

CPC COOPERATIVE PATENT CLASSIFICATION

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

WARNING

The following IPC groups are not used in the CPC scheme. Subject matter covered by these 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

Methods or apparatus for drilling

1/00	Percussion drilling (drives used in the borehole E21B 4/00 ; rotary drilling machines in general B23B)	4/14	. . Fluid operated hammers
1/02	. Surface drives for percussion drilling	4/145	. . . {of the self propelled-type, e.g. with a reverse mode to retract the device from the hole}
1/04	. . Devices for reversing the movement of the rod or cable at the surface {(not used, see E21B 1/02)}	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
3/00	Rotary drilling (drives used in the borehole E21B 4/00 ; rotary drilling machines in general B23B)	4/18	. Anchoring or feeding in the borehole
3/02	. Surface drives for rotary drilling	4/20	. combined with surface drive (E21B 4/10 takes precedence)
3/025	. . with a to-and-fro rotation of the tool	6/00	Drives for combined percussion and rotary drilling (drives used in the borehole E21B 4/00)
3/03	. . with an intermittent unidirectional rotation of the tool	6/02	. the rotation being continuous
3/035	. . with slipping or elastic transmission	6/04	. . Separate drives for percussion and rotation
3/04	. . Rotary tables {(portable drilling rigs with rotary tables E21B 7/021)}	6/06	. the rotation being intermittent, e.g. obtained by ratchet device
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)}	6/08	. . Separate drives for percussion and rotation
2003/05	. . . {with a to-and-fro rotation of the drill pipe or casing}	7/00	Special methods or apparatus for drilling
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)	7/001	. {Drilling a non circular hole (excavating trenches E02F 5/02 ; cutting machines for slitting E21C 25/00)}
4/00	Drives used in the borehole	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)}
4/003	. {Bearing, sealing, lubricating details (for roller bits E21B 10/22 ; bearings in general F16C ; sealing in general F16J ; lubricating in general F16N)}	7/003	. {Drilling with mechanical conveying means (bailers, e.g. baskets, buckets E21B 27/00 ; tunnelling E21D)}
4/006	. {Mechanical motion converting means, e.g. reduction gearings (E21B 4/10 takes precedence; gearings in general F16H)}	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)}
4/02	. Fluid rotary type drives (hydraulic turbines for drilling wells F03B 13/02)	7/006	. . . {combined with a bucket-type container (bailers with helical conveying means E21B 27/04)}
4/04	. Electric drives (E21B 4/12 takes precedence)	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)}
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)	7/008	. {Drilling ice or a formation covered by ice}
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		

