

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](#) to [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 **[E21B23/00D](#)**
[E21B 31/08](#) covered by [E21B 27/00](#)
[E21B 43/22](#) covered by [C09K 8/58](#)

Guidance heading: **Methods or apparatus for drilling**

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

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

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

- E21B 3/02 . Surface drives for rotary drilling
- E21B 3/025 . . with a to-and-fro rotation of the tool
- E21B 3/03 . . with an intermittent unidirectional rotation of the tool
- E21B 3/035 . . with slipping or elastic transmission
- E21B 3/04 . . Rotary tables {(portable drilling rigs with rotary tables [E21B 7/021](#))}
- E21B 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](#))}
- E21B 2003/05 . . . {with a to-and-fro rotation of the drill pipe or casing }
- E21B 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](#))

E21B 4/00 **Drives used in the borehole**

- E21B 4/003 . {Bearing, sealing, lubricating details (for roller bits [E21B 10/22](#); bearings in general [F16C](#); sealing in general [F16J](#); lubricating in general [F16N](#))}
- E21B 4/006 . {Mechanical motion converting means, e.g. reduction gearings ([E21B 4/10](#) takes precedence; gearings in general [F16H](#))}

- E21B 4/02 . Fluid rotary type drives ([hydraulic turbines for drilling wells F03B 13/02](#))
- E21B 4/04 . Electric drives ([E21B 4/12 takes precedence](#))
- E21B 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](#))
- E21B 4/08 . . impact being obtained by gravity only, e.g. with lost-motion connection
- E21B 4/10 . . continuous unidirectional rotary motion of shaft or drilling pipe effecting consecutive impacts
- E21B 4/12 . . Electrically operated hammers
- E21B 4/14 . . Fluid operated hammers
- E21B 4/145 . . . {[of the self propelled-type, e.g. with a reverse mode to retract the device from the hole](#)}
- E21B 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
- E21B 4/18 . Anchoring or feeding in the borehole
- E21B 4/20 . combined with surface drive ([E21B 4/10 takes precedence](#))

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

- E21B 7/00** **Special methods or apparatus for drilling**
- E21B 7/001 . {[Drilling a non circular hole](#) ([excavating trenches E02F 5/02](#); [cutting machines for slitting E21C 25/00](#))}
- E21B 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](#))}
- E21B 7/003 . {[Drilling with mechanical conveying means](#) ([bailers, e.g. baskets, buckets E21B 27/00](#); [tunnelling E21D](#))}
- E21B 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](#))}
- E21B 7/006 . . . {[combined with a bucket-type container](#) ([bailers with helical conveying means E21B 27/04](#))}
- E21B 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](#))}
- E21B 7/008 . {[Drilling ice or a formation covered by ice](#)}
- E21B 7/02 . Portable drilling rigs, truck-or skid-mounted, with their own drive ([portable drilling rigs for use on underwater floors E21B 7/124](#))
- E21B 7/021 . . {[With a rotary table, i.e a fixed rotary drive for a relatively advancing tool](#) ([rotary tables E21B 3/04](#))}

- E21B 7/022 .. { Control of the drilling operation; Hydraulic or pneumatic means for activation or operation ([control circuits for drilling masts E21B 15/045](#))}
- E21B 7/023 .. { the mast being foldable or telescopically retractable}
- E21B 7/024 .. { having means for adapting to inclined terrain; having means for stabilizing the vehicle while drilling}
- E21B 7/025 .. { Rock drills, i.e. jumbo drills}
- E21B 7/026 .. { having auxiliary platforms, e.g. for observation purposes}
- E21B 7/027 .. { Drills for drilling shallow holes, e.g. for taking soil samples or for drilling postholes}
- E21B 7/028 ... { the drilling apparatus being detachable from the vehicle, e.g. hand portable drills}
- E21B 7/04 . Directional drilling ([derricks or masts specially adapted therefor E21B 15/04](#))
- E21B 7/043 .. {for underwater installations}
- E21B 7/046 .. {horizontal drilling ([drilling with mechanical conveying means E21B 7/003](#))}
- E21B 7/06 .. Deflecting the direction of boreholes {([directional window cutting E21B 29/06](#); [deflecting the direction of fishing tools E21B 31/14](#))}
- E21B 7/061 ... {the tool shaft advancing relative to a guide, e.g. a curved tube or a whipstock}
- E21B 7/062 ... {the tool shaft rotating inside a non-rotating guide travelling with the shaft ([E21B 7/067](#) and [E21B 7/068](#) take precedence)}
- E21B 7/064 ... {specially adapted drill bits therefor}
- E21B 7/065 ... {using oriented fluid jets}
- E21B 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}
- E21B 7/068 ... {drilled by a down-hole drilling motor ([down-hole drives per se E21B 4/00](#), [E21B 7/067](#) takes precedence)}
- E21B 7/10 .. Correction of deflected boreholes
- E21B 7/12 . Underwater drilling ([derricks or masts specially adapted therefor E21B 15/02](#); [telescoping joints E21B 17/07](#); [using heave compensators E21B 19/09](#))
- E21B 7/122 .. {with submersible vertically movable guide}
- E21B 7/124 .. with underwater tool drive prime mover, e.g. portable drilling rigs for use on underwater floors
- E21B 7/1245 ... {using explosive means ([Anchors driven in by explosive charges B63B 21/28](#))}
- E21B 7/128 .. from floating support with independent underwater anchored guide base {[guide line systems E21B 41/10](#)}
- E21B 7/132 .. from underwater buoyant support
- E21B 7/136 .. from non-buoyant support ([E21B 7/124](#) takes precedence)
- E21B 7/14 . Drilling by use of heat, e.g. flame drilling {(by use of explosives [E21B 7/007](#))}
- E21B 7/143 .. {underwater}
- E21B 7/146 .. {Thermal lances}
- E21B 7/15 .. of electrically generated heat
- E21B 7/16 . Applying separate balls or pellets by the pressure of the drill, so-called shot-drilling
- E21B 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](#))

- E21B 7/185 .. {underwater}
- E21B 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](#)})
- E21B 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](#))}
- E21B 7/203 ... {using down-hole drives (down-hole drives per se [E21B 4/00](#))}
- E21B 7/205 .. {without earth removal ([E21B 7/30](#) takes precedence)}

NOTE

Special methods or apparatus for drilling without earth removal [E21B 7/26](#)

