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:

- E21B 1/12 - E21B 1/38 covered by E21B 1/00
- E21B 7/08 covered by E21B 7/06
- E21B 11/04 covered by E21B 27/00
- E21B 23/12 covered by E21B 23/002
- E21B 31/08 covered by E21B 27/00
- E21B 43/22 covered by C09K 8/58
- E21B 47/001-E21B 47/009 covered by
- E21B 47/013-E21B 47/017 covered by
- E21B 47/0224-E21B 47/0236 covered by
- E21B 47/047-E21B 47/053 covered by
- E21B 47/07 covered by
- E21B 47/085 covered by
- E21B 47/092-E21B 47/098 covered by
- E21B 47/103-E21B 47/117 covered by
- E21B 47/125-E21B 47/135 covered by
- E21B 47/20-E21B 47/24 covered by
- E21B 47/26 covered by

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

1/00  **Percussion drilling** (drives used in the borehole E21B 4/00; rotary drilling machines in general B23B)

1/02   . Surface drives for percussion drilling
1/04   . Devices for reversing the movement of the rod or cable at the surface (not used, see E21B 1/02)

3/00  **Rotary drilling** (drives used in the borehole E21B 4/00; rotary drilling machines in general B23B)

3/02   . Surface drives for rotary drilling
3/025  . with a to-and-fro rotation of the tool
3/03   . with an intermittent unidirectional rotation of the tool
3/035  . with slipping or elastic transmission
3/04   . Rotary tables ((portable drilling rigs with rotary tables E21B 7/021))
3/045  . . . movably mounted on the drilling structure or platform (derricks adapted to be moved on their substructure E21B 15/003; specially adapted for underwater drilling, E21B 15/02)
3/045  . . . with a to-and-fro rotation of the drill pipe or casing

2003/05 . . . 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)

4/00  Drives used in the borehole

4/003  . Bearing, sealing, lubricating details (for roller bits E21B 10/22; bearings in general F16C; sealing in general F16J; lubricating in general F16N)
4/006  . Mechanical motion converting means, e.g. reduction gearings (E21B 4/10 takes precedence; gearings in general F16H)
4/02  . Fluid rotary type drives (hydraulic turbines for drilling wells F03B 13/02)
4/04  . Electric drives (E21B 4/12 takes precedence)
4/06  . Down-hole impacting means, e.g. hammers (perussion drill bits E21B 10/36; boring rams E21B 11/02; releasing-jars E21B 31/107)
4/08  . impact being obtained by gravity only, e.g. with lost-motion connection
4/10  . continuous unidirectional rotary motion of shaft or drilling pipe effecting consecutive impacts
4/12  . Electrically operated hammers
4/14  . Fluid operated hammers
Methods or apparatus for drilling

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 extended 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. baskets, 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)]

7/007 . [Drilling by use of explosives (underwater drilling using explosives E21B 7/1245; setting-tools actuated by explosives E21B 23/04, E21B 23/065; cutting or destroying objects in boreholes by explosives E21B 29/02; freeing objects using explosives E21B 31/075; gun or shaped-charge perforators E21B 43/116; fracturing by explosives E21B 43/263, E21B 43/248; taking samples using explosives E21B 49/04)]

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 therefor E21B 15/04)

7/043 . . [underwater installations]

7/046 . [horizontal drilling (drilling with mechanical conveying means E21B 7/003)]

7/06 Deflecting the direction of boreholes (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 whippstock]

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 of 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 therefor E21B 15/02; telescoping joints E21B 17/07; using heave compensators E21B 19/09)

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 43/20; 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)]

7/201 . . . [with helical conveying means (drilling with helical conveying means E21B 7/005; augers E21B 10/44; drilling rods or pipes with helical structure E21B 17/22)]
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 axe 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 axes (cross axle roller bits \(E21B\ 10/10\))

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

2010/225 . . . (sealing details)

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

10/24 . . . characterised by lubricating details

7/203 . . . [using down-hole drives (down-hole drives per \(E21B\ 4/00\))]

7/205 . . . [without earth removal (\(E21B\ 7/30\) takes precedence)]

7/206 . . . [using down-hole drives (down-hole drives per \(E21B\ 4/00\); \(E21B\ 7/203\) and \(E21B\ 7/206\) take precedence)]

7/24 . . . Drilling using vibrating or oscillating means, e.g. out-of-balance masses (percussion drilling \(E21B\ 1/00\))

7/26 . . . Drilling without earth removal, e.g. with self-propelled burrowing devices (\((E21B\ 7/205\) and \(E21B\ 7/30\) take precedence; down-hole drives \(E21B\ 4/00\). [e.g. self-propelled fluid-operated hammers \(E21B\ 4/145\)])

7/265 . . . (Combined with earth removal)

7/28 . . . Enlarging drilled holes, e.g. by counterboring (drill bits for enlarging the borehole \(E21B\ 10/26\))

7/30 . . . without earth removal

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-expandable roller cutters

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

10/32 . . . with expandable cutting tools

10/322 . . . [cutter shifted by fluid pressure (\(E21B\ 10/345\) 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 \(E21B\ 10/82\))

