

CPC COOPERATIVE PATENT CLASSIFICATION

E FIXED CONSTRUCTIONS

EARTH DRILLING; MINING

E21 EARTH DRILLING; MINING

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

- 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 43/27	covered by	E21B 43/26
E21B 47/001-E21B 47/005	covered by	E21B 47/0001 - E21B 47/0005
E21B 47/007 - E21B 47/009	covered by	E21B 47/0006 - E21B 47/0008
E21B 47/013	covered by	E21B 47/01
E21B 47/017	covered by	E21B 47/011
E21B 47/0224-E21B 47/0236	covered by	E21B 47/02208 - E21B 47/02232
E21B 47/047-E21B 47/053	covered by	E21B 47/042 - E21B 47/044
E21B 47/07	covered by	E21B 47/065
E21B 47/085	covered by	E21B 47/082
E21B 47/092-E21B 47/098	covered by	E21B 47/0905 - E21B 47/0915
E21B 47/103-E21B 47/117	covered by	E21B 47/1005 - E21B 47/1025
E21B 47/125-E21B 47/135	covered by	E21B 47/121 - E21B 47/123
E21B 47/20-E21B 47/24	covered by	E21B 47/182 - E21B 47/187
E21B 47/26	covered by	E21B 47/124

- 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)	3/06	. . . 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)
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)	4/00	Drives used in the borehole
3/02	. Surface drives for rotary drilling	4/003	. {Bearing, sealing, lubricating details (for roller bits E21B 10/22 ; bearings in general F16C ; sealing in general F16J ; lubricating in general F16N)}
3/025	. . with a to-and-fro rotation of the tool	4/006	. {Mechanical motion converting means, e.g. reduction gearings (E21B 4/10 takes precedence; gearings in general F16H)}
3/03	. . with an intermittent unidirectional rotation of the tool	4/02	. Fluid rotary type drives (hydraulic turbines for drilling wells F03B 13/02)
3/035	. . with slipping or elastic transmission	4/04	. Electric drives (E21B 4/12 takes precedence)
3/04	. . Rotary tables {(portable drilling rigs with rotary tables E21B 7/021)}	4/06	. Down-hole impacting means, e.g. hammers (percussion drill bits E21B 10/36 ; boring rams E21B 11/02 ; releasing-jars E21B 31/107)
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)}	4/08	. . impact being obtained by gravity only, e.g. with lost-motion connection
2003/05	. . . {with a to-and-fro rotation of the drill pipe or casing}	4/10	. . continuous unidirectional rotary motion of shaft or drilling pipe effecting consecutive impacts
		4/12	. . Electrically operated hammers

- 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. 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 31/1075](#); 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 . . {for 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 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 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 43/29](#); 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](#))}