- E21B 7/206 ... {using down-hole drives (down-hole drives per se [E21B 4/00](#))}
- E21B 7/208 .. {using down-hole drives (down-hole drives per se [E21B 4/00](#); [E21B 7/203](#) and [E21B 7/206](#) take precedence)}
- E21B 7/24 . Drilling using vibrating or oscillating means, e.g. out-of-balance masses (percussion drilling [E21B 1/00](#))
- E21B 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](#)})
- E21B 7/265 .. {Combined with earth removal}
- E21B 7/28 . Enlarging drilled holes, e.g. by counterboring (drill bits for enlarging the borehole [E21B 10/26](#))
- E21B 7/30 .. without earth removal

Guidance heading: Drilling tools

- E21B 10/00** **Drill bits** (specially adapted for deflecting the direction of boring [E21B 7/064](#); with means for collecting substances [E21B 27/00](#))
- E21B 10/003 . {with cutting edges facing in opposite axial directions}
- E21B 10/006 . {providing a cutting edge which is self-renewable during drilling}
- E21B 10/02 . Core bits (characterised by wear resisting parts [E21B 10/46](#); obtaining undisturbed cores [E21B 25/00](#))
- E21B 10/04 .. with core destroying means
- E21B 10/06 .. Roller core bits
- E21B 10/08 . Roller bits (roller core bits [E21B 10/06](#); with leading portion [E21B 10/26](#); characterised by wear resisting parts [E21B 10/46](#))
- E21B 10/083 .. {with longitudinal axis, e.g. wobbling or nutating roller bit (longitudinal axis roller reamers [E21B 10/30](#))}
- E21B 10/086 .. {with excentric movement}
- E21B 10/10 .. with roller axle supported at both ends (with disc-cutters [E21B 10/12](#))
- E21B 10/12 .. with discs cutters

- E21B 10/14 . . combined with non-rolling cutters other than of leading-portion type
- E21B 10/16 . . characterised by tooth form or arrangement
- E21B 10/18 . . characterised by conduits or nozzles for drilling fluids ([drilling fluid supply to the bearings E21B 10/23](#))
- E21B 10/20 . . characterised by detachable or adjustable parts, e.g. legs or axles ([cross axle roller bits E21B 10/10](#))
- E21B 10/22 . . characterised by bearing, lubrication or sealing details
- E21B 2010/225 . . . {sealing details }
- E21B 10/23 . . . with drilling fluid supply to the bearings
- E21B 10/24 . . . characterised by lubricating details
- E21B 2010/243 {with drilling fluid supply to the bearing }
- E21B 10/246 {with pumping means for feeding lubricant}
- E21B 10/25 . . . characterised by sealing details
- E21B 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](#))
- E21B 10/28 . . with non-expandable roller cutters
- E21B 10/30 . . . Longitudinal axis roller reamers, e.g. reamer stabilisers
- E21B 10/32 . . with expandable cutting tools
- E21B 10/322 . . . {cutter shifted by fluid pressure ([E21B 10/345 takes precedence](#))}
- E21B 10/325 . . . {the cutter being shifted by a spring mechanism}
- E21B 10/327 . . . {the cutter being pivoted about a longitudinal axis ([E21B 10/34 takes precedence](#))}
- E21B 10/34 . . . of roller-cutter type
- E21B 10/345 {cutter shifted by fluid pressure}
- E21B 10/36 . . Percussion drill bits ([characterised by wear resisting parts E21B 10/46](#)){[with helical conveying portion E21B 10/445](#)}
- E21B 10/38 . . characterised by conduits or nozzles for drilling fluids
- E21B 10/40 . . with leading portion
- E21B 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](#))
- E21B 2010/425 . . {characterised by teeth or cutter arrangement }
- E21B 10/43 . . characterised by the arrangement of teeth or other cutting elements
- E21B 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](#))
- E21B 10/445 . . {percussion type, e.g. for masonry ([percussion drill bits in general E21B 10/36](#))}
- E21B 10/46 . . characterised by wear resisting parts, e.g. diamond inserts ({[drill bits with self-renewable cutting edge E21B 10/006](#)})
- E21B 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](#)})
- E21B 10/485 . . . {with inserts in form of chisels, blades or the like}

- E21B 10/50 . . the bit being of roller type
- E21B 10/52 . . . with chisel or button type inserts
- E21B 10/54 . . the bit being of the rotary drag type, e.g. fork-type bits
- E21B 2010/545 . . . {with blades having performed cutting elements mounted on a distinct support, e.g. polycrystalline inserts }
- E21B 10/55 . . . with preformed cutting elements { with blades having preformed cutting elements mounted on a distinct support, e.g. polycrystalline inserts }
- E21B 10/56 . . Button type inserts ([E21B 10/52](#) takes precedence)
- E21B 2010/561 . . . {Inserts with performed cutting elements mounted on a distinct support, e.g. polycrystalline inserts }
- E21B 2010/562 {having a non planar or non circular cutting face }
- E21B 2010/563 {having a cutting face with different segments, e.g. mosaic-type inserts }
- E21B 2010/564 {characterised by support details }
- E21B 2010/565 {Interface between the substrate and the cutting element }
- E21B 2010/566 {with chip breaking arrangements }
- E21B 10/567 . . . with preformed cutting elements mounted on a distinct support, e.g. polycrystalline inserts
- E21B 10/5673 { having a non planar or non circular cutting face }
- E21B 10/5676 { having a cutting face with different segments, e.g. mosaic-type inserts }
- E21B 10/573 characterised by support details
- E21B 10/5735 { Interface between the substrate and the cutting element }
- E21B 10/58 . . Chisel type inserts ([E21B 10/485](#), [E21B 10/52](#), [E21B 10/54](#) take precedence)
- E21B 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](#)})
- E21B 10/602 . . {the bit being a rotary drag type bit with blades}
- E21B 10/605 . . {the bit being a core-bit}
- E21B 2010/607 . . {characterised by the nozzle structure }
- E21B 10/61 . . characterised by the nozzle structure
- E21B 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](#)})
- E21B 2010/622 . . {with plural separable cutter elements }
- E21B 2010/624 . . . {independently attachable }
- E21B 10/627 . . with plural detachable cutting elements
- E21B 10/633 . . . independently detachable
- E21B 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](#))
- E21B 10/66 . . the cutting element movable through the drilling pipe and laterally shiftable
- E21B 11/00 Other drilling tools {([boring grabs E21B 27/00](#))}**
- E21B 11/005 . {Hand operated drilling tools}