- 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](#))}
- 7/203 . . . {using down-hole drives ([down-hole drives per se E21B 4/00](#))}
- 7/205 . . . {without earth removal ([E21B 7/30 takes precedence](#))}
- NOTE**
- Special methods or apparatus for drilling without earth removal [E21B 7/26](#)
- 7/206 . . . {using down-hole drives ([down-hole drives per se E21B 4/00](#))}
- 7/208 . . . {using down-hole drives ([down-hole drives per se 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
- 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 excentric movement}
- 10/10 . . with roller axle supported at both ends (with disc-cutters [E21B 10/12](#))
- 10/12 . . with discs cutters
- 10/14 . . combined with non-rolling cutters other than of leading-portion type
- 10/16 . . characterised by tooth form or arrangement
- 10/18 . . characterised by conduits or nozzles for drilling fluids (drilling fluid supply to the bearings [E21B 10/23](#))
- 10/20 . . characterised by detachable or adjustable parts, e.g. legs or axles (cross axle roller bits [E21B 10/10](#))
- 10/22 . . characterised by bearing, lubrication or sealing details
- 2010/225 . . . {sealing details}
- 10/23 . . . with drilling fluid supply to the bearings
- 10/24 . . . characterised by lubricating details
- 2010/243 {with drilling fluid supply to the bearing}
- 10/246 {with pumping means for feeding lubricant}
- 10/25 . . . characterised by sealing details
- 10/26 . . Drill bits with leading portion, i.e. drill bits with a pilot cutter; Drill bits for enlarging the borehole, e.g. reamers (percussion drill bits with leading portion [E21B 10/40](#); augers with leading portion [E21B 10/44](#))
- 10/28 . . with non-expandible roller cutters
- 10/30 . . . Longitudinal axis roller reamers, e.g. reamer stabilisers
- 10/32 . . with expandible 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 10/62](#))
- 2010/425 . . {characterised by teeth or cutter arrangement}
- 10/43 . . characterised by the arrangement of teeth or other cutting elements
- 10/44 . . Bits with helical conveying portion, e.g. screw type bits; Augers with leading portion or with detachable parts ({Rotary drag type drill bits [E21B 10/42](#)}; drilling rods with helical structure [E21B 17/22](#))
- 10/445 . . {percussion type, e.g. for masonry (percussion drill bits in general [E21B 10/36](#))}
- 10/46 . . characterised by wear resisting parts, e.g. diamond inserts {(drill bits with self-renewable cutting edge [E21B 10/006](#))}
- 10/48 . . the bit being of core type {(saw cylinders having their cutting rim equipped with abrasive particles for drilling stone or glass [B28D 1/041](#))}
- 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}
- 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)}	17/03	. . between drilling rod or pipe and drill motor, e.g. between drilling rod and hammer
11/005	. {Hand operated drilling tools}	17/04	. . between rod {or the like} and bit or between rod and rod {or the like}
11/02	. Boring rams (percussion drives used in the borehole E21B 4/06 ; percussion drill bits E21B 10/36)	17/042	. . . threaded {(readily releasing joints E21B 17/06)}
11/06	. with driven cutting chains or similarly driven tools	17/0423	. . . . {with plural threaded sections, e.g. with two-step threads}
12/00	Accessories for drilling tools {(connecting and disconnecting drill bit and drilling pipe E21B 19/18 ; sharpening stone drill bits B24B 3/33)}	17/0426	. . . . {with a threaded cylindrical portion, e.g. for percussion rods}
12/02	. Wear indicators	17/043	. . . . with locking means
12/04	. Drill bit protectors	17/046	. . . with ribs, pins or jaws, and complementary grooves or the like, e.g. bayonet catches
12/06	. Mechanical cleaning devices	17/05	. . . Swivel joints
<u>Other equipment or details for drilling; Well equipment or well maintenance</u>		17/06	. . . Releasing-joints, e.g. safety joints
15/00	Derricks; Masts; {Other supports (drill rigs with movable understructures E21B 7/02)}	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)}
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)}	17/073	. . . . {with axial rotation}
15/006	. {Means for anchoring the drilling machine to the ground}	17/076	. . . . {between rod or pipe and drill bit}
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 })	17/08	. . Casing joints
15/04	. specially adapted for directional drilling, e.g. slant hole rigs {(with skidding means E21B 15/003)}	17/085	. . . {Riser connections (connectors for wellhead E21B 33/038)}
15/045	. . {Hydraulic, pneumatic or electric circuits for their positioning}	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)
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)	17/1007	. . {for the internal surface of a pipe, e.g. wear bushings for underwater well-heads}
17/003	. {with electrically conducting or insulating means (E21B 17/028 and E21B 17/023 take precedence)}	17/1014	. . {Flexible or expansible centering means, e.g. with pistons pressing against the wall of the well (E21B 17/1042 takes 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)}	17/1021	. . . {with articulated arms or arcuate springs (measuring the diameter E21B 47/08)}
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)	17/1028	. . . . {with arcuate springs only, e.g. baskets with outwardly bowed strips for cementing operations}
17/012	. . {with buoyancy elements (E21B 17/015 takes precedence)}	17/1035	. . {for plural rods, pipes or lines, e.g. for control lines}
17/015	. . {Non-vertical risers, e.g. articulated or catenary-type}	17/1042	. . {Elastomer protector or centering means}
17/017	. . {Bend restrictors for limiting stress on risers}	17/105	. . . {split type}
17/02	. Couplings; joints {(Expandable couplings or joints E21B 43/106)}	17/1057	. . {Centralising devices with rollers or with a relatively rotating sleeve (E21B 17/1014 takes precedence)}
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)}	17/1064	. . . {Pipes or rods with a relatively rotating sleeve}
17/023	. . {Arrangements for connecting cables or wirelines to downhole devices}	17/1071	. . {specially adapted for pump rods, e.g. sucker rods}
17/025	. . . {Side entry subs}	17/1078	. . {Stabilisers or centralisers for casing, tubing or drill pipes (devices for off-center positioning E21B 17/10 ; E21B 17/1007 - E21B 17/1064 take precedence)}
17/026	. . . {Arrangements for fixing cables or wirelines to the outside of downhole devices (protectors and centralisers for cables and control lines E21B 17/1035)}	17/1085	. . {Wear protectors; Blast joints; Hard facing (wear protection included in centralising devices, see relevant subgroups)}
17/028	. . {Electrical or electro-magnetic connections}	17/1092	. . {Gauge section of drill bits}
		17/12	. . Devices for placing or drawing out wear protectors
		17/14	. Casing shoes {for the protection of the bottom of the casing}
		17/16	. Drill collars

