

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 23/00D](#)**

[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-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

- 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 17/10D](#))}
- 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 33/005
 - . { [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 43/02B , compositions therefor C09K 8/56)}
E21B 33/14	...	for cementing casings into boreholes {(using special cement compositions E21B 33/13B ; 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 43/00C](#)] 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](#), **E21B 57/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