systems]
44/02 . . . Automatic control of the tool feed ([E21B 44/005), E21B 44/10 take precedence)
44/04 . . . in response to the torque of the drive (; Measuring drilling torque (E21B 44/06 takes precedence; measuring stresses in a well bore pipe E21B 47/006)]
44/06 . . . in response to the flow or pressure of the motive fluid of the drive
44/08 . . . in response to the amplitude of the movement of the percussion tool, e.g. jump or recoil
44/10 . . . Arrangements for automatic stopping when the tool is lifted from the working face (informative reference: arrangements for automatic stopping for portable percussion tools B25D 9/265)]
45/00 Measuring the drilling time or rate of penetration
47/00 Survey of boreholes or wells (monitoring pressure or flow of drilling fluid E21B 21/08; geophysical logging G01Y)
47/0001 . . . [for underwater installations]
47/0002 . . . [Survey of boreholes or wells by visual inspection (photographing internal surfaces, e.g. of pipes G03B 37/005; closed circuit television systems H04N 7/18)]
Automatic control, surveying or testing

47/0003. [Determining well or borehole volumes (determining depth E21B 47/04; diameter E21B 47/08; measuring volumes in general G01E)]

47/0005. [control of cementation quality or level (measuring temperature E21B 47/065)]

47/0006. [Measuring stresses in a well bore pipe string or casing (for locating stuck pipe E21B 47/09)]

47/0007. [Survey of down-hole pump systems]

47/0008. [Survey of walking-beam pump systems, e.g. for the detection of so called "pumped-off" conditions]

47/01. Devices for supporting measuring instruments on a drill pipe, rod or wireline (setting or locking tools in boreholes or wells E21B 23/00); ([flexible centering means per se E21B 17/014]) Protecting measuring instruments in boreholes against heat, shock, pressure or the like

47/02. Determining slope or direction (clinometers or direction meters G01C)

47/0208. . . [using seismic or acoustic means]

47/0216. . . [using at least one source of electromagnetic energy and at least one detector therefor]

47/0224. . . [at least one of the sources or one of the detectors being located above ground]

47/0223. . . [using a pendulum]

47/0224. . . [of devices in the borehole (E21B 47/022 takes precedence)]

47/0226. . . of penetrated ground layers (apparatus for obtaining oriented cores E21B 25/16; formation testing E21B 49/00)

47/04. Measuring depth or liquid level (measuring liquid level in general (and teleredorders for level of liquids) G01E; (measuring depth in general G01B 7/26))

47/0402. . . [Measuring or locating liquid level (E21B 47/044 takes precedence)]

47/044. . . [using radioactive markers]

47/06. Measuring temperature or pressure (measuring temperature in general G01K; measuring pressure in general G01L (teleredorders for pressure G01L; teleredorders for temperature G01K))

47/065. . . [Measuring temperature]

47/08. Measuring the diameter (measuring diameter in general G01R)

47/082. . . [using radiant means, e.g. acoustic, radioactive, electromagnetic]

47/09. Locating or determining the position of objects in boreholes or wells, (e.g. the position of an extending arm); Identifying the free or blocked portions of pipes (measuring depth E21B 47/044; measuring diameter E21B 47/08)

47/0905. . . [by detecting magnetic anomalies (investigating materials by investigating magnetic variables G01N 27/72)]

47/091. . . [by detecting an acoustic anomaly, e.g. a mud-pressure pulse]

47/0915. . . [using impression packers, e.g. to detect recesses or perforations]

47/10. Locating fluid leaks, intrusions or movements (using impression packers E21B 47/0915; flow measurement in general G01E; examining density and leaking in general G01M)

47/1005. . . [using thermal measurements (measurement temperature E21B 47/065)]

47/101. . . [using acoustic energy]

47/1015. . . [using tracers; using radioactivity]

47/102. . . [using electrical indications; using light radiations]

47/1025. . . . (Detecting leaks, e.g. of tubing, by pressure testing (investigating fluid-tightness of structures by using fluid or vacuum G01M 3/02)]

47/12. Means for transmitting measuring-signals (or control signals) from the well to the surface (or from the surface to the well), e.g. for logging while drilling (remote signalling in general G08)

47/121. . . [using earth as an electrical conductor (E21B 47/122 takes precedence; in general H04B 13/02; electric prospecting G01V 3/00)]

47/122. . . [by electromagnetic energy, e.g. radio frequency (in general H04B; magnetic prospecting G01V 3/00)]

47/123. . . [using light waves (optical transmission in general H04B 10/00; light guides, e.g. optical fibres G02B 6/00)]

47/124. . . [Storing data down-hole, e.g. in a memory or on a record carrier (recording in connection with measuring in general G01D; information storage in general G11)]

47/14. . . [using acoustic waves]

47/16. . . [through the drill string or casing, e.g. by torsional acoustic waves]

47/18. . . [through the well fluid, e.g. mud pressure pulse telemetry]

47/182. . . . [by continuous mud waves with modulation of the waves]

47/185. . . . [by negative mud pulses using a pressure relieve valve between drill pipe and annulus]

47/187. . . . [by positive mud pulses using a flow restricting valve within the drill pipe]

49/00 Testing the nature of borehole walls; Formation testing; Methods or apparatus for obtaining samples of soil or well fluids, specially adapted to earth drilling or wells (sampling in general G01N 1/00)

49/001. . . [specially adapted for underwater installations]

49/003. [by analysing drilling variables or conditions (E21B 49/005 takes precedence; systems specially adapted for monitoring a plurality of drilling variables or conditions E21B 44/80)]

49/005. [Testing the nature of borehole walls or the formation by using drilling mud or cutting data (investigating chemical or physical properties of materials per se G01N)]

49/006. [Measuring wall stresses in the borehole (investigation of mechanical properties of foundation soil E02D 1/022)]
Automatic control, surveying or testing

49/008  .  [by injection test; by analysing pressure variations in an injection or production test, e.g. for estimating the skin factor (measuring pressure E21B 47/06; obtaining fluid samples or testing fluids E21B 49/08)]

49/02  .  by mechanically taking samples of the soil
(apparatus for obtaining undisturbed cores E21B 25/00; investigation of foundation soil in situ E02D 1/00)

49/025  .  .  [of underwater soil, e.g. with grab devices (underwater coring E21B 25/18)]

49/04  .  .  using explosives in boreholes; using projectiles penetrating the wall ((drilling by use of explosives E21B 7/007; gun or shaped charge perforators E21B 43/116))

49/06  .  .  with side-wall drilling tools {pressing} or scrapers

49/08  .  .  Obtaining fluid samples or testing fluids, in boreholes or wells [(packers E21B 33/12; valves E21B 34/00; analysing pressure variations in an injection or production test E21B 49/008)]

49/081  .  .  .  [with down-hole means for trapping a fluid sample (E21B 49/10 takes precedence)]

49/082  .  .  .  [Wire-line fluid samplers (E21B 49/083 takes precedence)]

49/083  .  .  .  [Samplers adapted to be lowered into or retrieved from a landing nipple, e.g. for testing a well without removing the drill string]

49/084  .  .  .  [with means for conveying samples through pipe to surface]

2049/085  .  .  .  [Determining specific physical fluid parameters]

49/086  .  .  .  [Withdrawing samples at the surface]

49/087  .  .  .  [Well testing, e.g. testing for reservoir productivity or formation parameters]

49/088  .  .  .  [combined with sampling]

49/10  .  .  .  using side-wall fluid samplers or testers