

CLASS 175, BORING OR PENETRATING THE EARTH

SECTION I - CLASS DEFINITION

A. This class relates to processes and means for initially forming or radially enlarging an elongated hole in the earth in situ by dislocating the solid material of the earth.

1. The means forming the hole is of the type which advances inwardly into the earth from the point at which the earth is pierced and acts on the entire peripheral extent of the hole as it advances.

2. Dislocating of the earth formation may be achieved by any action, such as disintegrating, compacting, chipping, cutting, severing, splitting, spalling, piercing, burning, decomposing or eroding, for example, so long as the purpose is to form a hole.

B. This class also takes tools not elsewhere classified specifically described as for forming bores in masonry, concrete, cement, glass or similar materials having a brittle frangible character similar to rock.

C. This class is also the locus for below ground impact connections. Such devices, commonly called "Jars" are defined as a means forming a lost motion connection in a shaft or cable, and are provided with impacting faces which are described as generating a blow to be delivered to some device connected to the rod or cable and located in a hole in the earth. Combinations involving below ground impact connection and a specifically claimed art device which forms subject matter for another class will be found in such other class.

However, the combination of the below ground impact connection and a specific joint for joining the shaft or cable to an art device which forms subject matter for another class is classifiable in Class 175.

D. This class includes subject matter relating to devices for firing a bullet or exploding a shaped charge from an inaccessible hole to penetrate the formation (See Subclass References to the Current Class, below.). Also included are such devices which are limited by disclosure to perforating or cutting a casing or other hole lining in an inaccessible hole but which would inherently function to direct a bullet or charge in the same manner as a formation cutter or perforator.

SECTION II - LINES WITH OTHER CLASSES AND WITHIN THIS CLASS

RELATIONSHIP TO CLASS 166, WELLS

Classes 166 and 175 are very closely related since the majority of the wells classifiable in Class 166 are made by the processes or apparatus of Class 175 and much of the apparatus of Class 166 used in operating wells is also useful in operating Class 175 apparatus. In view of this fact, the general lines between these two classes are different with respect to processes and apparatus.

A. Process

Processes of making, using or treating a well which as a whole are more comprehensive than an earth boring or penetrating process and which include a step of earth boring or penetrating, which step alone would be classifiable in the processes of Class 175, are classified in the appropriate process subclasses of Class 166, except as noted below.

A well fluid sampling process including a step of earth boring or penetrating is classifiable in Class 166, unless a step of sampling the earth formation solids is included in such a fluid sampling process, then classification is in Class 175. (See Subclass References to the Current Class, below.)

Generally, processes of cementing a well are classified in Class 166 while processes of boring the earth with fluid containing a plugging or cementing type constituent are classified in Class 175. Also see References to Other Classes, below, for the reference to Class 166.

Processes for cleaning the wall of a well or earth bore in which the material being removed has been deposited in the well are classified in Class 166. Processes in which the well bore is enlarged or acted upon to remove the natural solid earth formation (e.g., reaming), are classified in Class 175. In a process of cleaning a well bore which includes a step of drilling or boring, the step of the removal of the deposited material from the wall of a well or earth bore must be specifically recited in the claim to be classifiable in Class 166 since practically all drilling processes would inherently result in cleaning of the well bore.

Processes of casing or lining well bores are generally classifiable in Class 166 even though an earth boring step is claimed. However, drilling a well generally involves the use of a tubing, particularly in rotary drilling operations, which may in some instances be left in

the bore to form a casing or lining. Therefore, a patent which claims in a boring process the formation of a cased or lined well by merely leaving the tubing or the like used in the boring operation in the well, will be classified in Class 175.

If, however, a drill tubing or shaft and a separate well lining or casing are specifically described, and steps are claimed of boring and lining or casing, classification will be in the processes of Class 166 even if the separate casing or lining is specifically described as including an earth cutting shoe and the step of cutting with the casing or lining is claimed.

B. Apparatus

In general, Class 175 is more comprehensive than Class 166 with respect to apparatus when an earth boring tool is claimed in combination with a well feature except as noted below.

Cutters specifically described as perforating or cutting well pipe in situ as defined in Class 166 are classified in such subclass even though such cutter may be incidentally described as also cutting the earth. For such cutters to be classified in Class 175, there must be a cutter element which is specifically described as a rock or earth cutting element in addition to the pipe cutter and such earth cutting element must be claimed. However, devices for firing a bullet or exploding a shaped charge to perforate or cut well pipe in situ are classified in Class 175 even though the disclosure is limited to perforating or cutting casing or a wall member in a bore if the device inherently functions to form a bore in the earth formation.

A lateral probe extending from a tubular well member to engage and penetrate the earth formation to form a fluid passage is classified in Class 166. If the probe removes any of the earth formation, for a sample or otherwise, classification will be in Class 175. See Subclass References to the Current Class, below.

Class 166 is more comprehensive than Class 175 when an earth boring tool is not claimed; Class 166 taking subcombinations of Class 175 subject matter, such as a below ground impact connection claimed in combination with a well feature.

RELATIONSHIP TO OTHER CLASSES WHICH INCLUDE SUBJECT MATTER CLOSELY RELATED TO CLASS 175.

A. Processes

Processes for forming a hole in stone or a stone like substance which has been previously removed from its relative position, and processes for precious stone working are classified elsewhere. (See References to Other Classes, below.)

Processes of forming holes in the earth for agricultural purposes such as, for example, aerating the soil are classified elsewhere. (See References to Other Classes, below.)

Processes for forming openings in the earth while recovering in desirable sizes or shapes a valuable material which naturally occurs in the solid state are classified elsewhere. However, merely forming a hole in valuable material for a purpose other than recovery of the material removed, such as to form a hole to receive a blasting charge or for ventilation is classified in Class 175. Disintegrating hard material in situ where the area worked is of larger surface extent than the working extent of the tool, and forming a large horizontal opening in the earth by following a cutting means into an opening with a horizontally operating vehicle support therefor is elsewhere. (See References to Other Classes, below.)

methods and apparatus for installing water or earth control structures or piles or the like in the earth which may include a hole forming step or means are classified elsewhere as are methods or apparatus for forming an underground fluid storage cavity, or a shaft or tunnel, which go beyond merely removing the material to form the hole. However, boring generally involves the use of tubing, and such tubing may, in some instances, be left in the bore to form a cased hole which may be described as a shaft, tunnel, or conduit for fluid, etc. Therefore, a patent which claims in a boring process, the formation of a cased or lined hole by merely leaving the tubing or the like used in the boring operation in the hole, will be classified in Class 175. (See References to Other Classes, below.)

Processes where boring or penetrating the earth is employed as part of a process within the Class 588 definition. (See References to Other Classes, below.)

B. Tool driving or impacting;

Means to drive or impact a tool, when such means includes combined features, such as driving and advancing, driving and cleansing or specific impact relationship to a tool, but which means is not limited to specific art use are elsewhere. Class 175 includes combinations of such means with means such as the specific structure

of the work contacting portion of a tool, a fluid head adapted to engage a bore entrance, or a bore wall engaging guide or packer on a shaft being used in a boring operation. Class 175 also provides for below ground impacting devices comprising lost motion connectings as described in C, Tools, below, even when such impacting devices are not combined with any other specific feature for Class 175. (See References to Other Classes, below.)