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)}	10/22	. . characterised by bearing, lubrication or sealing details
7/203	. . . {using down-hole drives (down-hole drives per se E21B 4/00)}	2010/225	. . . {sealing details}
7/205	. . {without earth removal (E21B 7/30 takes precedence)}	10/23	. . . with drilling fluid supply to the bearings
	NOTE	10/24	. . . characterised by lubricating details
	Special methods or apparatus for drilling without earth removal E21B 7/26	2010/243	. . . . {with drilling fluid supply to the bearing}
7/206	. . . {using down-hole drives (down-hole drives per se E21B 4/00)}	10/246	. . . . {with pumping means for feeding lubricant}
7/208	. . {using down-hole drives (down-hole drives per se E21B 4/00 ; E21B 7/203 and E21B 7/206 take precedence)}	10/25	. . . characterised by sealing details
7/24	. Drilling using vibrating or oscillating means, e.g. out-of-balance masses (percussion drilling E21B 1/00)	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)
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 })	10/28	. . with non-expandable roller cutters
7/265	. . {Combined with earth removal}	10/30	. . . Longitudinal axis roller reamers, e.g. reamer stabilisers
7/28	. Enlarging drilled holes, e.g. by counterboring (drill bits for enlarging the borehole E21B 10/26)	10/32	. . with expandable cutting tools
7/30	. . without earth removal	10/322	. . . {cutter shifted by fluid pressure (E21B 10/345 takes precedence)}
Drilling tools		10/325	. . . {the cutter being shifted by a spring mechanism}
10/00	Drill bits (specially adapted for deflecting the direction of boring E21B 7/064 ; with means for collecting substances E21B 27/00)	10/327	. . . {the cutter being pivoted about a longitudinal axis (E21B 10/34 takes precedence)}
10/003	. {with cutting edges facing in opposite axial directions}	10/34	. . . of roller-cutter type
10/006	. {providing a cutting edge which is self-renewable during drilling}	10/345	. . . . {cutter shifted by fluid pressure}
10/02	. Core bits (characterised by wear resisting parts E21B 10/46 ; obtaining undisturbed cores E21B 25/00)	10/36	. Percussion drill bits (characterised by wear resisting parts E21B 10/46 {; with helical conveying portion E21B 10/445 })
10/04	. . with core destroying means	10/38	. . characterised by conduits or nozzles for drilling fluids
10/06	. . Roller core bits	10/40	. . with leading portion
10/08	. Roller bits (roller core bits E21B 10/06 ; with leading portion E21B 10/26 ; characterised by wear resisting parts E21B 10/46)	10/42	. 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)
10/083	. . {with longitudinal axis, e.g. wobbling or nutating roller bit (longitudinal axis roller reamers E21B 10/30)}	2010/425	. . {characterised by teeth or cutter arrangement}
10/086	. . {with eccentric movement}	10/43	. . characterised by the arrangement of teeth or other cutting elements
10/10	. . with roller axle supported at both ends (with disc-cutters E21B 10/12)	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)
10/12	. . with discs cutters	10/445	. . {percussion type, e.g. for masonry (percussion drill bits in general E21B 10/36)}
10/14	. . combined with non-rolling cutters other than of leading-portion type	10/46	. characterised by wear resisting parts, e.g. diamond inserts ({drill bits with self-renewable cutting edge E21B 10/006 })
10/16	. . characterised by tooth form or arrangement	10/48	. . the bit being of core type ({saw cylinders having their cutting rim equipped with abrasive particles for drilling stone or glass B28D 1/041 })
10/18	. . characterised by conduits or nozzles for drilling fluids (drilling fluid supply to the bearings E21B 10/23)	10/485	. . . {with inserts in form of chisels, blades or the like}
10/20	. . characterised by detachable or adjustable parts, e.g. legs or axles (cross axle roller bits E21B 10/10)	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}
2010/562	. . . . {having a non planar or non circular cutting face}
2010/563	. . . . {having a cutting face with different segments, e.g. mosaic-type inserts}
2010/564	. . . . {characterised by support details}
2010/565	. . . . . {Interface between the substrate and the cutting element}
2010/566	. . . . {with chip breaking arrangements}
10/567	. . . with preformed cutting elements mounted on a distinct support, e.g. polycrystalline inserts
10/5673	. . . . {having a non planar or non circular cutting face}
10/5676	. . . . {having a cutting face with different segments, e.g. mosaic-type inserts}
10/573	. . . . characterised by support details
10/5735	. . . . . {Interface between the substrate and the cutting element}
10/58	. . Chisel type inserts ({ E21B 10/485 ;} E21B 10/52 , E21B 10/54 take precedence)
10/60	. characterised by conduits or nozzles for drilling fluids (for roller bits E21B 10/18 ; for percussion drill bits E21B 10/38 ; mining picks with arrangement of fluid-spraying nozzles E21C 35/187)
10/602	. . {the bit being a rotary drag type bit with blades}
10/605	. . {the bit being a core-bit}
2010/607	. . {characterised by the nozzle structure}
10/61	. . characterised by the nozzle structure
10/62	. characterised by parts, e.g. cutting elements, which are detachable or adjustable (E21B 10/64 takes precedence; for roller bits E21B 10/20 ; {for rotary drag type drill bits E21B 10/42 }; for augers E21B 10/44)
2010/622	. . {with plural separable cutter elements}
2010/624	. . . {independently attachable}
10/627	. . with plural detachable cutting elements
10/633	. . . independently detachable
10/64	. characterised by the whole or part thereof being insertable into or removable from the borehole without withdrawing the drilling pipe (retrievable core receivers E21B 25/02)
10/66	. . the cutting element movable through the drilling pipe and laterally shiftable
11/00	Other drilling tools ({ boring grabs E21B 27/00 })
11/005	. {Hand operated drilling tools}
11/02	. Boring rams (percussion drives used in the borehole E21B 4/06 ; percussion drill bits E21B 10/36)
11/06	. with driven cutting chains or similarly driven tools
12/00	Accessories for drilling tools ({ connecting and disconnecting drill bit and drilling pipe E21B 19/18 ; sharpening stone drill bits B24B 3/33 })
12/02	. Wear indicators
12/04	. Drill bit protectors
12/06	. Mechanical cleaning devices