- E21B 11/02 . Boring rams (percussion drives used in the borehole [E21B 4/06](#); percussion drill bits [E21B 10/36](#))
- E21B 11/06 . with driven cutting chains or similarly driven tools
- E21B 12/00** **Accessories for drilling tools** {(connecting and disconnecting drill bit and drilling pipe [E21B 19/18](#); sharpening stone drill bits [B24B 3/33](#))}
- E21B 12/02 . Wear indicators
- E21B 12/04 . Drill bit protectors
- E21B 12/06 . Mechanical cleaning devices

Guidance heading: Other equipment or details for drilling; Well equipment or well maintenance

- E21B 15/00** **Derricks; Masts; {Other supports (drill rigs with movable understructures [E21B 7/02](#))}**
- E21B 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](#))}
- E21B 15/006 . {Means for anchoring the drilling machine to the ground}
- E21B 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](#)})
- E21B 15/04 . specially adapted for directional drilling, e.g. slant hole rigs {(with skidding means [E21B 15/003](#))}
- E21B 15/045 .. {Hydraulic, pneumatic or electric circuits for their positioning}
- E21B 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](#))**
- E21B 17/003 . {with electrically conducting or insulating means ([E21B 17/028](#) and [E21B 17/023](#) take precedence)}
- E21B 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](#))}
- E21B 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](#))
- E21B 17/012 .. {with buoyancy elements ([E21B 17/015](#) takes precedence)}
- E21B 17/015 .. {Non-vertical risers, e.g. articulated or catenary-type}
- E21B 17/017 .. {Bend restrictors for limiting stress on risers}
- E21B 17/02 . Couplings; joints { Expandable couplings or joints [E21B 43/106](#)}
- E21B 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](#))}
- E21B 17/023 .. { Arrangements for connecting cables or wirelines to downhole devices}
- E21B 17/025 ... { Side entry subs}
- E21B 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](#))}
- E21B 17/028 .. { Electrical or electro-magnetic connections}

- E21B 17/03 .. between drilling rod or pipe and drill motor, e.g. between drilling rod and hammer
- E21B 17/04 .. between rod {or the like} and bit or between rod and rod {or the like}
- E21B 17/042 ... threaded {(readily releasing joints [E21B 17/06](#))}
- E21B 17/0423 {with plural threaded sections, e.g. with two-step threads}
- E21B 17/0426 {with a threaded cylindrical portion, e.g. for percussion rods}
- E21B 17/043 with locking means
- E21B 17/046 ... with ribs, pins or jaws, and complementary grooves or the like, e.g. bayonet catches
- E21B 17/05 ... Swivel joints
- E21B 17/06 ... Releasing-joints, e.g. safety joints
- E21B 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](#)})
- E21B 17/073 {with axial rotation}
- E21B 17/076 {between rod or pipe and drill bit}
- E21B 17/08 .. Casing joints
- E21B 17/085 ... {Riser connections (connectors for wellhead [E21B 33/038](#))}
- E21B 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](#))
- E21B 17/1007 .. {for the internal surface of a pipe, e.g. wear bushings for underwater well-heads}
- E21B 17/1014 .. {Flexible or expansible centering means, e.g. with pistons pressing against the wall of the well ([E21B 17/1042](#) takes precedence)}
- E21B 17/1021 ... {with articulated arms or arcuate springs (measuring the diameter [E21B 47/08](#))}
- E21B 17/1028 {with arcuate springs only, e.g. baskets with outwardly bowed strips for cementing operations}
- E21B 17/1035 .. {for plural rods, pipes or lines, e.g. for control lines}
- E21B 17/1042 .. {Elastomer protector or centering means}
- E21B 17/105 ... {split type}
- E21B 17/1057 .. {Centralising devices with rollers or with a relatively rotating sleeve ([E21B 17/1014](#) takes precedence)}
- E21B 17/1064 ... {Pipes or rods with a relatively rotating sleeve}
- E21B 17/1071 .. { specially adapted for pump rods, e.g. sucker rods}
- E21B 17/1078 .. { Stabilisers or centralisers for casing, tubing or drill pipes (devices for off-center positioning [E21B 17/10](#); [E21B 17/1007](#) to [E21B 17/1064](#) take precedence)}
- E21B 17/1085 .. { Wear protectors; Blast joints; Hard facing (wear protection included in centralising devices, see relevant subgroups)}
- E21B 17/1092 .. { Gauge section of drill bits}
- E21B 17/12 .. Devices for placing or drawing out wear protectors
- E21B 17/14 . Casing shoes {for the protection of the bottom of the casing}
- E21B 17/16 . Drill collars
- E21B 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](#)})

- E21B 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](#))}
- E21B 17/203 . . {with plural fluid passages}
- E21B 17/206 . . {with conductors, e.g. electrical, optical (hoses with electrically conducting means in general [F16L 11/127](#))}
- E21B 17/22 . Rods or pipes with helical structure (drill bits with helical conveying portion [E21B 10/44](#))

- E21B 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](#))**
- E21B 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](#))}
- E21B 19/004 . . {supporting a riser from a drilling or production platform}
- E21B 19/006 . . . {including heave compensators}
- E21B 19/008 . {Winding units, specially adapted for drilling operations (capstans, winches [B66D](#); cathead actuated pipe wrenches or spinners [E21B 19/162](#))}
- E21B 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](#))
- E21B 19/04 . . Hooks
- E21B 19/06 . . Elevators, i.e. rod or tube gripping devices
- E21B 19/07 . . . Slip-type elevators (slips [E21B 19/10](#))
- E21B 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
- E21B 19/081 . . Screw-and-nut feed mechanisms
- E21B 19/083 . . Cam, rack or like feed mechanisms
- E21B 19/084 . . with flexible drawing means, e.g. cables
- E21B 19/086 . . with a fluid-actuated cylinder ([E21B 19/084](#), [E21B 19/087](#), [E21B 19/09](#) take precedence)
- E21B 19/087 . . by means of a swinging arm
- E21B 19/089 . . with a spring or an additional weight
- E21B 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](#)})
- E21B 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](#))}
- E21B 19/12 . Rope clamps (rope clamps in general [F16G 11/00](#)){rod, casings or tube clamps not secured to elevators}
- E21B 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](#)})
- E21B 19/143 . . {specially adapted for underwater drilling}
- E21B 19/146 . . {Carousel systems, i.e. rotating rack systems}
- E21B 19/15 . . Racking of rods in horizontal position; Handling between horizontal and vertical position