C. Tools

Class 175 takes the terminal or work performing element for forming a bore in the earth which is generically called a tool, and includes bits, nozzles, drive points, heaters, etc., and analogous and similar tools elsewhere provided for are noted as follows:

Tools for boring gem stones, and also the combination of a tool for boring stone or stone-like material when the tool is claimed in combination with a work support or work holder are elsewhere as are sawing or splitting tools for working blocks of stone and stone-like materials, and for stone surface working tools and miscellaneous stone working tools (e.g., miners picks). (See References to Other Classes, below.)

Tools for boring or penetrating into the earth, when the boring is done to recover valuable cuttings from a borehole in desirable size or shape, and also includes earth boring or penetrating tools which are specifically described as being adapted to follow a boring movement with a lateral movement relative to the surface of a hard material which is being worked to form a channel or kerf are elsewhere. However, Class 175 takes such channeling cutters which are described as functioning completely below the surface of the earth in an inaccessible hole. Apparatus for forming a large horizontal passageway into the earth by continuously advancing a cutting device by means of a horizontally operating vehicle which forms a passageway as the vehicle follows the cutting means into and along the passageway are elsewhere. (See References to Other Classes, below.)

Rotary boring bits not otherwise classifiable are elsewhere. (See References to Other Classes, below.)

Soft earth removing tools such as ditchers, dredgers and clam shells, which are adapted to form a hole of greater peripheral extent than the tool by lateral movement which may or may not follow a boring advance, or by repeated laterally displaced excavatory grabs are elsewhere. (See References to Other Classes, below.)

A tool which is provided with a cutting edge adapted for boring or penetrating into the earth, but which is solely disclosed as for boring into the earth around a living plant for the purpose of removing the plant from the earth as the tool is extracted, is classified in the appropriate agricultural or material handling class.

A tool such as a drive point or nozzle which assists in the placement or construction of an earth embedded structure and forms part of the completed structure is classified in the appropriate building art.

A device which is disclosed as a tool to bore or penetrate the earth by directly applying heat to fluidize or comminute, but which is merely a heater of general utility (e.g., does not claim bit elements, drilling fluid discharge port, etc.), is classified in the appropriate heating class.

In the References to Other Classes, below, search notes to classes which provide for processes for boring or penetrating the earth, or apparatus or processes relating to subject matter which is described for use in connection with a process or apparatus for boring or penetrating the earth, including a statement of the line with the most closely related classes.

SECTION III - SUBCLASS REFERENCES TO THE CURRENT CLASS

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 2+, for subject matter relating to devices for firing a bullet or exploding a shaped charge from an inaccessible hole to penetrate the formation.
- 2+, for a mechanical earth boring means or step combined with an explosive means or step ancillary to the boring.
- 59, for a step of sampling earth formation solids.
- 65+, for processes of boring the earth with fluid containing a plugging or cementing type constituent.
- 77, 78 and 79+. A lateral probe extending from a tubular well member to engage and penetrate the earth formation to form a fluid passage is classified elsewhere. If the probe removes any of the earth formation, for a sample or otherwise, classification will be in this class (175).
- 90, for channeling cutters which are described as functioning completely below the surface of the earth in an inaccessible hole.
- 327+, for the definition of "bit."

SECTION IV - REFERENCES TO OTHER CLASSES

SEE OR SEARCH CLASS:

- 29, Metal Working, appropriate subclasses for metal working apparatus and processes of mechanical manufacture, and particularly subclasses 95+ for cutters for metal working. Class 29 takes a cutter for use in a bore hole where the sole disclosed use of the cutter is to mill away metallic objects in a bore hole.
- 33, Geometrical Instruments, subclasses 302 and 304+ for methods of and apparatus for indicating borehole direction by utilizing forces such as terrestrial gravitation or magnetism.
- 37, Excavating, appropriate subclasses for processes and apparatus for making an opening in the earth by the removal or displacement of material. The line between Class 37 and Class 175 being generally related to the peripheral extent of the opening at the surface of the earth. Class 37 taking subject matter relating to forming an opening wherein the periphery of said opening greatly exceeds the cross-sectional area of the tool or cutting organization. (Lines With Other Classes and Within This Class, "Relationship to Other Classes").
- 37, Excavating, for soft earth removing tools such as ditchers, dredgers and clam shells, which are adapted to form a hole of greater peripheral extent than the tool by lateral movement which may or may not follow a boring advance, or by repeated laterally displaced excavatory grabs. (Lines With Other Classes and Within This Class, "Relationship to Other Classes").
- 52, Static Structures (e.g., Buildings), subclass 40 for a shaft or tower merely holding a named article or support means, subclasses 111-121 for mechanism operated or relatively movable shaft (e.g., a tower), subclasses 155-165 for land anchors, subclasses 651.05 and 651.06 for three-dimensional openwork (e.g., a mast), and subclasses 831-857 for a residual elongated structural unit.
- 60, Power Plants, appropriate subclasses for power plants and motors of the type provided for in Class 60 for operating earth boring or penetrating means. The nominal recitation of an earth boring or penetrating load (e.g., boring tool) will not preclude classification in Class 60.
- 73, Measuring and Testing, appropriate subclasses and particularly subclasses 152.01+ for a nominal drilling step or apparatus combined with a step or apparatus for measuring or testing.
- 74, Machine Element or Mechanism, appropriate subclasses for mechanical movements, gearing, and elements provided for therein which are described for use in earth boring or penetrating apparatus.
- 76, Metal Tools and Implements, Making, appropriate subclasses, and particularly subclass 102 and 108 for blanks and processes for making drilling tools. Patents including claims to blanks or processes for making drills and claims to the drill as an article of manufacture are classified with the article in Class 175.
- 81, Tools, appropriate subclasses for tools for connecting elements of boring means and particularly subclasses 53+ for wrenches.
- 89, Ordnance, appropriate subclass for a expelled projectile or firing control of general utility.
- 91, Motors: Expansible Chamber Type, appropriate subclass for an expansible chamber fluid motor, including such a motor for operating an earth boring means.
- 92, Expansible Chamber Devices, appropriate subclass for an expansible chamber device, including such device which may be described as used in operating an earth boring means.
- 95, Gas Separation: Processes, for processes of gas separation, particularly subclasses 241+ for degasification of liquid.
- 96, Gas Separation: Apparatus, for apparatus for gas separation, particularly subclasses 155+ for degasifying means for liquid.
- 102, Ammunition and Explosives, appropriate subclass for a process of apparatus relating to an explosive charge of general utility and particularly subclasses 301+ for blasting and well torpedoes. Class 175 provides for subject matter for extending or enlarging a bore or perforating a formation from an inaccessible hole or penetrating a casing or other wall member in an inaccessible hole by means of a gun or shaped charge device which would inherently penetrate the formation. However, Class 102 provides for subject matter relating to merely causing an explosion in a hole where such explosion is not directed in a particular manner relating to a shaped charge or cartridge, per se. Also, Class 102 includes blasting of general utility to break up earth formation, even though mechanical earth boring steps or means to position the charge are included. However, a