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 19/00 ; 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 })
17/021	. . {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 17/06 })
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	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)
17/06	. . . Releasing-joints, e.g. safety joints	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)}
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 })	19/004	. . {supporting a riser from a drilling or production platform}
17/073	. . . . {with axial rotation}	19/006	. . . {including heave compensators}
17/076	. . . . {between rod or pipe and drill bit}	19/008	. {Winding units, specially adapted for drilling operations (capstans, winches B66D ; cathead actuated pipe wrenches or spinners E21B 19/162)}
17/08	. . Casing joints	19/02	. 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)
17/085	. . . {Riser connections (connectors for wellhead E21B 33/038)}	19/04	. . Hooks
17/10	. Wear protectors; Centralising devices, {e.g. stabilisers} (drives used in the borehole with anchoring means E21B 4/18 ; guiding or centralising devices outside the borehole E21B 19/24)	19/06	. . Elevators, i.e. rod or tube gripping devices
17/1007	. . {for the internal surface of a pipe, e.g. wear bushings for underwater well-heads}	19/07	. . . Slip-type elevators (slips E21B 19/10)
17/1014	. . {Flexible or expansible centering means, e.g. with pistons pressing against the wall of the well (E21B 17/1042 takes precedence)}	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
17/1021	. . . {with articulated arms or arcuate springs (measuring the diameter E21B 47/08)}	19/081	. . Screw-and-nut feed mechanisms
17/1028	. . . . {with arcuate springs only, e.g. baskets with outwardly bowed strips for cementing operations}	19/083	. . Cam, rack or like feed mechanisms
17/1035	. . {for plural rods, pipes or lines, e.g. for control lines}	19/084	. . with flexible drawing means, e.g. cables
17/1042	. . {Elastomer protector or centering means}	19/086	. . with a fluid-actuated cylinder (E21B 19/084 , E21B 19/087 , E21B 19/09 take precedence)
17/105	. . . {split type}	19/087	. . by means of a swinging arm
17/1057	. . {Centralising devices with rollers or with a relatively rotating sleeve (E21B 17/1014 takes precedence)}	19/089	. . with a spring or an additional weight
17/1064	. . . {Pipes or rods with a relatively rotating sleeve}	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 })
17/1071	. . {specially adapted for pump rods, e.g. sucker rods}	19/10	. Slips; 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)}
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)}	19/12	. Rope clamps (rope clamps in general F16G 11/00) {rod, casings or tube clamps not secured to elevators}
17/1085	. . {Wear protectors; Blast joints; Hard facing (wear protection included in centralising devices, see relevant subgroups)}	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 1/0442 })
17/1092	. . {Gauge section of drill bits}	19/143	. . {specially adapted for underwater drilling}
17/12	. . Devices for placing or drawing out wear protectors	19/146	. . {Carousel systems, i.e. rotating rack systems}
17/14	. Casing shoes {for the protection of the bottom of the casing}	19/15	. . Racking of rods in horizontal position; Handling between horizontal and vertical position
17/16	. Drill collars	19/155	. . . {Handling between horizontal and vertical position}
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 })	19/16	. Connecting or disconnecting pipe couplings or joints (E21B 19/20 takes precedence; pipe wrenches or the like B25B)
17/20	. Flexible or articulated drilling pipes {, e.g. flexible or articulated rods, pipes or cables (risers E21B 17/01 ; swivel joints E21B 17/05)}	19/161	. . {using a wrench or a spinner adapted to engage a circular section of pipe (E21B 19/168 takes precedence)}
17/203	. . {with plural fluid passages}	19/162	. . . {cathead actuated}
17/206	. . {with conductors, e.g. electrical, optical (hoses with electrically conducting means in general F16L 11/127)}		
17/22	. Rods or pipes with helical structure (drill bits with helical conveying portion E21B 10/44)		