- E21B 19/155 . . . {Handling between horizontal and vertical position}
- E21B 19/16 . Connecting or disconnecting pipe couplings or joints ([E21B 19/20](#) takes precedence; Pipe wrenches or the like [B25B](#))
- E21B 19/161 .. {using a wrench or a spinner adapted to engage a circular section of pipe ([E21B 19/168](#) takes precedence)}
- E21B 19/162 . . . {cathead actuated}
- E21B 19/163 . . . {piston-cylinder actuated}
- E21B 19/164 . . . {motor actuated ([E21B 19/162](#) and [E21B 19/163](#) take precedence)}
- E21B 19/165 .. {Control or monitoring arrangements therefor}
- E21B 19/166 . . . {Arrangements of torque limiters or torque indicators}
- E21B 19/167 .. {using a wrench adapted to engage a non circular section of pipe, e.g. a section with flats or splines}
- E21B 19/168 .. {using a spinner with rollers or a belt adapted to engage a well pipe}
- E21B 19/18 . Connecting or disconnecting drill bit and drilling pipe
- E21B 19/20 . Combined feeding from rack and connecting, e.g. automatically
- E21B 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](#))}
- E21B 19/24 . Guiding or centralising devices for drilling rods or pipes

- E21B 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](#))
- E21B 21/001 . {specially adapted for underwater drilling}
- E21B 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](#))}
- E21B 21/003 . {Means for stopping loss of drilling fluid (plastering the borehole wall [E21B 33/138](#))}
- E21B 2021/005 . {using gaseous fluids }
- E21B 2021/006 . {Underbalanced techniques, i.e. where borehole fluid pressure is below formation pressure }
- E21B 2021/007 . {Arrangements for handling drilling fluids or cuttings outside the borehole, e.g. mud boxes }
- E21B 2021/008 .. {Means engaging the bore entrance, e.g. hoods for collecting dust }
- E21B 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](#))}
- E21B 21/012 .. { using exhaust air from the drilling motor for blowing off the dust at the borehole entrance}
- E21B 21/015 .. Means engaging the bore entrance, e.g. hoods for collecting dust
- E21B 21/02 . Swivel joints in hose-lines {(hose connections in general [F16L 31/00](#), [F16L 33/00](#))}
- E21B 21/06 . Arrangements for treating drilling fluids outside the borehole (treating steps per se, see the relevant subclasses)
- E21B 2021/061 .. {for treating dust-loaded gaseous fluids }
- E21B 21/062 .. {by mixing components}

- E21B 21/063 . . {by separating components}
- E21B 21/065 . . . {Separating solids from drilling fluids}
- E21B 21/066 {with further treatment of the solids, e.g. for disposal}
- E21B 21/067 . . . {Separating gases from drilling fluids}
- E21B 21/068 . . {using chemical treatment}
- E21B 21/07 . . for treating dust-laden gaseous fluids
- E21B 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](#))
- E21B 21/10 . Valve arrangements in drilling fluid circulation systems ([valves in general F16K](#))
- E21B 21/103 . . {Down-hole by-pass valve arrangements, i.e. between the inside of the drill string and the annulus}
- E21B 21/106 . . {Valve arrangements outside the borehole, e.g. kelly valves}
- E21B 21/12 . using drilling pipes with plural fluid passages, e.g. closed circulation systems ([pipes with plural fluid passages E21B 17/18](#))
- E21B 21/14 . using liquids and gases, e.g. foams
- E21B 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](#))
- E21B 21/18 . Preventing exhaust air from the drill motor from blowing-off towards the working face
- E21B 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](#))**
- E21B 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](#))}
- E21B 23/004 . { Indexing systems for guiding relative movement between telescoping parts of downhole tools}
- E21B 23/006 . . { "J-slot" systems, i.e. lug and slot indexing mechanisms}
- E21B 2023/008 . {Self propelling system or apparatus, e.g. for moving tools within the horizontal portion of a borehole }
- E21B 23/01 . for anchoring the tools or the like ([E21B 23/02 to E21B 23/06 take precedence](#); [anchoring of drives in the borehole E21B 4/18](#); [packers E21B 33/12](#))
- E21B 23/02 . for locking the tools or the like in landing nipples or in recesses between adjacent sections of tubing ([E21B 23/03 to E21B 23/06 take precedence](#))
- E21B 23/03 . for setting the tools into, or removing the tools from, laterally offset landing nipples or pockets
- E21B 23/04 . operated by fluid means, e.g. actuated by explosion ([E21B 23/06](#), [E21B 23/08 take precedence](#))
- E21B 23/06 . for setting packers
- E21B 23/065 . . {setting tool actuated by explosion or gas generating means}
- E21B 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](#))
- E21B 23/10 . . Tools specially adapted therefor

- E21B 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](#))

E21B 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](#))

- E21B 25/005
- {Above ground means for handling the core, e.g. for extracting the core from the core barrel}
- E21B 25/02
- the core receiver being insertable into, or removable from, the borehole without withdrawing the drilling pipe ([retrievable drill bits E21B 10/64](#))
- E21B 25/04
- .. the core receiver having a core forming cutting edge or element, e.g. punch type core barrels
- E21B 25/06
- the core receiver having a flexible liner or inflatable retaining means
- E21B 25/08
- Coating, freezing, consolidating cores ([E21B 25/06 takes precedence](#)); Recovering uncontaminated cores or cores at formation pressure
- E21B 25/10
- Formed core retaining or severing means ([E21B 25/06](#), [E21B 25/08 take precedence](#))
- E21B 25/12
- .. of the sliding wedge type
- E21B 25/14
- .. mounted on pivot transverse to core axis
- E21B 25/16
- for obtaining oriented cores
- E21B 25/18
- the core receiver being specially adapted for operation under water

E21B 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**

- E21B 27/005
- {Collecting means with a strainer}
- E21B 27/02
- Dump bailers, i.e. containers for depositing substances, e.g. cement or acids
- E21B 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](#)}

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

WARNING

Group [E21B 28/00](#) is not complete. See also [E21B 43/003](#)

E21B 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](#))}**

- E21B 29/002
- {Cutting, e.g. milling, a pipe with a cutter rotating along the circumference of the pipe}
- E21B 29/005
- .. {with a radially-expansible cutter rotating inside the pipe, e.g. for cutting an annular window}
- E21B 29/007
- .. {with a radially-retracting cutter rotating outside the pipe}