- mechanical earth boring means or step combined with an explosive means or step ancillary to the boring is classifiable in Class 175. See Subclass References to the Current Class, above.
- 111, Planting, appropriate subclasses for agricultural type planting including a step or means for boring or penetrating the earth combined with depositing an object in the bore (usually a seed or living plant).
- 123, Internal-Combustion Engines, appropriate subclasses for internal-combustion engines and including such engines for operating earth boring means.
- 125, Stone Working, appropriate subclasses for processes and apparatus for working stone and stone-like material, which is not in situ in the earth. Boring or penetrating tools which are described for working materials (e.g., glass, ceramics, concrete) which are not normally in situ will, nevertheless, be classified in Class 175 if the claims are limited to the boring tool. (Lines With Other Classes and Within This Class, "Relationship to Other Classes").
- 125, Stone Working, for processes for forming a hole in stone or a stone like substance which has been previously removed from its relative position, and for processes for precious stone working. (Lines With Other Classes and Within This Class, "Relationship to Other Classes").
- 125, Stone Working, provides for tools for boring gem stones, and also the combination of a tool for boring stone or stone-like material when the tool is claimed in combination with a work support or work holder. Class 125 also provides for sawing or splitting tools for working blocks of stone and stone-like materials, and for stone surface working tools and miscellaneous stone working tools (e.g., miners picks). (Lines With Other Classes and Within This Class, "Relationship to Other Classes").
- 137, Fluid Handling, appropriate subclasses for fluid handling means and including such means for use in earth boring apparatus.
- 138, Pipes and Tubular Conduits, for pipe structure of general utility.
- 144, Woodworking, for apparatus for boring wood including wood (e.g., trees) which may be in situ in the earth.
- 166, Wells, appropriate subclasses for processes and apparatus including steps or means for making or operating wells. The line between Class 166 and Class 175 is set forth in Lines With Other Classes and Within This Class, in this class definition.
- 166, Wells, subclasses 285+ for processes of cementing a well. The line between Class 166 and Class 175, when cementing or boring with fluid is concerned, is set forth in Lines With Other Classes and Within This Class in the class definition of Class 166 and the definition of subclass 285+ of the same class. (Lines With Other Classes and Within This Class, "Relationship to Class 166, Wells").
- 166, Wells, subclass 55 for cutters specifically described as perforating or cutting well pipe in situ and subclass 100 for a lateral probe extending from a tubular well member to engage and penetrate the earth formation to form a fluid passage. (Lines With Other Classes and Within This Class, "Relationship to Class 166, Wells").
- 171, Unearthing Plants or Buried Objects, appropriate subclasses for processes or apparatus for unearthing buried objects which may include boring steps or means.
- 172, Earth Working, for processes or means for working the earth, and particularly subclass 21 for earth perforators. (Lines With Other Classes and Within This Class, "Relationship to Other Classes").
- 172, Earth Working, for processes of forming holes in the earth for agricultural purposes such as, for example, aerating the soil. (Lines With Other Classes and Within This Class, "Relationship to Other Classes").
- 173, Tool Driving or Impacting, appropriate subclass for subject matter directed to driving or impacting a tool, when such subject matter includes combined features peculiar to tool driving, but which does not include features limiting the subject matter to a specific tool art, such as specific shape of the work contacting portion of a tool, related tools, or an opposed work support. (Lines With Other Classes and Within This Class, "Relationship to Other Classes").
- 173, Tool Driving or Impacting, for means to drive or impact a tool, when such means includes combined features, such as driving and advancing, driving and cleansing or specific impact relationship to a tool, but which means is not limited to specific art use. Class 175 includes combinations of such means with means such as the specific structure of the work contacting portion of a tool, a fluid head adapted to engage a bore entrance, or a bore wall engag-

- ing guide or packer on a shaft being used in a boring operation. Class 175 also provides for below ground impacting devices comprising lost motion connectings as described in Lines With Other Classes and Within This Class, C, Tools, above, even when such impacting devices are not combined with any other specific feature for Class 175. (Lines With Other Classes and Within This Class, "Relationship to Other Classes").
- 174, Electricity: Conductors and Insulators, appropriate subclasses for a combined tool shaft and electrical conductor, and particularly subclass 47 for a combined fluid conduit and electrical conductor.
- 185, Motors: Spring, Weight, and Animal Powered, for animal, spring, or weight powered devices which may be used for operating boring means.
- 188, Brakes, particularly subclass 67 for a brake (e.g., a clasp) mechanically connected to a relatively stationary structure and which holds a pipe or rod at various locations along the pipe's or rod's length for short, quick linear assembly or disassembly during a work or manufacturing operation, or preparation to a working operation done by the pipe, rod, or a pipe supported tool.
- 209, Classifying, Separating, and Assorting Solids, appropriate subclasses for processes and apparatus for selectively separating solids from solids including solids in drilling fluids.
- 210, Liquid Purification or Separation, appropriate subclasses for processes or apparatus for separating a material from a fluid including a drilling fluid.
- 248, Supports, appropriate subclasses, and particularly subclasses 637+ for machinery supports. The inclusion of a nominal boring means in a claim does not preclude classification in Class 248.
- 250, Radiant Energy, subclass 254 for methods and apparatus where a nominal drill apparatus or drilling step combined with a geological invisible radiation test, or earth formation or well material irradiation method or apparatus, and subclasses 256+ for methods and apparatus to detect or utilize invisible radiation to test material in or about a well.
- 251, Valves and Valve Actuation, appropriate subclasses for valve means including valves for use in earth boring.
- 254, Implements or Apparatus for Applying Pushing or Pulling Force, appropriate subclasses including means to advance or retract a boring means.
- 277, Seal for a Joint or Juncture, for a generic sealing means or process, subclasses 322+ for a seal for a well apparatus, subclasses 358+ for a relatively rotatable radially extending sealing face member (e.g., face, mechanical, etc.) or subclasses 500+ or a dynamic circumferential contact seal for other than a piston.
- 279, Chucks or Sockets, appropriate subclasses, including chucks and sockets for drilling tools, and particularly subclass 20 for a socket type, fluid conducting, drill holding chuck. The inclusion of details of the portion of the boring tool that cooperates with the chuck or socket does not preclude classification in Class 279. However, claims reciting plural boring tool elements which are simultaneously received in a chuck or socket are classified in Class 175.
- 285, Pipe Joints or Couplings, appropriate subclasses including pipe joints or couplings for earth boring or penetrating means, and particularly for joints or couplings for tool shafts. The nominal recitation of one joint or coupling member as being a boring tool does not preclude classification in Class 285.
- 294, Handling: Hand and Hoist-Line Implements, subclasses 49+ for hand type, nonrotary tools for boring post holes, and subclasses 86.1+ for grapples for removing or placing earth boring tools and other objects from or into a borehole and particularly subclass 86.34 for a means for retrieving a stuck object from a borehole combined with a means to remove material from around the stuck object, which means may include a nominally claimed earth boring bit, though if specific structure of a cutting edge for earth boring is claimed, classification is in Class 175. The term "stuck object" does not include a core of earth material. A core removing means is classifiable in Class 175 even if an earth boring feature is only nominally claimed. In the absence of an earth boring feature, a grapple for retrieving a core is classifiable in Class 294, subclasses 86.1+. As between Class 294 and Class 175, generally any claiming of an earth boring feature causes classification in Class 175, except for the subject matter of Class 294, subclass 86.34. Hand type, post hole boring tools which are described as being rotated in forming a hole are classified in Class 175.