19/163	. . . {piston-cylinder actuated}	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)
19/164	. . . {motor actuated (E21B 19/162 and E21B 19/163 take precedence)}	21/10	. Valves arrangements in drilling fluid circulation systems (valves in general F16K)
19/165	. . {Control or monitoring arrangements therefor}	21/103	. . {Down-hole by-pass valve arrangements, i.e. between the inside of the drill string and the annulus}
19/166	. . . {Arrangements of torque limiters or torque indicators}	21/106	. . {Valve arrangements outside the borehole, e.g. Kelly valves}
19/167	. . {using a wrench adapted to engage a non circular section of pipe, e.g. a section with flats or splines}	21/12	. using drilling pipes with plural fluid passages, e.g. closed circulation systems (pipes with plural fluid passages E21B 17/18)
19/168	. . {using a spinner with rollers or a belt adapted to engage a well pipe}	21/14	. using liquids and gases, e.g. foams
19/18	. Connecting or disconnecting drill bit and drilling pipe	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)
19/20	. Combined feeding from rack and connecting, e.g. automatically	21/18	. Preventing exhaust air from the drill motor from blowing-off towards the working face
19/22	. Handling reeled pipe or rod units, e.g. flexible drilling pipes {(lifting or hauling appliances using two or more cooperating endless chains B66D 3/003)}		
19/24	. Guiding or centralising devices for drilling rods or pipes		
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)	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)
21/001	. {specially adapted for underwater drilling}	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)}
21/002	. {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)}	23/004	. {Indexing systems for guiding relative movement between telescoping parts of downhole tools}
21/003	. {Means for stopping loss of drilling fluid (plastering the borehole wall E21B 33/138)}	23/006	. . {"J-slot" systems, i.e. lug and slot indexing mechanisms}
2021/005	. {using gaseous fluids}	2023/008	. {Self propelling system or apparatus, e.g. for moving tools within the horizontal portion of a borehole}
2021/006	. {Underbalanced techniques, i.e. where borehole fluid pressure is below formation pressure}	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)}
2021/007	. {Arrangements for handling drilling fluids or cuttings outside the borehole, e.g. mud boxes}	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)
2021/008	. . {Means engaging the bore entrance, e.g. hoods for collecting dust}	23/03	. for setting the tools into, or removing the tools from, laterally offset landing nipples or pockets
21/01	. 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)}	23/04	. operated by fluid means, e.g. actuated by explosion (E21B 23/06 , E21B 23/08 take precedence)
21/012	. . {using exhaust air from the drilling motor for blowing off the dust at the borehole entrance}	23/06	. for setting packers
21/015	. . Means engaging the bore entrance, e.g. hoods for collecting dust	23/065	. . {setting tool actuated by explosion or gas generating means}
21/02	. Swivel joints in hose-lines ({ hose connections in general F16L 31/00 , F16L 33/00)}	23/08	. 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)
21/06	. Arrangements for treating drilling fluids outside the borehole (treating steps per se , see the relevant subclasses)	23/10	. . Tools specially adapted therefor
2021/061	. . {for treating dust-loaded gaseous fluids}	23/14	. 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 17/1035 }; by fluid pressure E21B 23/08 ; provision on well heads for introducing or removing cable-operated tools E21B 33/072 , E21B 33/076)
21/062	. . {by mixing components}		
21/063	. . {by separating components}		
21/065	. . . {Separating solids from drilling fluids}		
21/066	. . . . {with further treatment of the solids, e.g. for disposal}		
21/067	. . . {Separating gases from drilling fluids}		
21/068	. . {using chemical treatment}		
21/07	. . for treating dust-laden gaseous fluids		