- 17/18 . Pipes provided with plural fluid passages ([E21B 17/203](#) takes precedence; circulation of drilling fluid by means of such pipes [E21B 21/12](#); {general [F16L 39/00](#)})
- 17/20 . Flexible or articulated drilling pipes, {e.g. flexible or articulated rods, pipes or cables (risers [E21B 17/01](#); swivel joints [E21B 17/05](#))}
- 17/203 . . {with plural fluid passages}
- 17/206 . . {with conductors, e.g. electrical, optical (hoses with electrically conducting means in general [F16L 11/127](#))}
- 17/22 . Rods or pipes with helical structure (drill bits with helical conveying portion [E21B 10/44](#))
- 19/00 Handling rods, casings, tubes or the like outside the borehole, e.g. in the derrick (surface drives [E21B 1/02](#), [E21B 3/02](#))**
- 19/002 . {specially adapted for underwater drilling ([E21B 19/09](#), [E21B 19/143](#) take precedence; risers with buoyancy elements [E21B 17/012](#), [E21B 17/015](#))}
- 19/004 . . {supporting a riser from a drilling or production platform}
- 19/006 . . . {including heave compensators}
- 19/008 . {Winding units, specially adapted for drilling operations (capstans, winches [B66D](#); cathead actuated pipe wrenches or spinners [E21B 19/162](#))}
- 19/02 . Rod or cable suspensions (load-engaging elements for hoisting or lowering purposes in general [B66C 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 3/04](#); slip-type elevators [E21B 19/07](#); casing heads with slips [E21B 33/0422](#))}
- 19/12 . Rope clamps (rope clamps in general [F16G 11/00](#)) {rod, casings or tube clamps not secured to elevators}
- 19/14 . Racks, ramps, troughs or bins, for holding the lengths of rod singly or connected; Handling between storage place and borehole ([E21B 19/20](#), [E21B 19/22](#) take precedence; {storing elongated articles in general [B65G 1/0442](#)})
- 19/143 . . {specially adapted for underwater drilling}
- 19/146 . . {Carousel systems, i.e. rotating rack systems}
- 19/15 . . Racking of rods in horizontal position; Handling between horizontal and vertical position
- 19/155 . . . {Handling between horizontal and vertical position}
- 19/16 . Connecting or disconnecting pipe couplings or joints ([E21B 19/20](#) takes precedence; Pipe wrenches or the like [B25B](#))
- 19/161 . . {using a wrench or a spinner adapted to engage a circular section of pipe ([E21B 19/168](#) takes precedence)}
- 19/162 . . . {cathead actuated}
- 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}
- 19/168 . . {using a spinner with rollers or a belt adapted to engage a well pipe}
- 19/18 . Connecting or disconnecting drill bit and drilling pipe
- 19/20 . Combined feeding from rack and connecting, e.g. automatically
- 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](#))**
- 21/001 . {specially adapted for underwater drilling}
- 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](#))}
- 21/003 . {Means for stopping loss of drilling fluid (plastering the borehole wall [E21B 33/138](#))}
- 2021/005 . {using gaseous fluids}
- 2021/006 . {Underbalanced techniques, i.e. where borehole fluid pressure is below formation pressure}
- 2021/007 . {Arrangements for handling drilling fluids or cuttings outside the borehole, e.g. mud boxes}
- 2021/008 . . {Means engaging the bore entrance, e.g. hoods for collecting dust}
- 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](#)})
- 21/012 . . {using exhaust air from the drilling motor for blowing off the dust at the borehole entrance}
- 21/015 . . Means engaging the bore entrance, e.g. hoods for collecting dust
- 21/02 . Swivel joints in hose-lines {(hose connections in general [F16L 31/00](#), [F16L 33/00](#))}