- 299, Mining or In Situ Disintegration of Hard Material, for processes for forming openings in the earth while recovering in desirable sizes or shapes a valuable material which naturally occurs in the solid state. However, merely forming a hole in valuable material for a purpose other than recovery of the material removed, such as to form a hole to receive a blasting charge or for ventilation is classified in Class 175. Class 299 further provides for disintegrating hard material in situ where the area worked is of larger surface extent than the working extent of the tool, and forming a large horizontal opening in the earth by following a cutting means into an opening with a horizontally operating vehicle support therefore. (Lines With Other Classes and Within This Class, "Relationship to Other Classes").
- 299, Mining or In Situ Disintegration of Hard Material, provides for tools for boring or penetrating into the earth, when the boring is done to recover valuable cuttings from a borehole in desirable size or shape, and also includes earth boring or penetrating tools which are specifically described as being adapted to follow a boring movement with a lateral movement relative to the surface of a hard material which is being worked to form a channel or kerf. However, Class 175 takes such channeling cutters which are described as functioning completely below the surface of the earth in an inaccessible hole. Class 299 also takes apparatus for forming a large horizontal passageway into the earth by continuously advancing a cutting device by means of a horizontally operating vehicle which forms a passageway as the vehicle follows the cutting means into and along the passageway. (Lines With Other Classes and Within This Class, "Relationship to Other Classes").
- 310, Electrical Generator or Motor Structure, appropriate subclasses including an electric motor for operating an earth boring means, and which may be described as entering a bore hole.
- 318, Electricity: Motive Power Systems, appropriate subclasses for electric motor power plants, and particularly subclass 39 for plural motors which may broadly be combined with feed and drive loads.
- 324, Electricity: Measuring and Testing, subclasses 323+ for a step or means for measuring an electrical property of the formation. The combination of nominal earth boring steps or means and a step or means for measuring an electrical property of the formation is classified in Class 324.
- 340, Communications: Electrical, subclasses 853.1+ for well bore electrical communications, including telemetering in a well bore.
- 367, Communications, Electrical: Acoustic Wave Systems and Devices, subclasses 14+ for acoustic wave seismic prospecting systems; and subclasses 81+ for acoustic wave wellbore telemetering.
- 384, Bearings, appropriate subclasses for bearing of general utility.
- 403, Joints and Connections, appropriate subclasses for rod couplings or joints for earth boring means. The nominal inclusion of one joint or coupling member as being a boring tool does not preclude classification in this class (403).
- 404, Road Structure, Process, or Apparatus, appropriate subclasses for (1) highway, pathway or walkway structure, per se; and (2) process and apparatus for making, installing, repairing or maintaining such structure where such structure, process or apparatus is not otherwise classifiable as either (a) specifically provided for in other loci or (b) of such general utility as to be provided for on that basis (See Lines With Other Classes and Within This Class in Class 404, class definition, for known collections of such nature and the particular lines of demarcation).
- 405, Hydraulic and Earth Engineering, appropriate subclasses for the combination of an earth boring process or apparatus and a process step or apparatus classifiable in Class 405. In the process of installing hydraulic and earth engineering structure, Class 405 is clearly superior, a mere recitation in a process claim preamble (e.g., in a process of driving a pile) being sufficient to control classification. (Lines With Other Classes and Within This Class, "Relationship to Other Classes").
- 405, Hydraulic and Earth Engineering, for methods and apparatus for installing water or earth control structures or piles or the like in the earth which may include a hole forming step or means. Further, Class 405 provides for methods or apparatus for forming an underground fluid storage cavity, or a shaft or tunnel, which go beyond merely removing the material to form the hole. However, boring generally involves the use of tubing, and such tubing may, in some instances, be left in the bore to form a cased hole which may be described as a

- shaft, tunnel, or conduit for fluid, etc. Therefore, a patent which claims in a boring process, the formation of a cased or lined hole by merely leaving the tubing or the like used in the boring operation in the hole, will be classified in Class 175. (Lines With Other Classes and Within This Class“Relationship to Other Classes”).
- 408, Cutting by Use of Rotating Axially Moving Tool, appropriate subclasses for processes and apparatus for boring or reaming bores by a rotating tool, not elsewhere provided for. Class 408, for example, takes steps and means for boring or reaming bores solely in metallic objects even though the metallic object may be embedded in the earth, and boring bits which are described as equally well suited for boring rock, etc., and either wood or metal. (Lines With Other Classes and Within This Class, “Relationship to Other Classes”).
- 408, Cutting by Use of Rotating Axially Moving Tool, is the generic home for rotary boring bits not otherwise classifiable. (Lines With Other Classes and Within This Class, “Relationship to Other Classes”).
- 414, Material or Article Handling, for material handling of general utility, and particularly subclasses 22.51+ for a well pipe or rod including tool shaft racking mechanism.
- 415, Rotary Kinetic Fluid Motors or Pumps, subclass 903 for a fluid motor disclosed as a well bit drive turbine.
- 417, Pumps, appropriate subclasses for pumps for circulating drilling mud.
- 418, Rotary Expansible Chamber Devices, appropriate subclasses for a rotary expansible chamber device, per se, or in combination with a nominally claimed Class 175 structure.
- 464, Rotary Shafts, Gudgeons, Housings, and Flexible Couplings for Rotary Shafts, appropriate subclasses for rotary shafts and flexible shaft couplings for transmitting rotary drive to a boring tool; and particularly subclasses 18+ for a flexible coupling between fluid conducting rotary shaft; subclasses 163+ for a coupling between a rotary drive table and axially movable drill string; and subclass 183 for a hollow torque transmitting shaft.
- 507, Earth Boring, Well Treating, and Oil Field Chemistry, subclasses 100+ for earth boring (e.g., drilling fluid) compositions. The inclusion of an inherent fluid handling step of; e.g., circulating fluid or injecting while boring, preparative step, or mixing, of a specific drilling fluid composition does not preclude classification in Class 507.
- 520, Synthetic Resins or Natural Rubbers, appropriate subclasses, particularly Class 523, subclasses 130+ for a composition containing a synthetic resin or natural rubber having utility in sealing fissures or crevices in stone, rock, or other subterranean formations or in consolidating a formation in a well or in cementing a well or to processes of preparing said composition.
- 588, Hazardous or Toxic Waste Destruction or Containment, subclasses 249 and 250 for processes where boring or penetrating the earth is employed as part of a process within the Class 588 definition. (Lines With Other Classes and Within This Class, “Relationship to Other Classes”).

SECTION V - GLOSSARY

ABOVE GROUND

The term “Above Ground” denotes any point which lies outside of a hole being formed in the earth, this may be either in the open (e.g., on the surface of the earth) or a cellar, tunnel or other hole in the earth from which a hole is being formed.

ADVANCE

Motion in a direction towards the desired depth or direction of a hole being formed.