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)	29/04	• Cutting of wire lines or the like (E21B 29/02 takes precedence)
25/005	• {Above ground means for handling the core, e.g. for extracting the core from the core barrel}	29/06	• Cutting windows, e.g. directional window cutters for whipstock operations ({ E21B 29/005 and E21B 29/08 take precedence {; whipstocks E21B 7/061 })
25/02	• the core receiver being insertable into, or removable from, the borehole without withdrawing the drilling pipe (retrievable drill bits E21B 10/64)	29/08	• Cutting or deforming pipes to control fluid flow (shear type blow-out preventers E21B 33/063)
25/04	• . the core receiver having a core forming cutting edge or element, e.g. punch type core barrels	29/10	• Reconditioning of well casings, e.g. straightening
25/06	• the core receiver having a flexible liner or inflatable retaining means	29/12	• specially adapted for underwater installations (E21B 29/08 takes precedence)
25/08	• Coating, freezing, consolidating cores (E21B 25/06 takes precedence); Recovering uncontaminated cores or cores at formation pressure	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)
25/10	• Formed core retaining or severing means (E21B 25/06 , E21B 25/08 take precedence)	31/002	• {Destroying the objects to be fished, e.g. by explosive means (cutting by explosives E21B 29/02)}
25/12	• . of the sliding wedge type	31/005	• {using vibrating or oscillating means (vibration generating arrangements for boreholes or wells E21B 28/00)}
25/14	• . mounted on pivot transverse to core axis	31/007	• {fishing tools with means for attaching comprising fusing or sticking}
25/16	• for obtaining oriented cores	31/03	• Freeing by flushing {; Controlling differential pipe sticking}
25/18	• the core receiver being specially adapted for operation under water	31/06	• using magnetic means
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	31/107	• using impact means for releasing stuck parts, e.g. jars (telescoping joints E21B 17/07)
27/005	• {Collecting means with a strainer}	31/1075	• . {using explosives}
27/02	• Dump bailers, i.e. containers for depositing substances, e.g. cement or acids	31/113	• . hydraulically-operated
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)}	31/1135	• . . {Jars with a hydraulic impedance mechanism, i.e. a restriction, for initially delaying escape of a restraining fluid}
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)	31/12	• Grappling tools, e.g. tongs or grabs
	WARNING	31/125	• . {specially adapted for parted wire line or ropes}
	Group E21B 28/00 is not complete. See also E21B 43/003	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)
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)}	31/16	• . combined with cutting or destroying means (cutting or destroying means per se E21B 29/00)
29/002	• {Cutting, e.g. milling, a pipe with a cutter rotating along the circumference of the pipe}	31/18	• . gripping externally, e.g. overshot
29/005	• . {with a radially-expandable cutter rotating inside the pipe, e.g. for cutting an annular window}	31/20	• . gripping internally, e.g. fishing spears
29/007	• . {with a radially-retracting cutter rotating outside the pipe}	33/00	Sealing or packing boreholes or wells
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)	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 C23F)}
		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)	33/1272	. . . . {inflated by down-hole pumping means operated by a pipe string}
33/0407	. . . . {with a suspended electrical cable}	33/1275	. . . . {inflated by down-hole pumping means operated by a down-hole drive}
33/0415	. . . . {rotating or floating support for tubing or casing hanger}	33/1277	. . . . {characterised by the construction or fixation of the sleeve}
33/0422	. . . . {a suspended tubing or casing being gripped by a slip or an internally serrated member (slips in rotary table E21B 19/10)}	33/128	. . . 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)}
33/043	. . . . specially adapted for underwater well heads ((E21B 33/0407), E21B 33/047 take precedence)	33/1285	. . . . {by fluid pressure}
33/047	. . . . for plural tubing strings	33/129	. . . with mechanical slips for hooking into the casing (E21B 33/122 , E21B 33/124 take precedence)
33/05	. . . . Cementing-heads, e.g. having provision for introducing cementing plugs	33/1291	. . . . {anchor set by wedge or cam in combination with frictional effect, using so-called drag-blocks (E21B 33/1295 takes precedence)}
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)}	33/1292	. . . . . {with means for anchoring against downward and upward movement}
33/061	. . . . {Ram-type blow-out preventers, e.g. with pivoting rams}	33/1293	. . . . . {with means for anchoring against downward and upward movement (E21B 33/1291 , E21B 33/1295 take precedence)}
33/062	. . . . . {with sliding rams}	33/1294	. . . . {characterised by a valve, e.g. a by-pass valve}
33/063	. . . . . {for shearing drill pipes (cutting of wireline E21B 29/04 ; cutting pipes E21B 29/08)}	33/1295	. . . . . actuated by fluid pressure
33/064	. . . . specially adapted for underwater well heads (connectors therefor E21B 33/038 ; control systems for submerged well-heads E21B 33/0355)}	33/12955	. . . . . {using drag blocks frictionally engaging the inner wall of the well}
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)}	33/13	. . 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)
33/072	. . . . for cable-operated tools (E21B 33/076 takes precedence)	33/134	. . . Bridging plugs (packers E21B 33/12)}
33/076	. . . . specially adapted for underwater installations	33/136	. . . Baskets, e.g. of umbrella type
33/08	. . Wipers; Oil savers	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)}
33/085	. . . {Rotatable packing means, e.g. rotating blow-out preventers}	33/14	. . . for cementing casings into boreholes ({ using special cement compositions C09K 8/42 ; control of cementation quality or level E21B 47/0005)}
33/10	. . in the borehole ({ sealing the junction between main bore and laterals E21B 41/0042)}	33/143	. . . . {for underwater installations}
2033/105	. . {characterised by sealing the junction between a lateral and a main bore}	33/146	. . . . {Stage cementing, i.e. discharging cement from casing at different levels}
33/12	. . Packers; Plugs ({ locking packers or plugs in landing nipples E21B 23/02 }; used for cementing E21B 33/134 , E21B 33/16)}	33/16	. . . . using plugs for isolating cement charge; Plugs therefor ({ spacer compositions C09K 8/424 ; stage cementing E21B 33/146)}
33/1204	. . . {permanent; drillable}	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)
33/1208	. . . {characterised by the construction of the sealing or packing means (E21B 33/1277 takes precedence)}	2034/002	. {Ball valves}
33/1212	. . . . {including a metal-to-metal seal element}	2034/005	. {Flapper valves}
33/1216	. . . . {Anti-extrusion means, e.g. means to prevent cold flow of rubber packing}	2034/007	. {Sleeve valves}
33/122	. . . Multiple string packers	34/02	. in well heads
33/124	. . . Units with longitudinally-spaced plugs for isolating the intermediate space	34/04	. . in underwater well heads
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)		