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 \(E21B\ 10/22\))

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 \(E21B\ 10/006\))

10/48 . . . the bit being of core type \((\{saw cylinders having their cutting rim equipped with abrasive particles for drilling stone or glass \(B28D\ 10/41\}\))

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]

10/56 . . . Button type inserts (\(E21B\ 10/52\) takes precedence)

2010/561 . . . . . . [Inserts with performed cutting elements mounted on a distinct support, e.g. polycrystalline inserts]
Drilling tools

E21B

17/00 Drilling rods or pipes; Flexible drill strings; Kellys; 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 17/28 and E21B 17/023 take precedence)]

17/006 . [Accessories for drilling pipes, e.g. cleaners (wear protectors E21B 17/10; handling drilling pipes E21B 19/00; 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]

17/023 . [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 17/035)]

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 17/06]

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]

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]
Other equipment or details for drilling; Well equipment or well maintenance

19/008 . [Winding units, specially adapted for drilling operations (capstans, winches E26D; cathead actuated pipe wrenches or spinners E21B 19/162)]
19/002 . Rod or cable suspensions (load-engaging elements for hoisting or lowering purposes in general B66C 1/00; 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 . Slips, Spiders [ Catching devices (rotary tables with master bushing or Kelly bushing E21B 304; 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 1/0423)]
19/146 . [Carrousel 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]
19/163 . [piston-cylinder actuated]
19/164 . [motor actuated (E21B 19/162 and E21B 19/163 take precedence)]
19/165 . [Control or monitoring arrangements therefor]
19/166 . [Arrangements of torque limiters or torque indicators]
19/167 . [using a wrench adapted to engage a non circular section of pipe, e.g. a section with flats or splines]
Other equipment or details for drilling; Well equipment or well maintenance

21/00 Methods or apparatus for flushing boreholes, e.g. by use of exhaust air from motor (freeing objects stuck in boreholes by flushing E21B 31/03; well drilling compositions C09K 8/02)

21/01 . . [specially adapted for underwater drilling]

21/02 . [Down-hole drilling fluid separation systems (containers comprising collecting means with a strainer E21B 27/005; subsoil filtering E21B 43/02; down-hole production separators E21B 43/38)]

21/03 . [Means for stopping loss of drilling fluid (plastering the borehole wall E21B 33/138)]

21/04 . . (gaseous fluids)

21/05 . . [Underbalanced techniques, i.e. where borehole fluid pressure is below formation pressure]

21/06 . [Arrangements for handling drilling fluids or cuttings outside the borehole, e.g. mud boxes]

21/07 . . (Means engaging the bore entrance, e.g. hoods for collecting dust)

21/08 . Arrangements for handling drilling fluids or cuttings outside the borehole, e.g. mud boxes (swivel joints in hose-lines E21B 21/02; arrangements for treating drilling fluids E21B 21/06; waste disposal systems E21B 41/005)

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)

23/02 . . [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)]

23/03 . [Indexing systems for guiding relative movement between telescoping parts of downhole tools]

23/04 . . ("J-slot" systems, i.e. lug and slot indexing mechanisms)

23/05 . . [Self propelling system or apparatus, e.g. for moving tools within the horizontal portion of a borehole]

23/06 . 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)

23/07 . 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)

23/08 . for setting the tools into, or removing the tools from, laterally offset landing nipples or pockets

23/09 . operated by fluid means, e.g. actuated by explosion (E21B 23/06, E21B 23/08 take precedence)

23/09 . for setting packers

23/09 . setting tool actuated by explosion or gas generating means)

23/09 . Introducing or running tools by fluid pressure, e.g. through-the-flow-line tool systems (tool diverters E21B 23/002; special provisions on heads therefor E21B 33/068; cementing plugs E21B 33/16; scrapers operated by fluid pressure E21B 37/04)

23/09 . . Tools specially adapted therefor

23/09 . for displacing 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)

25/00 . . (core bits E21B 10/02; using explosives or projectiles in boreholes E21B 49/04; side-wall sampling or coring E21B 49/06)

25/05 . . (above ground means for handling the core, e.g. for extracting the core from the core barrel)

25/07 . the core receiver being insertable into, or removable from, the borehole without withdrawing the drilling pipe (retrievable drill bits E21B 10/64)

25/07 . . the core receiver having a core forming cutting edge or element, e.g. punch type core barrels
Other equipment or details for drilling; Well equipment or well maintenance

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 of pipes in boreholes or wells; Reconditioning of well casings while in the ground (‘by enlarging drilled holes or counterboring E21B 7/28)’
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 whistpool operations (‘E21B 29/005 and E21B 29/008 take precedence’; whistpools E21B 7/006)
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 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 47/009)
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
31/107 . using impact means for releasing stuck parts, e.g. jars (telescoping joints E21B 17/07)
31/1075 . . (using explosives)
31/113 . . hydraulically-operated
31/1135 . . (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 7/06)
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 spears