BELOW GROUND

“Below Ground” denotes any point within a hole being formed in the earth from the point at which the earth is pierced by the means forming the hole.

BORE

The hole formed by the boring means. It is not limited to a vertically extending hole, but can extend at any angle into the earth.

BOREWALL

The wall which forms the periphery of a hole in the earth. In the case of a lined hole the inside wall of the lining constitutes a borewall for purposes of classification.

BORING MEANS

A combination of parts comprising an earth boring or drilling device. It may comprise merely a tool provided with a handle for manipulating the same to form a hole in the earth, or a complex combination of parts including above ground structure for supporting, feeding and driving a tool for boring a hole in the earth.

CASING

A tube which is introduced in a preformed bore and forms a lining for the bore.

CONVEYOR

A mechanical device for receiving and carrying cuttings, for example, it may consist of a simple chute for directing cuttings away from the bore entrance, a helical screw fixed to the tool shaft, or a power-driven endless carrier type device extending between any two points within the bore or from any point within the bore to any location above ground.

DRILLING FLUID

Any fluid, gaseous or liquid, which is introduced into the bore for the purpose of lubricating or cleaning any part of the boring means, or to displace or assist the tool in displacing the formation, or to flush or clean the bore of cuttings.

DRIVE

A part of the boring means which comprises a motion generating, applying, or transmitting means which is specifically adapted to repeatedly or continuously act upon a boring tool to cause the tool to bore by cutting or penetrating into the earth. Drive is divided into the following major categories: (1) Feed. The sustained forced advance of a boring tool by means other than mere gravity, adapted to cause the tool to cut or penetrate either with or without another type of drive means; (2) Impact Drive. The actuation of a boring tool by a means adapted to deliver a series of blows upon a tool or tool shaft, said impact delivering means being adapted to move relative to said tool or tool shaft; (3) Reciprocating Drive. The actuation of a boring tool by means adapted to cause the tool to partake of to and fro axial movement, at least one direction of axial movement being caused by the drive; (4) Rotary Drive. The actuation of a boring tool by means causing the tool to continuously rotate about its own axis, and includes uniform or step by step unidirectional or oscillatory motion.

INACCESSIBLE HOLE

A hole or cavity in the earth which is not large enough to permit both a human operator and a boring means to be located therein. A specific disclosure that the hole or cavity is a well or borehole and that the supporting or carrying means for the boring means substantially fills said hole or cavity will be considered an inaccessible hole.

MOTIVE FLUID

Any fluid which is derived from a pressurized stream which operates a drive motor for the boring means. Motive fluid when exhausted into the bore is also considered to be drilling fluid.

RETRACTION

Motion in a direction away from the bottom of a hole being formed.

SHAFT

A part of the boring means which comprises an elongate, relatively slender structure (e.g., rod, tube, casing, strand, cable, etc., or any combination thereof), which is connected to another part of the boring means for manipulating, supporting or driving said other part. (1) Actuating Shaft. A shaft connected to another part of the boring means for modifying or controlling said other part (e.g., cutter expansion shaft). (2) Shaft Section. One of the individual elements of a multipart shaft. (3) Tool Shaft. A shaft which is connected to the boring tool and extends above ground, or to another part of the boring means (e.g., to the drive or advance means. (4) Tool Drive Shaft. A tool shaft connecting the tool to the drive means, to transmit mechanical movement from the drive to the tool.

TOOL

Comprises the terminal or work applying element of the boring means including bits, nozzles, drive points, projectiles, explosives, etc., which disintegrates, dislocates, erodes or compresses the earth to form a bore. See the appropriate subclasses for the definition of particular tools, and particularly Subclass References to the Current Class, above, for the definition of "bit".

SUBCLASSES

1 WITH SEISMIC SHOCK GENERATING:
This subclass is indented under the class definition. Process or apparatus which includes a step or means for boring a hole in the earth, combined with a step or means located within the hole relating to subjecting the earth to a force to initiate a seismic wave in the earth.

- (1) Note. For classification in this subclass, the process or means causing the force must be specifically described as for generating a seismic shock and not left to inference.

SEE OR SEARCH THIS CLASS, SUBCLASS:

2+, and the search there noted for boring by explosion.

SEE OR SEARCH CLASS:

- 166, Wells, appropriate subclasses for processes and apparatus which may cause seismic wave generation, and particularly subclasses 177.1+ and 308 and the search notes there noted for processes and apparatus respectively, for fracturing the formation.
- 181, Acoustics, subclasses 101+, for geophysical exploration involving seismic wave generating or detecting.
- 367, Communications, Electrical: Acoustic Wave Systems and Devices, subclasses 140+ for compressional wave detectors.

2 BORING WITH EXPLOSION IN INACCESSIBLE HOLE:

This subclass is indented under the class definition. Process or apparatus comprising subject matter directed to exploding a charge in an inaccessible hole to directly attack the formation or to propel an object such as a bullet into the formation.

- (1) Note. Internal combustion motors and similar devices operating below the surface of the ground are excluded and found in subclasses 92+.
- (2) Note. Subject matter directed to a device described as for causing a below ground explosive charge or projectile to extend or enlarge a bore or perforate the forma-

tion or a wall member in the hole is classified under this definition if (1) the sole disclosure is for use in an in-accessible hole or (2) there is a specific disclosure for use in an inaccessible hole. However, an explosive device which is described as adapted to cause a blast of general utility or a gun or general utility even though incidentally described as usable to extend, enlarge or perforate the formation or a wall member in the hole is classified in the appropriate subclasses.

- (3) Note. Devices which fire bullets or charges in a manner that would inherently penetrate an earth formation in an inaccessible hole are included under this definition even though the specific disclosure for use in an inaccessible hole is limited to perforating or severing a casing or a wall member in the hole.

SEE OR SEARCH CLASS:

- 89, Ordnance, appropriate subclasses for means for firing explosive projectiles.
- 102, Ammunition and Explosives, appropriate subclasses and particularly subclasses 20+ and 22+ for an explosive charge below ground for fracturing or breaking up the formation.
- 166, Wells, subclass 299 for a well process including an explosive step, subclasses 55+ for means for perforating or cutting pipe at an unprepared point including explosive means which does not inherently cause penetration of an earth formation to form a bore, and subclass 63 for a well apparatus with explosive means.
- 299, Mining or In Situ Disintegration of Hard Material, subclass 13 for a process including a blasting step for recovering valuable material from the earth or breaking up hard material in situ.

3 Severing formed core by explosion:

This subclass is indented under subclass 2. Process or apparatus involving a step or means utilizing an explosive charge to separate a previously formed undisturbed core from the formation.

- (1) Note. For classification in this subclass the charge must be set off before the core is fully formed.

SEE OR SEARCH THIS CLASS, SUB-CLASS:
244+, and the search there noted for other type core severing means.

3.5 **Explosive charge carried by projectile:**

This subclass is indented under subclass 2. Subject matter in which a projectile containing an explosive charge is described as forming a bore as it is projected into the formation by an explosive charge and the explosive charge carried by the projectile is then fired.