21/06	• Arrangements for treating drilling fluids outside the borehole (treating steps per se, see the relevant subclasses)	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)
2021/061	• . {for treating dust-loaded gaseous fluids}	23/10	• . Tools specially adapted therefor
21/062	• . {by mixing components}	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)
21/063	• . {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		
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)	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)
21/10	• Valve arrangements in drilling fluid circulation systems (valves in general F16K)	25/005	• {Above ground means for handling the core, e.g. for extracting the core from the core barrel}
21/103	• . {Down-hole by-pass valve arrangements, i.e. between the inside of the drill string and the annulus}	25/02	• the core receiver being insertable into, or removable from, the borehole without withdrawing the drilling pipe (retrievable drill bits E21B 10/64)
21/106	• . {Valve arrangements outside the borehole, e.g. kelly valves}	25/04	• . the core receiver having a core forming cutting edge or element, e.g. punch type core barrels
21/12	• using drilling pipes with plural fluid passages, e.g. closed circulation systems (pipes with plural fluid passages E21B 17/18)	25/06	• the core receiver having a flexible liner or inflatable retaining means
21/14	• using liquids and gases, e.g. foams	25/08	• Coating, freezing, consolidating cores (E21B 25/06 takes precedence); Recovering uncontaminated cores or cores at formation pressure
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)	25/10	• Formed core retaining or severing means (E21B 25/06 , E21B 25/08 take precedence)
21/18	• Preventing exhaust air from the drill motor from blowing-off towards the working face	25/12	• . of the sliding wedge type
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)	25/14	• . mounted on pivot transverse to core axis
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)}	25/16	• for obtaining oriented cores
23/004	• {Indexing systems for guiding relative movement between telescoping parts of downhole tools}	25/18	• the core receiver being specially adapted for operation under water
23/006	• . { "J-slot" systems, i.e. lug and slot indexing mechanisms}	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
2023/008	• {Self propelling system or apparatus, e.g. for moving tools within the horizontal portion of a borehole}	27/005	• {Collecting means with a strainer}
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 })	27/02	• Dump bailers, i.e. containers for depositing substances, e.g. cement or acids
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)	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)}
23/03	• for setting the tools into, or removing the tools from, laterally offset landing nipples or pockets	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)
23/04	• operated by fluid means, e.g. actuated by explosion (E21B 23/06 , E21B 23/08 take precedence)		WARNING
23/06	• for setting packers		Group E21B 28/00 is not complete. See also E21B 43/003
23/065	• . {setting tool actuated by explosion or gas generating means}		

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)}	33/03	. . Well heads; Setting-up thereof (valve arrangements therefor E21B 34/02)
29/002	. {Cutting, e.g. milling, a pipe with a cutter rotating along the circumference of the pipe}	33/035	. . . specially adapted for underwater installations (E21B 33/043 , E21B 33/064 , E21B 33/076 take precedence)
29/005	. . {with a radially-expansible cutter rotating inside the pipe, e.g. for cutting an annular window}	33/0355	. . . . {Control systems, e.g. hydraulic, pneumatic, electric, acoustic, for submerged well heads}
29/007	. . {with a radially-retracting cutter rotating outside the pipe}	33/037	. . . . Protective housing therefor
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)	33/0375	. . . . . {Corrosion protection means (in general C23F)}
29/04	. Cutting of wire lines or the like (E21B 29/02 takes precedence)	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)
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 })	33/0385	. . . . . {electrical connectors (underwater electrical connections in general H01R 13/523)}
29/08	. Cutting or deforming pipes to control fluid flow (shear type blow-out preventers E21B 33/063)	33/04	. . . Casing heads; Suspending casings or tubings in well heads (setting of casings in wells E21B 43/10)
29/10	. Reconditioning of well casings, e.g. straightening	33/0407	. . . . {with a suspended electrical cable}
29/12	. specially adapted for underwater installations (E21B 29/08 takes precedence)	33/0415	. . . . {rotating or floating support for tubing or casing hanger}
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)	33/0422	. . . . {a suspended tubing or casing being gripped by a slip or an internally serrated member (slips in rotary table E21B 19/10)}
31/002	. {Destroying the objects to be fished, e.g. by explosive means (cutting by explosives E21B 29/02)}	33/043	. . . . specially adapted for underwater well heads ({ E21B 33/0407 ,} E21B 33/047 take precedence)
31/005	. {using vibrating or oscillating means (vibration generating arrangements for boreholes or wells E21B 28/00)}	33/047	. . . . for plural tubing strings
31/007	. {fishing tools with means for attaching comprising fusing or sticking}	33/05	. . . . Cementing-heads, e.g. having provision for introducing cementing plugs
31/03	. Freeing by flushing; {Controlling differential pipe sticking}	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)}
31/06	. using magnetic means	33/061	. . . . {Ram-type blow-out preventers, e.g. with pivoting rams}
31/107	. using impact means for releasing stuck parts, e.g. jars (telescoping joints E21B 17/07)	33/062	. . . . . {with sliding rams}
31/1075	. . {using explosives}	33/063	. . . . . {for shearing drill pipes (cutting of wireline E21B 29/04 ; cutting pipes E21B 29/08)}
31/113	. . hydraulically-operated	33/064	. . . . specially adapted for underwater well heads (connectors therefor E21B 33/038 ; {control systems for submerged well-heads E21B 33/0355 })
31/1135	. . . {Jars with a hydraulic impedance mechanism, i.e. a restriction, for initially delaying escape of a restraining fluid}	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 })
31/12	. Grappling tools, e.g. tongs or grabs	33/072	. . . . for cable-operated tools (E21B 33/076 takes precedence)
31/125	. . {specially adapted for parted wire line or ropes}	33/076	. . . . specially adapted for underwater installations
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)	33/08	. . Wipers; Oil savers
31/16	. . combined with cutting or destroying means (cutting or destroying means per se E21B 29/00)	33/085	. . . {Rotatable packing means, e.g. rotating blow-out preventers}
31/18	. . gripping externally, e.g. overshot	33/10	. in the borehole ({ sealing the junction between main bore and laterals E21B 41/0042 })
31/20	. . gripping internally, e.g. fishing spears	2033/105	. . {characterised by sealing the junction between a lateral and a main bore}
33/00	Sealing or packing boreholes or wells	33/12	. . Packers; Plugs ({ locking packers or plugs in landing nipples E21B 23/02 }; used for cementing E21B 33/134 , E21B 33/16)
2033/005	. {Sealings characterised by their shape}	33/1204	. . . {permanent; drillable}
33/02	. Surface sealing or packing		