34/045	. . . {adapted to be lowered on a tubular string into position within a blow-out preventer stack, e.g. so-called test trees}	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)
34/06	. in wells	37/02	. Scrapers specially adapted therefor
34/063	. . {Valve or closure with destructible element, e.g. frangible disc (E21B 34/103 takes precedence)}	37/04	. . operated by fluid pressure, e.g. free-piston scrapers (operating other tools by fluid pressure E21B 23/08)
34/066	. . {electrically actuated}	37/045	. . . {Free-piston scrapers}
34/08	. . responsive to flow or pressure of the fluid obtained (E21B 34/10 takes precedence)	37/06	. using chemical means for preventing, limiting {or eliminating} the deposition of paraffins or like substances (chemical compositions therefor C09K 8/52)
34/085	. . . {with time-delay systems, e.g. hydraulic impedance mechanisms}	37/08	. cleaning <u>in situ</u> of down-hole filters, screens, {e.g. casing perforations,} or gravel packs (E21B 37/06 takes precedence)
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)	37/10	. Well swabs ({pistons in general F16J })
34/101	. . . {with means for equalizing fluid pressure above and below the valve}	40/00	Tubing catchers, automatically arresting the fall of oil-well tubing {(preventing small objects from falling into the borehole E21B 41/0021)}
34/102	. . . {with means for locking the closing element in open or closed position (E21B 34/105 and E21B 34/108 take precedence)}	41/00	Equipment or details not covered by groups E21B 15/00 - E21B 40/00
34/103	. . . . {with a shear pin}	41/0007	. {for underwater installations (E21B 41/005 , E21B 41/04 , E21B 41/06 , E21B 41/08 , E21B 41/10 take precedence)}
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}	41/0014	. . {Underwater well locating or reentry systems}
34/106	. . . . {the retrievable element being a secondary control fluid actuated valve landed into the bore of a first inoperative control fluid actuated valve}	41/0021	. {Safety devices, e.g. for preventing small objects from falling into the borehole}
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)}	2041/0028	. {Fuzzy logic, artificial intelligence, neural networks, or the like}
34/108	. . . {with time delay systems, e.g. hydraulic impedance mechanisms}	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)}
34/12	. . operated by movement of casings or tubings	41/0042	. . {characterised by sealing the junction between a lateral and a main bore}
34/125	. . . {with time delay systems, e.g. hydraulic impedance mechanisms}	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)}
34/14	. . operated by movement of tools, e.g. sleeve valves operated by pistons or wire line tools ({ E21B 34/066 takes precedence})	41/0057	. . {Disposal of a fluid by injection into a subterranean formation}
34/16	. Above-ground control means therefor {(control systems for submerged well heads E21B 33/0355)}	41/0064	. . . {Carbon dioxide sequestration (storing fluids in porous layers B65G 5/005)}
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)	41/0071	. . {Adaptation of flares, e.g. arrangements of flares in offshore installations (flares of waste gases or noxious gases F23G 7/08)}
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)	41/0078	. {Nozzles used in boreholes (drilling by liquid or gas jets E21B 7/18 ; drill bits with nozzles E21B 10/60 ; perforators using direct fluid action E21B 43/114 ; obtaining a slurry of minerals using nozzles E21B 43/29 ; nozzles in general B05B)}
36/001	. {Cooling arrangements}	41/0085	. {Adaptations of electric power generating means for use in boreholes (generation of electric power <u>per se</u> H02)}
36/003	. {Insulating arrangements}	41/0092	. {Methods relating to program engineering, design or optimisation}
36/005	. {Heater surrounding production tube}	41/02	. <u>in situ</u> inhibition of corrosion in boreholes or wells (dump bailers E21B 27/02 ; chemical compositions therefor C09K 8/54 ; inhibiting corrosion in general C23F)
36/006	. {Combined heating and pumping means}	41/04	. Manipulators for underwater operations, e.g. temporarily connected to well heads (manipulators in general B25J)
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		