4 **Driving core receiver by explosion or with receptacle collecting material in bore:**

This subclass is indented under subclass 2. Subject matter directed to an explosive apparatus which includes or is combined with (1) a core receiving barrel or tube which is propelled into the formation by an explosive charge or (2) a receptacle or the like which is described as adapted to collect and remove a sample of the formation from the hole.

- (1) Note. An apparatus having a receptacle or the like described as adapted to collect only fluid is included under this definition, as well as a receptacle adapted to collect solid formation material or both fluid and solid formation material.

SEE OR SEARCH CLASS:
166, Wells, subclass 264 for a process of sampling only fluid from a well, and including an explosive boring step.

4.5 **Directing successive projectiles or charges in same path:**

This subclass is indented under subclass 2. Subject matter directed to plural charges or bullets which are fired through the same gun barrel and/or in succession in the same direction and along the same line into the formation without removing the firing apparatus from the hole.

4.51 **With position orienting or indicating:**

This subclass is indented under subclass 2. Subject matter directed to (1) means to position or aim an explosive charge or projectile relative to a predetermined point or direction in the hole, (2) means to enable an operator at the surface to determine where something (e.g., the explosive charge or projectile) is located in the hole or (3) means to place an indicator (e.g., reference bullet) in the formation or hole wall.

- (1) Note. A means which merely centralizes the device in the hole or holds the device against an undetermined point at the side of the hole, or is merely described as engaging the hole bottom is not included as a positioning or aiming means under this definition and is classified on other features.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 4.5, for subject matter directed to orienting means for directing successive projectiles or charges along the same path.

SEE OR SEARCH CLASS:

- 166, Wells, subclasses 255.1+ for a well process including a step of determining the position of an object in the well.

4.52 **With wall engaging packer or anchor:**

This subclass is indented under subclass 2. Subject matter directed to means engaging the hole wall or a tubular member in the hole to (1) block fluid flow between the explosive apparatus and the hole wall or member or (2) attach the explosive apparatus to the hole wall or other wall in the hole so as to resist the action of gravity or a lifting force.

- (1) Note. The means to block fluid flow or attach the explosive apparatus must be insertable from above ground to coact with the hole wall or a prepositioned tubular member in the hole.

SEE OR SEARCH CLASS:

- 102, Ammunition and Explosives, subclass 319 for a well torpedo with anchoring means or a well wall contacting guide or buffer.

4.53 Firing chamber movable in bore relative to carrier or another firing chamber:

This subclass is indented under subclass 2. Subject matter directed to (1) a chamber for an explosive charge which is movable while it is in the hole relative to a body or frame which supports the chamber in the hole or (2) plural chambers which are connected together so as to permit relative movement between the chambers while they are in the hole.

4.54 With bore condition firing control, or compensating means:

This subclass is indented under subclass 2. Subject matter directed to means provided in the apparatus to (1) start, stop or modify operation of an explosive firing means in response to a sensed condition within the hole or (2) compensate for change in a hole condition due to exploding of a charge.

4.55 Independent firing of plural charges:

This subclass is indented under subclass 2. Subject matter directed to means including plural charges and a control to separately fire the charges.

- (1) Note. Charges which are consecutively or train fired due to the single actuation of a control means are not included under this definition unless the firing can be interrupted so as to control the firing of one charge separately from another, such train firing being classified on other features.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 4.5, for subject matter directed to separately controlled firing in which successive projectiles or charges are directed in the same path.

4.56 Firing control mechanically actuated in bore:

This subclass is indented under subclass 2. Subject matter directed to a mechanical control means which is actuated in the hole to explode the charge.

- (1) Note. For purposes of this definition, mechanical control comprises any relative movement of mechanical parts

which takes place below ground or in an inaccessible hole. For example, merely an electrical switch blade which is moved by some means in the hole relative to a contact is considered mechanical control for this definition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 4.55, for subject matter directed to independent firing of plural charges or projectiles and which may include a firing control mechanically actuated in the hole.

4.57 Projectile forms bore:

This subclass is indented under subclass 2. Subject matter comprising an apparatus or process for firing a missile.

- (1) Note. A mere missile or projectile, per se, is not classified under this definition. It is classified in the appropriate ordnance class if the disclosure is not limited to earth boring and no specific earth boring feature is claimed. However, if the disclosure is limited to earth boring or a specific earth boring feature is claimed, classification is in the appropriate subclass herebelow in Class 175.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 3.5, for subject matter directed to a projectile which carries an explosive charge.

4.58 With means to initially restrain projectile for pressure build-up:

This subclass is indented under subclass 4.57. Subject matter directed to means which are provided to temporarily hold back the missile at the time of firing the explosive charge so as to build up pressure behind the missile and propel the missile with high initial acceleration when the holding means is overcome.

4.59 With means to prevent preliminary bore fluid contact:

This subclass is indented under subclass 4.57. Subject matter directed to means which are provided to prevent ambient fluid in the hole from coming in contact with the missile until propulsion of the missile commences.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

4.58, for subject matter directed to a device in which a means is adapted to initially restrain a projectile for pressure buildup and also prevent preliminary bore fluid contact.

4.6 **Concave-shaped charge:**

This subclass is indented under subclass 2. Subject matter directed to means in which the explosive charge is hollowed or dished inwardly toward a central point to give a focused pressure to directly attack the formation or a wall member in the hole.

5 **BORING A SUBMERGED FORMATION:**

This subclass is indented under the class definition. Process or apparatus comprising a step or means for sinking a well, shaft or deep boring in the surface of the earth lying below a body of water, (e.g., ocean, lake or river).

- (1) Note. Included under this definition are patents in which the sole specific disclosure or a claim is directed to subject matter for boring in strata located below a body of water. Excluded from this subclass are subcombinations of a boring apparatus such as a tool, disclosed as being part of an underwater drilling apparatus, but which has no structure specially adapting the tool to under water boring. Such structure is classified in the appropriate subclasses below.

SEE OR SEARCH CLASS:

37, Excavating, subclass 307 for dredges for excavating below a body of water.
 114, Ships, appropriate subclasses for floating supports, per se. Class 175 takes patents relating to a floating support for an earth boring apparatus where some element of the earth boring apparatus is claimed. Nominal recitation of a drill rig, or details of a derrick or draw works have not been considered to involve specialized drilling features and are classified in Class 114.
 166, Wells, subclasses 300+ for a process or apparatus relating to forming or producing a well which is located in

the earth's surface below a body of water.

405, Hydraulic and Earth Engineering, subclasses 158+ for a process of apparatus for laying a pipe or cable into a submerged location.

6 **Boring with underwater tool drive prime mover:**

This subclass is indented under subclass 5. Subject matter including a drive means for a boring tool, and in which said drive means is located below the surface of the water during the boring operation.

- (1) Note. For the definition of "drive", see the class definition.

SEE OR SEARCH CLASS:

114, Ships, subclass 336 for submarines with life saving or salvage devices, and which may include means to bore into a sunken vessel.

7 **Boring from floating support with submerged independent anchored guide base:**

This subclass is indented under subclass 5. Subject matter, utilizing a base structure positioned on the underwater floor and completely covered by water when so positioned and a floating structure independent of the base structure, said floating structure and base structure cooperating to support and guide the drilling apparatus during the drilling operation.