33/1208	. . . {characterised by the construction of the sealing or packing means (E21B 33/1277 takes precedence)}	33/146	. . . . {Stage cementing, i.e. discharging cement from casing at different levels}
33/1212	. . . . {including a metal-to-metal seal element}	33/16	. . . . using plugs for isolating cement charge; Plugs therefor {(spacer compositions C09K 8/424 ; stage cementing E21B 33/146)}
33/1216	. . . . {Anti-extrusion means, e.g. means to prevent cold flow of rubber packing}		
33/122	. . . Multiple string packers	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)
33/124	. . . Units with longitudinally-spaced plugs for isolating the intermediate space	2034/002	. {Ball valves}
33/1243	. . . . {with inflatable sleeves}	2034/005	. {Flapper valves}
33/1246	. . . . {inflated by down-hole pumping means operated by a pipe string}	2034/007	. {Sleeve valves}
33/126	. . . with fluid-pressure-operated elastic cup or skirt (E21B 33/122 , E21B 33/124 take precedence)	34/02	. in well heads
33/1265	. . . . {with mechanical slips}	34/04	. . in underwater well heads
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}
33/1272	. . . . {inflated by down-hole pumping means operated by a pipe string}	34/06	. in wells
33/1275	. . . . {inflated by down-hole pumping means operated by a down-hole drive}	34/063	. . {Valve or closure with destructible element, e.g. frangible disc (E21B 34/103 takes precedence)}
33/1277	. . . . {characterised by the construction or fixation of the sleeve}	34/066	. . {electrically actuated}
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 })	34/08	. . responsive to flow or pressure of the fluid obtained (E21B 34/10 takes precedence)
33/1285	. . . . {by fluid pressure}	34/085	. . . {with time-delay systems, e.g. hydraulic impedance mechanisms}
33/129	. . . with mechanical slips for hooking into the casing (E21B 33/122 , E21B 33/124 take 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)
33/1291	. . . . {anchor set by wedge or cam in combination with frictional effect, using so-called drag-blocks (E21B 33/1295 takes precedence)}	34/101	. . . {with means for equalizing fluid pressure above and below the valve}
33/1292	. . . . {with means for anchoring against downward and upward movement}	34/102	. . . {with means for locking the closing element in open or closed position (E21B 34/105 and E21B 34/108 take precedence)}
33/1293	. . . . {with means for anchoring against downward and upward movement (E21B 33/1291 , E21B 33/1295 take precedence)}	34/103	. . . . {with a shear pin}
33/1294	. . . . {characterised by a valve, e.g. a by-pass valve}	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}
33/1295	. . . . actuated by fluid pressure	34/106	. . . . {the retrievable element being a secondary control fluid actuated valve landed into the bore of a first inoperative control fluid actuated valve}
33/12955	. . . . {using drag blocks frictionally engaging the inner wall of the well}	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)}
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)	34/108	. . . {with time delay systems, e.g. hydraulic impedance mechanisms}
33/134	. . . Bridging plugs {(packers E21B 33/12)}	34/12	. . operated by movement of casings or tubings
33/136	. . . Baskets, e.g. of umbrella type	34/125	. . . {with time delay systems, e.g. hydraulic impedance mechanisms}
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)}	34/14	. . operated by movement of tools, e.g. sleeve valves operated by pistons or wire line tools ({ E21B 34/066 takes precedence})
33/14	. . . for cementing casings into boreholes {(using special cement compositions C09K 8/42 ; control of cementation quality or level E21B 47/0005)}	34/16	. Above-ground control means therefor {(control systems for submerged well heads E21B 33/0355)}
33/143	. . . . {for underwater installations}		