41/06	• Work chambers for underwater operations, e.g. temporarily connected to well heads (in general B63C 11/00)	43/088	• . . . {Wire screens (comprising porous materials E21B 43/082 ; comprising woven materials E21B 43/084)}
41/08	• 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	43/10	• . . . 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)
41/10	• Guide posts, e.g. releasable; Attaching guide lines to underwater guide bases	43/101	• . . . {for underwater installations}
Obtaining fluids from wells		43/103	• . . . {of expandable casings, screens, liners, or the like}
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)	43/105	• {Expanding tools specially adapted therefor}
43/003	• {Vibrating earth formations (vibration generating arrangements for boreholes or wells E21B 28/00)}	43/106	• {Couplings or joints therefor}
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)}	43/108	• {Expandable screens or liners}
43/01	• specially adapted for obtaining from underwater installations (underwater well heads E21B 33/035)	43/11	• Perforators; Permeators
43/0107	• . . {Connecting of flow lines to offshore structures (E21B 43/013 takes precedence)}	43/112	• . . Perforators with extendable perforating members, e.g. actuated by fluid means
2043/0115	• . . {Drilling for or production of natural gas hydrate reservoirs; Drilling through or monitoring of formations containing gas hydrates}	43/114	• . . Perforators using direct fluid action {on the wall to be perforated}, e.g. abrasive jets
43/0122	• . . {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)}	43/116	• . . Gun or shaped charge perforators {(projectiles with shaped or hollow charge F42B 12/10)}
43/013	• . . Connecting a production flow line to an underwater well head	43/117	• . . . Shaped charge perforators (E21B 43/118 takes precedence)
43/0135	• . . . {using a pulling cable}	43/118	• . . . characterised by lowering in vertical position and subsequent tilting to operating position
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)	43/1185	• . . . Ignition systems
43/02	• Subsoil filtering (E21B 43/11 takes precedence, chemical compositions for consolidating loose sand or the like around wells C09K 8/56)	43/11852	• {hydraulically actuated}
43/025	• . . {Consolidation of loose sand or the like round the wells without excessively decreasing the permeability thereof (sealing borehole walls E21B 33/138)}	43/11855	• {mechanically actuated, e.g. by movement of a wireline or a drop-bar (E21B 43/11852 takes precedence)}
43/04	• . . Graveling of wells	43/11857	• {firing indication systems}
43/045	• . . . {Crossover tools}	43/119	• . . Details, e.g. for locating perforating place or direction
43/08	• . . Screens or liners {(expandable screens or liners E21B 43/108 ; obtaining drinking water; filters E03B 3/18)}	43/1195	• . . . {Replacement of drilling mud; decrease of undesirable shock waves}
43/082	• . . . {Screens comprising porous materials, e.g. prepacked screens}	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)
43/084	• . . . {Screens comprising woven materials, e.g. mesh or cloth}	43/121	• . . {Lifting well fluids (survey of down-hole pump systems E21B 47/0007)}
43/086	• . . . {Screens with preformed openings, e.g. slotted liners (comprising porous materials E21B 43/082)}	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 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](#))}
- 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 . . Repressuring 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 47/0006](#))}
 - 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 percussive 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 [G01F](#))}
- 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 therefor}
- 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 {and telerecorders for level of liquids} [G01F](#); {measuring depth in general [G01B 7/26](#)})
- 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 pressure [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 27/72](#))}
- 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 [G01F](#); 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 44/00](#))}
- 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](#))}
- 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