

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 [31/107B](#); 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 33/035F](#) }

- 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 10/571](#) takes precedence) }
- 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 E16K](#))
- 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 ([{ \[side entry sub E21B 17/02D\]\(#\); \[control line protectors E21B 17/1035\]\(#\) }; 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 43/02B](#), 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 [E21B 33/13B5](#); 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 43/11TAKES 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 [E21B 43/22D](#)) }
- 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](#), [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