E21B 29/02	<ul style="list-style-type: none"> 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})
E21B 29/04	<ul style="list-style-type: none"> Cutting of wire lines or the like (E21B 29/02 takes precedence)
E21B 29/06	<ul style="list-style-type: none"> Cutting windows, e.g. directional window cutters for whipstock operations ({E21B 29/005 and} E21B 29/08 take precedence ({whipstocks E21B 7/061})}
E21B 29/08	<ul style="list-style-type: none"> Cutting or deforming pipes to control fluid flow (shear type blow-out preventers E21B 33/063)
E21B 29/10	<ul style="list-style-type: none"> Reconditioning of well casings, e.g. straightening
E21B 29/12	<ul style="list-style-type: none"> specially adapted for underwater installations (E21B 29/08 takes precedence)
E21B 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)
E21B 31/002	<ul style="list-style-type: none"> {Destroying the objects to be fished, e.g. by explosive means (cutting by explosives E21B 29/02)}
E21B 31/005	<ul style="list-style-type: none"> {using vibrating or oscillating means (vibration generating arrangements for boreholes or wells E21B 28/00)}
E21B 31/007	<ul style="list-style-type: none"> {fishing tools with means for attaching comprising fusing or sticking}
E21B 31/03	<ul style="list-style-type: none"> Freeing by flushing; {Controlling differential pipe sticking}
E21B 31/06	<ul style="list-style-type: none"> using magnetic means
E21B 31/107	<ul style="list-style-type: none"> using impact means for releasing stuck parts, e.g. jars (telescoping joints E21B 17/07)
E21B 31/1075	<ul style="list-style-type: none"> .. {using explosives}
E21B 31/113	<ul style="list-style-type: none"> .. hydraulically-operated
E21B 31/1135	<ul style="list-style-type: none"> ... {Jars with a hydraulic impedance mechanism, i.e. a restriction, for initially delaying escape of a restraining fluid}
E21B 31/12	<ul style="list-style-type: none"> Grappling tools, e.g. tongs or grabs
E21B 31/125	<ul style="list-style-type: none"> .. {specially adapted for parted wire line or ropes}
E21B 31/14	<ul style="list-style-type: none"> .. with means deflecting the direction of the tool, e.g. by use of knuckle joints (apparatus for deflecting the boring E21B 7/06)
E21B 31/16	<ul style="list-style-type: none"> .. combined with cutting or destroying means (cutting or destroying means per se E21B 29/00)
E21B 31/18	<ul style="list-style-type: none"> .. gripping externally, e.g. overshot
E21B 31/20	<ul style="list-style-type: none"> .. gripping internally, e.g. fishing spears
E21B 33/00	Sealing or packing boreholes or wells
E21B 2033/005	<ul style="list-style-type: none"> {Sealings characterised by their shape }
E21B 33/02	<ul style="list-style-type: none"> Surface sealing or packing
E21B 33/03	<ul style="list-style-type: none"> .. Well heads; Setting-up thereof (valve arrangements therefor E21B 34/02)
E21B 33/035	<ul style="list-style-type: none"> ... specially adapted for underwater installations (E21B 33/043, E21B 33/064, E21B 33/076 take precedence)
E21B 33/0355	<ul style="list-style-type: none"> {Control systems, e.g. hydraulic, pneumatic, electric, acoustic, for submerged well heads}
E21B 33/037	<ul style="list-style-type: none"> Protective housing therefor
E21B 33/0375	<ul style="list-style-type: none"> {Corrosion protection means (in general C23F)}

E21B 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)
E21B 33/0385	.....	{electrical connectors (underwater electrical connections in general H01R 13/523)}
E21B 33/04	...	Casing heads; Suspending casings or tubings in well heads (setting of casings in wells E21B 43/10)
E21B 33/0407	....	{with a suspended electrical cable}
E21B 33/0415	....	{rotating or floating support for tubing or casing hanger}
E21B 33/0422	....	{a suspended tubing or casing being gripped by a slip or an internally serrated member (slips in rotary table E21B 19/10)}
E21B 33/043	....	specially adapted for underwater well heads ({ E21B 33/0407 ,} E21B 33/047 take precedence)
E21B 33/047	....	for plural tubing strings
E21B 33/05	....	Cementing-heads, e.g. having provision for introducing cementing plugs
E21B 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)}
E21B 33/061	....	{Ram-type blow-out preventers, e.g. with pivoting rams}
E21B 33/062	.....	{with sliding rams}
E21B 33/063	.....	{for shearing drill pipes (cutting of wireline E21B 29/04 ; cutting pipes E21B 29/08)}
E21B 33/064	....	specially adapted for underwater well heads (connectors therefor E21B 33/038 ; {control systems for submerged well-heads E21B 33/0355 })
E21B 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 })
E21B 33/072	....	for cable-operated tools (E21B 33/076 takes precedence)
E21B 33/076	....	specially adapted for underwater installations
E21B 33/08	..	Wipers; Oil savers
E21B 33/085	...	{Rotatable packing means, e.g. rotating blow-out preventers}
E21B 33/10	.	in the borehole {sealing the junction between main bore and laterals E21B 41/0042 }
E21B 2033/105	..	{characterised by sealing the junction between a lateral and a main bore }
E21B 33/12	..	Packers; Plugs ({locking packers or plugs in landing nipples E21B 23/02 }; used for cementing E21B 33/134 , E21B 33/16)
E21B 33/1204	...	{permanent; drillable}
E21B 33/1208	...	{characterised by the construction of the sealing or packing means (E21B 33/1277 takes precedence)}
E21B 33/1212	....	{including a metal-to-metal seal element}
E21B 33/1216	....	{Anti-extrusion means, e.g. means to prevent cold flow of rubber packing}
E21B 33/122	...	Multiple string packers
E21B 33/124	...	Units with longitudinally-spaced plugs for isolating the intermediate space
E21B 33/1243	....	{with inflatable sleeves}
E21B 33/1246	.....	{inflated by down-hole pumping means operated by a pipe string}