- (1) Note. A mere casing extending upwardly from the marine floor is not included under this definition.

- (2) Note. The base structure may be connected to the floating structure by flexible means which will permit the floating structure to move relative to the base structure.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

10, for submersible guide means which may engage the marine floor but which guide means is mounted on a guide frame which frame will move with movement of the floating structure.

220, for above ground guide means for relatively advancing tool.

8 Boring from submerged buoyant support:
This subclass is indented under subclass 5. Subject matter, utilizing a normally floating or buoyant support for a boring means which is submerged to a position below the surface of the water during the boring operation.

(1) Note. Merely sinking anchors which may normally be buoyant is excluded.

(2) Note. The boring means or support therefore need not be completely submerged to be placed in this subclass.

9 Boring from nonbuoyant support:
This subclass is indented under subclass 5. Subject matter utilizing a boring means mounted on a structure at or above the surface of the body of water and which structure is so constructed or anchored by means of fixed rigid supports (e.g., piles) as to be nonbuoyant or unaffected by the normal wave or tide action of the body of water.

(1) Note. A guide frame or casing for the tool or tool shaft which engages the formation is excluded unless the frame or casing prevents movement of the supporting structure for the boring means.

SEE OR SEARCH CLASS:

405, Hydraulic and Earth Engineering, subclasses 195.1+ for marine floor supported structures. Class 175 takes a structure adapted to support an earth boring device in a body of water where some details of the boring device is claimed. Nominal recitation of a drilling rig, provision for drilling a mere foundation for a support, details of a derrick or draw works, or mere access spaces communicating with the surface of the water which could be used equally well in a pile driving organization have not been considered to involve specialized drilling features and are classified in Class 405.

10 Boring with submersible vertically movable guide:

This subclass is indented under subclass 5. Subject matter, utilizing a support for a boring means provided with a vertically disposed guide frame, a second guide frame or member mounted on said first guide frame, said second guide frame or member being movable relative to said first guide frame in a vertical direction to a position below the surface of the body of the water.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

220, and the search there noted for above ground guide means for relatively advancing tool.

11 BORING BY DIRECTLY APPLYING HEAT TO FLUIDIZE OR COMMUNUTE:

This subclass is indented under the class definition. Process or apparatus comprising a step or means for directing a form of heat energy into a mineral body to (1) alter the physical state of the body or (2) separate the mineral body into particles (e.g., spalling).

(1) Note. Class 175 is considered generic to heat working of naturally occurring mineral bodies in situ, and as such, takes all processes and apparatus particularly adapted to heat working of said bodies, not limited to (1) surface treatment or channeling of blocks of stone, classified in Class 125, Stone Working, or (2) mining or channeling of in situ mineral bodies for the recovery of valuable material therefrom, classified in Class 299, Mining or In Situ Disintegration of Hard Material.

(2) Note. Apparatus classifiable herein, must include a structural modification peculiar to mineral working. For heating devices of general application search the appropriate heating class.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

2, for subject matter in which heat energy is generated by an explosion which is caused to occur in a bore-hole.

17, for subject matter relating to heating or cooling within the borehole or heating or cooling drilling fluid.

SEE OR SEARCH CLASS:

60, Power Plants, subclasses 200.1+ for jet reaction motors and processes for operating the same and subclasses 39.01+ for mixed fluid power plants.

65, Glass Manufacturing, subclasses 112+ for glass stock treating including severing or perforating, and see the collection of notes thereunder.

75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, appropriate subclasses for smelting of mineral ores.

110, Furnaces, appropriate subclasses for furnaces.

125, Stone Working, subclass 2 for channeling or working blocks of stone by heat.

148, Metal Treatment, subclass 194 for processes of chemical-heat removing (e.g., flame cutting, etc.) or burning (i.e., oxidizing) of metal.

166, Wells, subclass 302 and the subclasses there noted for well processes including a heating step, and subclasses 57+ for well heating apparatus.

225, Severing by Tearing or Breaking, subclasses 93+ for apparatus for severing by breaking, especially subclass 93.5 for such apparatus utilizing thermal shock.

241, Solid Material Comminution or Disintegration, subclass 1 for solid material comminution and disintegration by heat.

266, Metallurgical Apparatus, subclasses 48+ for metallurgical blowpipes.

299, Mining or In Situ Disintegration of Hard Material, subclasses 3+ for in situ conversion of solid material to fluid by the use the heat, and subclass 14 for a process including a step of heating.

405, Hydraulic and Earth Engineering, subclass 131 for thawing earth.

423, Chemistry of Inorganic Compounds, for chemically treating mixtures to obtain metal containing compounds which processes may include heating.

12 Combustion of the formation material:

This subclass is indented under subclass 11. Subject matter in which material comprising the in situ formation is disclosed as entering into an exothermic chemical reaction.

(1) Note. The chemical reaction is generally started or sustained by introducing a reactant (e.g., oxygen) from an external source.

SEE OR SEARCH CLASS:

166, Wells, subclasses 251.1 and 256+ for processes of in situ combustion for the recovery of fluid from the earth which processes might incidentally show boring by in situ combustion.

299, Mining or In Situ Disintegration of Hard Material, subclass 5 for recovering valuable solid material by conversion to the fluid state which includes a chemical reaction, such as combustion.

13 With introduction of slag forming flux:

This subclass is indented under subclass 11. Subject matter in which a chemical compound is directed into the heated or molten mass of disintegrated material to bring about the formation of a resultant product having a desirable property (e.g., to increase fluidity).

SEE OR SEARCH CLASS:

75, Specialized Metallurgical Processes, Compositions for Use Therein, Consolidated Metal Powder Compositions, and Loose Metal Particulate Mixtures, subclasses 303+ for fluxes for smelting and treating ores.

14 Combustion is confined chamber having restricted discharge orifice:

This subclass is indented under subclass 11. Subject matter in which an exothermic chemical reaction is caused to occur in a confined area, and the products of the reaction are discharged through a restriction from said area against the mineral body with jet and/or intensely heated characteristics.

- (1) Note. The “confined area” consists of an area enclosed by structure other than the mere walls of the borehole being formed in the mineral body.

SEE OR SEARCH CLASS:

- 60, Power Plants, subclasses 200.1+ for jet reaction motors and processes for operating the same.
- 239, Fluid Sprinkling, Spraying, and Diffusing, appropriate subclasses for a jet discharge nozzle, per se, or combined with the system for providing fluid to the nozzle.
- 266, Metallurgical Apparatus, subclasses 48+ for metallurgical blowpipes with internal-combustion chambers.
- 431, Combustion, subclass 158 for a combustion chamber not disclosed for power purposes, specialized to combustion, and having a jet discharge.

15 Rotating the heating tool:

This subclass is indented under subclass 11. Subject matter in which the heat applying or directing device is continuously rotated about an axis.

16 Electrically produced heat:

This subclass is indented under subclass 11. Subject matter in which the heat is generated by an electric current either (1) within, or (2) in close proximity to the mineral body being worked.

SEE OR SEARCH CLASS:

- 166, Wells, subclass 60 for electrical well heaters.
- 219, Electric Heating, subclasses 68+ for electrical cutting or disintegrating of metal, subclass 221 for tools and instruments, and subclasses 277+ for oil well heaters.