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 per se H02)}
36/003	. {Insulating arrangements}	41/0092	. {Methods relating to program engineering, design or optimisation}
36/005	. {Heater surrounding production tube}	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)
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}	41/06	. Work chambers for underwater operations, e.g. temporarily connected to well heads (in general B63C 11/00)
36/02	. using burners	41/08	. Underwater guide bases, e.g. drilling templates; Levelling therefor
36/025	. . {the burners being above ground or outside the bore hole}		WARNING
36/04	. using electrical heaters		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
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)	41/10	. Guide posts, e.g. releasable; Attaching guide lines to underwater guide bases
37/02	. Scrapers specially adapted therefor		
37/04	. . operated by fluid pressure, e.g. free-piston scrapers (operating other tools by fluid pressure E21B 23/08)		
37/045	. . . {Free-piston scrapers}		
37/06	. using chemical means for preventing, limiting {or eliminating} the deposition of paraffins or like substances (chemical compositions therefor C09K 8/52)		
37/08	. cleaning in situ of down-hole filters, screens, {e.g. casing perforations,} or gravel packs (E21B 37/06 takes precedence)		
37/10	. Well swabs ({pistons in general F16J })		
40/00	Tubing catchers, automatically arresting the fall of oil-well tubing ({preventing small objects from falling into the borehole E21B 41/0021 })		
41/00	Equipment or details not covered by groups E21B 15/00 - E21B 40/00		
41/0007	. {for underwater installations (E21B 41/005 , E21B 41/04 , E21B 41/06 , E21B 41/08 , E21B 41/10 take precedence)}		
41/0014	. . {Underwater well locating or reentry systems}		
41/0021	. {Safety devices, e.g. for preventing small objects from falling into the borehole}		
2041/0028	. {Fuzzy logic, artificial intelligence, neural networks, or the like}		
41/0035	. {Apparatus or methods for multilateral well technology, e.g. for the completion of or workover on wells with one or more lateral branches (whipstocks E21B 7/061 ; tool diverters E21B 23/002 ; cutting casing windows E21B 29/06 ; specific well pattern E21B 43/30)}		
41/0042	. . {characterised by sealing the junction between a lateral and a main bore}		
41/005	. {Waste disposal systems (treatment of drilling fluid outside the borehole E21B 21/06 ; collecting oil or the like from a submerged leakage E21B 43/0122)}		
41/0057	. . {Disposal of a fluid by injection into a subterranean formation}		
41/0064	. . . {Carbon dioxide sequestration (storing fluids in porous layers B65G 5/005)}		
		Obtaining fluids from wells	
		43/00	Methods or apparatus for obtaining oil, gas, water, soluble or meltable materials or a slurry of minerals from wells (applicable only to water E03B ; obtaining oil-bearing deposits or soluble or meltable materials by mining techniques E21C 41/00 ; pumps F04)
		43/003	. {Vibrating earth formations (vibration generating arrangements for boreholes or wells E21B 28/00)}
		43/006	. {Production of coal-bed methane (E21B 43/243 takes precedence; methods or devices for drawing-off gases for safety purposes in mines E21F 7/00)}
		43/01	. specially adapted for obtaining from underwater installations (underwater well heads E21B 33/035)
		43/0107	. . {Connecting of flow lines to offshore structures (E21B 43/013 takes precedence)}
		2043/0115	. . {Drilling for or production of natural gas hydrate reservoirs; Drilling through or monitoring of formations containing gas hydrates}
		43/0122	. . {Collecting oil or the like from a 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 . . Graveling 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 [F42B 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](#))}
- 43/14 . 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 phenoma, 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} [G01E](#); {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