E21B 33/126	...	with fluid-pressure-operated elastic cup or skirt (E21B 33/122 , E21B 33/124 take precedence)
E21B 33/1265	....	{with mechanical slips}
E21B 33/127	...	with inflatable sleeve (E21B 33/122 , E21B 33/124 take precedence)
E21B 33/1272	....	{inflated by down-hole pumping means operated by a pipe string}
E21B 33/1275	....	{inflated by down-hole pumping means operated by a down-hole drive}
E21B 33/1277	....	{characterised by the construction or fixation of the sleeve}
E21B 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 })
E21B 33/1285	....	{by fluid pressure}
E21B 33/129	...	with mechanical slips for hooking into the casing (E21B 33/122 , E21B 33/124 take precedence)
E21B 33/1291	....	{anchor set by wedge or cam in combination with frictional effect, using so-called drag-blocks (E21B 33/1295 takes precedence)}
E21B 33/1292	.....	{with means for anchoring against downward and upward movement}
E21B 33/1293	....	{with means for anchoring against downward and upward movement (E21B 33/1291 , E21B 33/1295 take precedence)}
E21B 33/1294	....	{characterised by a valve, e.g. a by-pass valve}
E21B 33/1295	....	actuated by fluid pressure
E21B 33/12955	.....	{using drag blocks frictionally engaging the inner wall of the well}
E21B 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)
E21B 33/134	...	Bridging plugs {(packers E21B 33/12)}
E21B 33/136	...	Baskets, e.g. of umbrella type
E21B 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)}
E21B 33/14	...	for cementing casings into boreholes {(using special cement compositions E21B33/13B ; control of cementation quality or level E21B 47/0005)}
E21B 33/143	....	{for underwater installations}
E21B 33/146	....	{Stage cementing, i.e. discharging cement from casing at different levels}
E21B 33/16	....	using plugs for isolating cement charge; Plugs therefor {(spacer compositions C09K 8/424 ; stage cementing E21B 33/146)}
E21B 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)
E21B 2034/002	.	{Ball valves }
E21B 2034/005	.	{Flapper valves }
E21B 2034/007	.	{Sleeve valves }
E21B 34/02	.	in well heads
E21B 34/04	..	in underwater well heads

- E21B 34/045 . . . {adapted to be lowered on a tubular string into position within a blow-out preventer stack, e.g. so-called test trees}
- E21B 34/06 . in wells
- E21B 34/063 . . {Valve or closure with destructible element, e.g. frangible disc ([E21B 34/103](#) takes precedence)}
- E21B 34/066 . . {electrically actuated}
- E21B 34/08 . . responsive to flow or pressure of the fluid obtained ([E21B 34/10](#) takes precedence)
- E21B 34/085 . . . {with time-delay systems, e.g. hydraulic impedance mechanisms}
- E21B 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](#))
- E21B 34/101 . . . {with means for equalizing fluid pressure above and below the valve}
- E21B 34/102 . . . {with means for locking the closing element in open or closed position ([E21B 34/105](#) and [E21B 34/108](#) take precedence)}
- E21B 34/103 {with a shear pin}
- E21B 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}
- E21B 34/106 {the retrievable element being a secondary control fluid actuated valve landed into the bore of a first inoperative control fluid actuated valve}
- E21B 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)}
- E21B 34/108 . . . {with time delay systems, e.g. hydraulic impedance mechanisms}
- E21B 34/12 . . operated by movement of casings or tubings
- E21B 34/125 . . . {with time delay systems, e.g. hydraulic impedance mechanisms}
- E21B 34/14 . . operated by movement of tools, e.g. sleeve valves operated by pistons or wire line tools ({[E21B 34/066](#) takes precedence})
- E21B 34/16 . Above-ground control means therefor {(control systems for submerged well heads [E21B 33/0355](#))}

- E21B 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](#))

- E21B 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](#))
- E21B 36/001 . {Cooling arrangements}
- E21B 36/003 . {Insulating arrangements}
- E21B 36/005 . {Heater surrounding production tube}
- E21B 36/006 . {Combined heating and pumping means}
- E21B 36/008 . {using chemical heat generating means}
- E21B 36/02 . using burners
- E21B 36/025 . . {the burners being above ground or outside the bore hole}
- E21B 36/04 . using electrical heaters

E21B 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)
E21B 37/02	. Scrapers specially adapted therefor
E21B 37/04	. . operated by fluid pressure, e.g. free-piston scrapers (operating other tools by fluid pressure E21B 23/08)
E21B 37/045	. . . {Free-piston scrapers}
E21B 37/06	. using chemical means for preventing, limiting { or eliminating} the deposition of paraffins or like substances (chemical compositions therefor C09K 8/52)
E21B 37/08	. cleaning in situ of down-hole filters, screens, {e.g. casing perforations,} or gravel packs (E21B 37/06 takes precedence)
E21B 37/10	. Well swabs {(pistons in general F16J)}
E21B 40/00	Tubing catchers, automatically arresting the fall of oil-well tubing {(preventing small objects from falling into the borehole E21B 41/0021)}
E21B 41/00	Equipment or details not covered by groups E21B 15/00 to E21B 40/00
E21B 41/0007	. {for underwater installations (E21B 41/005 , E21B 41/04 , E21B 41/06 , E21B 41/08 , E21B 41/10 take precedence)}
E21B 41/0014	. . {Underwater well locating or reentry systems}
E21B 41/0021	. {Safety devices, e.g. for preventing small objects from falling into the borehole}
E21B 2041/0028	. {Fuzzy logic, artificial intelligence, neural networks, or the like }
E21B 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)}
E21B 41/0042	. . {characterised by sealing the junction between a lateral and a main bore}
E21B 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)}
E21B 41/0057	. . {Disposal of a fluid by injection into a subterranean formation}
E21B 41/0064	. . . { Carbon dioxide sequestration (storing fluids in porous layers B65G 5/005)}
E21B 41/0071	. . {Adaptation of flares, e.g. arrangements of flares in offshore installations (flares of waste gases or noxious gases F23G 7/08)}
E21B 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)}
E21B 41/0085	. {Adaptations of electric power generating means for use in boreholes (generation of electric power per se H02)}
E21B 41/0092	. {Methods relating to program engineering, design or optimisation}
E21B 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)
E21B 41/04	. Manipulators for underwater operations, e.g. temporarily connected to well heads (manipulators in general B25J)
E21B 41/06	. Work chambers for underwater operations, e.g. temporarily connected to well heads (in general B63C 11/00)

- E21B 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](#)

- E21B 41/10 . Guide posts, e.g. releasable; Attaching guide lines to underwater guide bases