33/00 Sealing or packing boreholes or wells
2033/005 . (Sealings 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))
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))
Other equipment or details for drilling; Well equipment or well maintenance

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 33/040));

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 pipes E21B 29/08)
33/064 . . . . specially adapted for underwater well heads (connectors therefor E21B 33/038; control systems for submerged well-heads E21B 33/0351)
33/068 . . . . having provision for introducing objects or fluids into, or removing objects from, wells (cementing heads E21B 33/035; wipers, oil savers E21B 33/085)
33/072 . . . . for cable-operated tools (E21B 33/076) take 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)

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 33/1272 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 takes 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 33/02; methods or apparatus for grouting offshore structures E02B 17/0008; chemical compositions therefor C09K 8/00)
33/134 . . . . Bridging plugs (packers 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 F16K)

34/002 . . . . [Ball valves]
34/005 . . . . [Flapper valves]
34/007 . . . . [Sleeve valves]
34/02 . . . . in well heads
34/04 . . . . in underwater well heads
34/045 . . . . [adapted to be lowered on a tubular string into position within a blow-out preventer stack, e.g. so-called test trees]
34/06 . . . . in wells
34/063 . . . . [Valve or closure with destructible element, e.g. frangible disc (E21B 34/103 takes precedence)
34/066 . . . . [electrically actuated]
Other equipment or details for drilling; Well equipment or well maintenance

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 34/14); 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 34/06 takes precedence)
34/16 Above-ground control means therefor ((control systems for submerged 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 A62C, 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 bore hole]
36/04 . using electrical heaters

37/00 Methods or apparatus for cleaning boreholes or wells (E21B 21/00 takes precedence; [bailers E21B 27/00]; cleaning pipes in general B08B 9/02)
37/02 . Scrapers specially adapted thereto
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 E16B]

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 7/06); 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 . . [Dispposal of a fluid by injection into a subterranean formation]
41/0064 . . . [Carbon dioxide sequestration (storing fluids in porous layers B65G 5/005)]
41/0071 . . [Adaptation of flares, e.g. arrangements of flares in offshore installations (flares of waste gases or noxious gases F23G 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 43/14; 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)]
41/06 . . Work chambers for underwater operations, e.g. temporarily connected to well heads (in general B63C 11/00)
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)

43/012 . (Collecting oil or the like from a submerged 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 E03B 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 well 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 43/11852 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 34/00)

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)}

43/13 Obtaining from a multiple-zone well

43/14 Enhanced recovery methods for obtaining hydrocarbons (fracturing E21B 43/20; obtaining slurry E21B 43/29; reclamation of contaminated soil in situ B09C ; chemical compositions therefor C09K 8/58)

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))
Obtaining fluids from wells

Obtaining a slurry of minerals, e.g. by using nozzles arrangements for wells E21B 36/00 takes precedence; heating, cooling or insulating Melting minerals, e.g. sulfur (E21B 43/24) extendable nozzles E21B 43/292 Dissolving minerals other than hydrocarbons, e.g. C09K 8/60 E21B 43/003 E21B 28/00 E21B 27/02)

Methods for stimulating production (dump bailers); chemical compositions therefor (combustion in situ using explosives E21B 43/48) measuring drilling torque (E21B 44/06 takes precedence); measuring stresses in a well bore pipe (E21B 47/0006)

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 47/0006)]

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 G01V)

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)]

47/0003 . . [Determining well or borehole volumes (determining depth E21B 47/04, diameter E21B 47/08; measuring volumes in general G01P)]
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 17/1014]) Protecting measuring instruments in boreholes against heat, shock, pressure or the like

**NOTE**

Devices for both supporting and protecting measuring instruments are only classified in E21B 47/011

47/011 . [Protecting measuring instruments (cooling or insulating arrangements for boreholes or wells E21B 36/00)]
47/02 . Determining slope or direction (clinometers or direction meters G01C)
47/022 . . . of the borehole, { e.g. using geomagnetism}
47/02208 . . . . . [using seismic or acoustic means]
47/02216 . . . . . [using at least one source of electromagnetic energy and at least one detector thereof]
47/02224 . . . . . . . [at least one of the sources or one of the detectors being located above ground]
47/02232 . . . . . {using a pendulum}
47/024 . . . of devices in the borehole (E21B 47/022 takes precedence)
47/026 . . . 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 G01L; measuring depth in general G01B 7/261;)
47/042 . . . [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; (telerecorders for temperature G01L; telerecorders for temperature G01K))
47/065 . . . . . . . . . . . [measuring temperature]
47/08 . Measuring the diameter (measuring diameter in general G01B)
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 47/04; measuring diameter E21B 47/08)
47/0905 . . . . . . . . . . . [by detecting magnetic anomalies (investigating materials by investigating magnetic variables G01N 27/27)]
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 G01F; examining density and leaking in general G01M])
47/1005 . . . . [using thermal measurements (measuring 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 44/00)]
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)]
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)]
Automatic control, surveying or testing

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