

**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 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 <a href="#">C23F</a> )}
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 <a href="#">E21B 43/013</a> )
E21B 33/0385	.....	{electrical connectors (underwater electrical connections in general <a href="#">H01R 13/523</a> )}
E21B 33/04	...	Casing heads; Suspending casings or tubings in well heads (setting of casings in wells <a href="#">E21B 43/10</a> )
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 <a href="#">E21B 19/10</a> )}
E21B 33/043	....	specially adapted for underwater well heads ({ <a href="#">E21B 33/0407</a> ;} <a href="#">E21B 33/047</a> 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 <a href="#">E21B 33/085</a> ; valves <a href="#">E21B 34/00</a> )}
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 <a href="#">E21B 29/04</a> ; cutting pipes <a href="#">E21B 29/08</a> )}
E21B 33/064	....	specially adapted for underwater well heads (connectors therefor <a href="#">E21B 33/038</a> ; {control systems for submerged well-heads <a href="#">E21B 33/0355</a> })
E21B 33/068	...	having provision for introducing objects or fluids into, or removing objects from, wells (cementing heads <a href="#">E21B 33/05</a> ; {wipers, oil savers <a href="#">E21B 33/08</a> })
E21B 33/072	....	for cable-operated tools ( <a href="#">E21B 33/076</a> 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 <a href="#">E21B 41/0042</a> }
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 <a href="#">E21B 23/02</a> }; used for cementing <a href="#">E21B 33/134</a> , <a href="#">E21B 33/16</a> )
E21B 33/1204	...	{permanent; drillable}
E21B 33/1208	...	{characterised by the construction of the sealing or packing means ( <a href="#">E21B 33/1277</a> 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 ( <a href="#">E21B 33/122</a> , <a href="#">E21B 33/124</a> take precedence)
E21B 33/1265	....	{with mechanical slips}
E21B 33/127	...	with inflatable sleeve ( <a href="#">E21B 33/122</a> , <a href="#">E21B 33/124</a> 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 ( <a href="#">E21B 33/122</a> , <a href="#">E21B 33/124</a> , { <a href="#">E21B 33/129</a> } take precedence; {characterised by the construction of the sealing means <a href="#">E21B 33/1208</a> })
E21B 33/1285	....	{by fluid pressure}
E21B 33/129	...	with mechanical slips for hooking into the casing ( <a href="#">E21B 33/122</a> , <a href="#">E21B 33/124</a> take precedence)
E21B 33/1291	....	{anchor set by wedge or cam in combination with frictional effect, using so-called drag-blocks ( <a href="#">E21B 33/1295</a> 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 ( <a href="#">E21B 33/1291</a> , <a href="#">E21B 33/1295</a> 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 <a href="#">E21B 27/02</a> ; { methods or apparatus for grouting offshore structures <a href="#">E02B 17/0008</a> } chemical compositions therefor <a href="#">C09K 8/00</a> )
E21B 33/134	...	Bridging plugs {(packers <a href="#">E21B 33/12</a> )}
E21B 33/136	...	Baskets, e.g. of umbrella type
E21B 33/138	...	Plastering the borehole wall; Injecting into the formations {(packers <a href="#">E21B 33/12</a> ; consolidation of loose sand or the like round the wells without excessively decreasing the permeability thereof <a href="#">E21B 43/02B</a> , compositions therefor <a href="#">C09K 8/56</a> )}
E21B 33/14	...	for cementing casings into boreholes {(using special cement compositions <a href="#">E21B 33/13B</a> ; control of cementation quality or level <a href="#">E21B 47/0005</a> )}
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 <a href="#">C09K 8/424</a> ; stage cementing <a href="#">E21B 33/146</a> )}
<b>E21B 34/00</b>		<b>Valve arrangements for boreholes or wells</b> (in drilling fluid circulation systems <a href="#">E21B 21/10</a> ; {tool diverters <a href="#">E21B 23/002</a> ;} blow-out preventers <a href="#">E21B 33/06</a> ; oil flow regulating apparatus <a href="#">E21B 43/12</a> ; valves in general <a href="#">F16K</a> )

- 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 CO<sub>2</sub> 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 (CO<sub>2</sub> 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