

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 [E21B 23/002](#)

[E21B 31/08](#) covered by [E21B 27/00](#)

[E21B 43/22](#) covered by [C09K 8/58](#)

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

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-expansible roller cutters
- E21B 10/30 . . . Longitudinal axis roller reamers, e.g. reamer stabilisers
- E21B 10/32 . . with expansible 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

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|-----------------------------|--|
| 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 |

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

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|-----------------------------|---|
| 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 | . 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 | . Cutting of wire lines or the like (E21B 29/02 takes precedence) |
| E21B 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)} |
| E21B 29/08 | . Cutting or deforming pipes to control fluid flow (shear type blow-out preventers E21B 33/063) |
| E21B 29/10 | . Reconditioning of well casings, e.g. straightening |
| E21B 29/12 | . 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 | . {Destroying the objects to be fished, e.g. by explosive means (cutting by explosives E21B 29/02)} |
| E21B 31/005 | . {using vibrating or oscillating means (vibration generating arrangements for boreholes or wells E21B 28/00)} |
| E21B 31/007 | . {fishing tools with means for attaching comprising fusing or sticking} |
| E21B 31/03 | . Freeing by flushing; {Controlling differential pipe sticking} |
| E21B 31/06 | . using magnetic means |
| E21B 31/107 | . using impact means for releasing stuck parts, e.g. jars (telescoping joints E21B 17/07) |
| E21B 31/1075 | .. {using explosives} |
| E21B 31/113 | .. hydraulically-operated |
| E21B 31/1135 | ... {Jars with a hydraulic impedance mechanism, i.e. a restriction, for initially delaying escape of a restraining fluid} |
| E21B 31/12 | . Grappling tools, e.g. tongs or grabs |
| E21B 31/125 | .. {specially adapted for parted wire line or ropes} |
| E21B 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) |
| E21B 31/16 | .. combined with cutting or destroying means (cutting or destroying means per se E21B 29/00) |
| E21B 31/18 | .. gripping externally, e.g. overshot |
| E21B 31/20 | .. gripping internally, e.g. fishing spears |
| E21B 33/00 | Sealing or packing boreholes or wells |

- E21B 2033/005 . {Sealings characterised by their shape}
- E21B 33/02 . Surface sealing or packing
- E21B 33/03 .. Well heads; Setting-up thereof (valve arrangements therefor [E21B 34/02](#))
- E21B 33/035 ... specially adapted for underwater installations ([E21B 33/043](#), [E21B 33/064](#), [E21B 33/076](#) take precedence)
- E21B 33/0355 {Control systems, e.g. hydraulic, pneumatic, electric, acoustic, for submerged well heads}
- E21B 33/037 Protective housing therefor
- E21B 33/0375 {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)} |

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|-------------------------------|--|
| 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

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 phenomena, 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)}

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