Guidance heading: Obtaining fluids from wells

- E21B 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](#))
- E21B 43/003 . {Vibrating earth formations (vibration generating arrangements for boreholes or wells [E21B 28/00](#))}
- E21B 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](#))}
- E21B 43/01 . specially adapted for obtaining from underwater installations (underwater well heads [E21B 33/035](#))
- E21B 43/0107 .. {Connecting of flow lines to offshore structures ([E21B 43/013](#) takes precedence)}
- E21B 2043/0115 .. {Drilling for or production of natural gas hydrate reservoirs; Drilling through or monitoring of formations containing gas hydrates }
- E21B 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](#))}
- E21B 43/013 .. connecting a production flow line to an underwater well head
- E21B 43/0135 ... {using a pulling cable}
- E21B 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](#))
- E21B 43/02 . Subsoil filtering ([E21B 43/11](#) takes precedence, chemical compositions for consolidating loose sand or the like around wells [C09K 8/56](#))
- E21B 43/025 .. { Consolidation of loose sand or the like round the wells without excessively decreasing the permeability thereof (sealing borehole walls [E21B 33/138](#))}
- E21B 43/04 .. Graveling of wells
- E21B 43/045 ... { Crossover tools}
- E21B 43/08 .. Screens or liners {(expandable screens or liners [E21B 43/108](#); obtaining drinking water; filters [E03B 3/18](#))}
- E21B 43/082 ... {Screens comprising porous materials, e.g. prepacked screens}
- E21B 43/084 ... {Screens comprising woven materials, e.g. mesh or cloth}
- E21B 43/086 ... {Screens with preformed openings, e.g. slotted liners (comprising porous materials [E21B 43/082](#))}
- E21B 43/088 ... {Wire screens (comprising porous materials [E21B 43/082](#); comprising woven materials [E21B 43/084](#))}

- E21B 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](#))
- E21B 43/101 . . . {for underwater installations}
- E21B 43/103 . . . { of expandable casings, screens, liners, or the like}
- E21B 43/105 {Expanding tools specially adapted therefor}
- E21B 43/106 { Couplings or joints therefor}
- E21B 43/108 { Expandable screens or liners}
- E21B 43/11 . . . Perforators; Permeators
- E21B 43/112 . . . Perforators with extendable perforating members, e.g. actuated by fluid means
- E21B 43/114 . . . Perforators using direct fluid action {on the wall to be perforated}, e.g. abrasive jets
- E21B 43/116 . . . Gun or shaped charge perforators {(projectiles with shaped or hollow charge [F42B 12/10](#))}
- E21B 43/117 . . . Shaped charge perforators ([E21B 43/118](#) takes precedence)
- E21B 43/118 . . . characterised by lowering in vertical position and subsequent tilting to operating position
- E21B 43/1185 . . . Ignition systems
- E21B 43/11852 {hydraulically actuated}
- E21B 43/11855 {mechanically actuated, e.g. by movement of a wireline or a drop-bar ([E21B 43/11852](#) takes precedence)}
- E21B 43/11857 {firing indication systems}
- E21B 43/119 . . . Details, e.g. for locating perforating place or direction
- E21B 43/1195 . . . {Replacement of drilling mud; decrease of undesirable shock waves}
- E21B 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](#))
- E21B 43/121 . . . {Lifting well fluids (survey of down-hole pump systems [E21B 47/0007](#))}
- E21B 43/122 . . . {Gas lift}
- E21B 43/123 {Gas lift valves}
- E21B 43/124 . . . {Adaptation of jet-pump systems}
- E21B 2043/125 . . . {Adaptation of walking-beam pump systems }
- E21B 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](#))}
- E21B 43/127 {Adaptations of walking-beam pump systems}
- E21B 43/128 . . . {Adaptation of pump systems with down-hole electric drives}
- E21B 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](#))}
- E21B 43/14 . . . Obtaining from a multiple-zone well
- E21B 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](#))}
- E21B 43/162 . . . {Injecting fluid from longitudinally spaced locations in injection well}

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

WARNING

Not complete pending a reorganisation. See also [E21B 43/24](#) and subgroups

- E21B 43/241 ... combined with solution mining of non-hydrocarbon minerals, e.g. solvent pyrolysis of oil shale
- E21B 43/243 ... Combustion in situ
- E21B 43/247 in association with fracturing processes {or crevice forming processes}
- E21B 43/248 using explosives
- E21B 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](#))
- E21B 43/255 .. {including the injection of a gaseous medium as treatment fluid into the formation}
- E21B 43/26 .. by forming crevices or fractures {(chemical compositions therefor [C09K 8/62](#))}
- E21B 43/261 ... {Separate steps of (1) cementing, plugging or consolidating and (2) fracturing or attacking the formation}
- E21B 43/263 ... using explosives {(Combustion in situ using explosives [E21B 43/248](#))}
- E21B 43/2635 {by means of nuclear energy (peaceful applications of nuclear explosive devices in general [G21J 3/00](#))}
- E21B 43/267 ... reinforcing fractures by propping {(chemical compositions therefor [C09K 8/80](#))}
- E21B 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](#))}
- E21B 43/281 .. {using heat (heating, cooling or insulating wells [E21B 36/00](#))}
- E21B 43/283 .. {in association with a fracturing process}

- E21B 43/285 . Melting minerals, e.g. sulfur ([E21B 43/24](#) takes precedence; heating, cooling or insulating arrangements for wells [E21B 36/00](#))
- E21B 43/29 . Obtaining a slurry of minerals, e.g. by using nozzles
- E21B 43/292 . . {using steerable or laterally extendable nozzles}
- E21B 43/295 . Gasification of minerals, e.g. for producing mixtures of combustible gases ([E21B 43/243](#) takes precedence)
- E21B 43/30 . Specific pattern of wells, e.g. optimizing the spacing of wells (production satellite stations [E21B 43/017](#))
- E21B 43/305 . . {comprising at least one inclined or horizontal well}
- E21B 43/32 . Preventing gas- or water- coning phenoma, i.e. the formation of a conical column of gas or water around wells
- E21B 43/34 . Arrangements for separating materials produced by the well (separating apparatus per se, see the relevant subclasses)
- E21B 43/36 . . Underwater separating arrangements ([E21B 43/38](#) takes precedence)
- E21B 43/38 . . in the well
- E21B 43/385 . . . {by reinjecting the separated materials into an earth formation in the same well}
- E21B 43/40 . . Separation associated with re-injection of separated materials {([E21B 43/385](#) takes precedence)}

Guidance heading: Automatic control, surveying or testing

- E21B 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](#))
- E21B 44/005 . {Below-ground automatic control systems}
- E21B 44/02 . Automatic control of the tool feed ({[E21B 44/005](#)}, [E21B 44/10](#) take precedence)
- E21B 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](#))}
- E21B 44/06 . . in response to the flow or pressure of the motive fluid of the drive
- E21B 44/08 . . in response to the amplitude of the movement of the percussion tool, e.g. jump or recoil
- E21B 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](#)}
- E21B 45/00** **Measuring the drilling time or rate of penetration**
- E21B 47/00** **Survey of boreholes or wells** (monitoring pressure or flow of drilling fluid [E21B 21/08](#); geophysical logging [G01V](#))
- E21B 47/0001 . {for underwater installations}

- E21B 47/0002 . { Survey of boreholes or wells by visual inspection (photographing internal surfaces, e.g. of pipes [G03B 37/005](#), **E21B57/A7B8**; closed circuit television systems [H04N 7/18](#))}
- E21B 47/0003 . {Determining well or borehole volumes (determining depth [E21B 47/04](#), diameter [E21B 47/08](#); measuring volumes in general [G01F](#))}
- E21B 47/0005 . {control of cementation quality or level (measuring temperature [E21B 47/065](#))}
- E21B 47/0006 . {Measuring stresses in a well bore pipe string or casing (for locating stuck pipe [E21B 47/09](#))}
- E21B 47/0007 . {Survey of down-hole pump systems}
- E21B 47/0008 . . {Survey of walking-beam pump systems, e.g. for the detection of so called "pumped-off" conditions}
- E21B 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](#)

- E21B 47/011 . . {Protecting measuring instruments (cooling or insulating arrangements for boreholes or wells [E21B 36/00](#))}
- E21B 47/02 . Determining slope or direction (clinometers or direction meters [G01C](#))
- E21B 47/022 . . of the borehole, {e.g. using geomagnetism}
- E21B 47/02208 . . . {using seismic or acoustic means}
- E21B 47/02216 . . . {using at least one source of electromagnetic energy and at least one detector therefor}
- E21B 47/02224 {at least one of the sources or one of the detectors being located above ground}
- E21B 47/02232 . . . {using a pendulum}
- E21B 47/024 . . of devices in the borehole ([E21B 47/022](#) takes precedence)
- E21B 47/026 . . of penetrated ground layers (apparatus for obtaining oriented cores [E21B 25/16](#); formation testing [E21B 49/00](#))
- E21B 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](#)}
- E21B 47/042 . . {Measuring or locating liquid level ([E21B 47/044](#) takes precedence)}
- E21B 47/044 . . {using radioactive markers}
- E21B 47/06 . Measuring temperature or pressure (measuring temperature in general [G01K](#); measuring pressure in general [G01L](#)){telerecorders for pressure [G01L](#); telerecorders for temperature [G01K](#)}
- E21B 47/065 . . {Measuring temperature}
- E21B 47/08 . Measuring the diameter (measuring diameter in general [G01B](#))
- E21B 47/082 . . {using radiant means, e.g. acoustic, radioactive, electromagnetic}
- E21B 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](#))

- E21B 47/0905 . . {by detecting magnetic anomalies (investigating materials by investigating magnetic variables [G01N 27/72](#))}
- E21B 47/091 . . {by detecting an acoustic anomaly, e.g. a mud-pressure pulse}
- E21B 47/0915 . . {using impression packers, e.g. to detect recesses or perforations}
- E21B 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](#)}
- E21B 47/1005 . . {using thermal measurements (measurement temperature [E21B 47/065](#))}
- E21B 47/101 . . {using acoustic energy}
- E21B 47/1015 . . {using tracers: using radioactivity}
- E21B 47/102 . . {using electrical indications: using light radiations}
- E21B 47/1025 . . {Detecting leaks, e.g. of tubing, by pressure testing (investigating fluid-tightness of structures by using fluid or vacuum [G01M 3/02](#))}
- E21B 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](#))
- E21B 47/121 . . {using earth as an electrical conductor ([E21B 47/122](#) takes precedence; in general [H04B 13/02](#) ; electric prospecting [G01V 3/00](#))}
- E21B 47/122 . . {by electromagnetic energy, e.g. radio frequency (in general [H04B](#) magnetic prospecting [G01V 3/00](#))}
- E21B 47/123 . . . {using light waves (optical transmission in general [H04B 10/00](#); light guides, e.g. optical fibres [G02B 6/00](#))}
- E21B 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](#))}
- E21B 47/14 . . using acoustic waves
- E21B 47/16 . . . through the drill string or casing, {e.g. by torsional acoustic waves}
- E21B 47/18 . . . through the well fluid, {e.g. mud pressure pulse telemetry}
- E21B 47/182 . . . {by continuous mud waves with modulation of the waves}
- E21B 47/185 . . . {by negative mud pulses using a pressure relieve valve between drill pipe and annulus}
- E21B 47/187 . . . {by positive mud pulses using a flow restricting valve within the drill pipe}
- E21B 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](#))**
- E21B 49/001 . . {specially adapted for underwater installations}
- E21B 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](#))}
- E21B 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](#))}
- E21B 49/006 . . {Measuring wall stresses in the borehole (investigation of mechanical properties of foundation soil [E02D 1/022](#))}
- E21B 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](#))}

- E21B 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](#))
- E21B 49/025 . . {of underwater soil, e.g. with grab devices ([underwater coring E21B 25/18](#))}
- E21B 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](#)}
- E21B 49/06 . . with side-wall drilling tools {pressing} or scrapers
- E21B 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](#))}
- E21B 49/081 . . {with down-hole means for trapping a fluid sample ([E21B 49/10](#) takes precedence)}
- E21B 49/082 . . . {Wire-line fluid samplers ([E21B 49/083](#) takes precedence)}
- E21B 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}
- E21B 49/084 . . { with means for conveying samples through pipe to surface}
- E21B 2049/085 . . {Determining specific physical fluid parameters }
- E21B 49/086 . . { Withdrawing samples at the surface}
- E21B 49/087 . . { Well testing, e.g. testing for reservoir productivity or formation parameters}
- E21B 49/088 . . . { combined with sampling}
- E21B 49/10 . . using side-wall fluid samplers or testers