17 WITH HEATING OR COOLING (1) WITHIN THE BORE, OR (2) DRILLING FLUID:

This subclass is indented under the class definition. Process or apparatus comprising a step or means (1) for changing the temperature of a drilling fluid or (2) positively changing the temperature of all or a portion of a bore or boring equipment within the bore.

- (1) Note. The mere step or means of circulating drilling fluid through the bore as a heat absorbing or transmitting medium is excluded even though the fluid may be compressed and expanded (e.g., exhaust from a down the hole motor).

- (2) Note. Heat produced incidental to the normal boring operation of a boring means (e.g., bit friction or motor heat) is excluded.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 1, for seismic shock generation which may include heating.
- 2+, for boring by below ground explosion.
- 11+, for boring by directly applying heat to fluidize or comminute and which may include cooling.
- 65+, and the search there noted for processes or apparatus for drilling with fluid which may heat or cool a bore. (See (1) Note above).
- 92+, for heating the bore incidental to the operation of a below ground drive motor.

SEE OR SEARCH CLASS:

- 166, Wells, subclass 302 and the subclasses there noted for well processes including heating and/or cooling, and subclasses 57+ for well heating or refrigerating apparatus.
- 219, Electric Heating, subclasses 277+ for electric oil well heaters.
- 299, Mining or In Situ Disintegration of Hard Material, subclasses 3+ for recovering valuable material by converting solid material to fluid in situ, and including melting material by heat or heated fluid.
- 405, Hydraulic and Earth Engineering, subclass 56 for a method or apparatus for heating or cooling the walls of an earthen cavity in which is sorted a fluid material; and subclasses 130+ for heating or cooling of an earth formation in general.

18 ICE BORING:

This subclass is indented under the class definition. Process or apparatus comprising steps or means which are peculiar to forming boreholes in naturally situated bodies of frozen water.

- (1) Note. A specific disclosure of use in boring ice is sufficient to cause classification in this subclass.
- (2) Note. The term “naturally situated bodies”, is limited to bodies of the type which are normally occurring earth structures such as glaciers or ponds. If the subject matter is limited by disclosure to bodies which do not meet this limitation, or the bodies are portions of naturally situated bodies which have been removed, classification will be in another class.

SEE OR SEARCH CLASS:

- 30, Cutlery, appropriate subclasses, and particularly subclasses 164.5+ for ice pick or chipper type cutlery.
- 125, Stone Working, appropriate subclasses for subject matter relating to working bodies of ice which are not in situ.
- 299, Mining or In Situ Disintegration of Hard Material, subclasses 3+ for melting ice in situ, subclasses 10+ for a process of mining ice, and subclasses 24+ for a device for working ice in situ.

19 BORING WITHOUT EARTH REMOVAL (I.E., COMPACTING EARTH FORMATION):

This subclass is indented under the class definition. Process or apparatus including a step or means peculiar to forming a borehole in the earth without the extraction of material from the borehole, and relating primarily to the wedging or packing aside of the earth by a driven element (e.g., drive point).

- (1) Note. Subject matter going beyond merely forming an opening in the earth (e.g., installing piling), is classified in another art on the basis of the additional function or structure. However, apparatus for forming or placing a lining or cas-

ing in the bore as part of the boring without earth removal operation, does not exceed the scope of this class unless significant lining or casing structure, which is classifiable elsewhere, is claimed.

- (2) Note. A disclosure that the principal boring operation is carried out without earth removal is necessary to cause classification in this subclass. For example, tools which have a drive point feature (i.e., pilot or anchor), but which have additional structure that in normal operation causes, or permits material to be removed from the borehole, will not be classified herein.
- (3) Note. Points that have screw or helical portions thereon which portions have a greater diameter than the largest diameter of the point will be classified under subclasses 327+ even though by disclosure no formation is removed, since any screw or helical portion would tend to convey material unless the tool was advanced the proper amount with respect to the speed of rotation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

327+, for earth boring bits and bit elements.

SEE OR SEARCH CLASS:

- 52, Static Structures (e.g., Buildings), subclasses 155+ for a piercing or expanding earth anchor.
- 174, Electricity: Conductors and Insulators, subclass 7 for driving type earth grounding rods.
- 405, Hydraulic and Earth Engineering, subclasses 232+ for apparatus and methods for driving piles into the ground.

20 Combined with earth removal (e.g., removing sample):

This subclass is indented under subclass 19. Subject matter including in addition to boring without earth removal, the step or means for removing earth, (e.g., boring without earth removal followed by taking a sample).

- SEE OR SEARCH THIS CLASS, SUB-CLASS:
405, and search there noted for core receiver driven into formation.
- 21 Fluid passage to exterior of drive point:**
This subclass is indented under subclass 19. Subject matter relating to conducting fluid through the drive point to the exterior thereof, generally to lubricate or treat the earth formation.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
227+, for lubricant fluid storage means carried by the tool or tool shaft.
- 22 Drive point detached from shaft to form cased bore or with installation of casing:**
This subclass is indented under subclass 19. Subject matter including a step or means for (1) separating a drive point from its shaft to permit the shaft to remain as a casing in the bore or (2) installing a separate casing as a part of the boring operation.
- (1) Note. Processes of installing a casing including forming a well or hydraulic or earth engineering structure which include boring are excluded and well be found in classes 166 and 405 respectively.
- (2) Note. The term “detached” as used in this title includes merely removing the drive point from its position adjacent the end of the shaft, as well as mechanically disconnecting the shaft and drive point.
- 23 Drive point retracted through shaft or casing:**
This subclass is indented under subclass 22. Subject matter including a step or means for withdrawing a drive point through a hollow shaft or casing.
- (1) Note. See subclass 257 and search there noted for earth boring means removable through a tool shaft.
- 24 AUTOMATIC CONTROL:**
This subclass is indented under the class definition. Process or apparatus comprising the steps or means for (1) sensing a condition of operation which may or may not occur and (2) controlling a power operated means in response to said sensed condition (without assistance from an intelligent operator) to initiate, modify, or terminate the operation.
- SEE OR SEARCH CLASS:
173, Tool Driving or Impacting, subclasses 2+ for automatic control of a power operated tool driving or impacting means.
254, Implements or Apparatus for Applying Pushing or Pulling Force, subclasses 267, 268 and 272+ for a load hauling or hoisting drum with control means responsive to a condition.
299, Mining or In Situ Disintegration of Hard Material, subclass 1 for subject matter relating to automatic control involved in recovering valuable earth material and disintegrating hard material in situ.
340, Communications: Electrical, subclasses 853.2+ for an electronic communication selective control system in a wellbore.
- 25 Of fluid pressure below ground:**
This subclass is indented under subclass 24. Subject matter in which a sensed condition of operation controls a power operated means to adjust or regulate the pressure of fluid which is (1) within a borehole or (2) confined in apparatus in which the fluid pressure may be automatically adjusted or modified while the confining apparatus is within a borehole.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
38, for automatic control in response to drilling fluid circulation.
- 26 Of boring means including a below-ground drive prime mover:**
This subclass is indented under subclass 24. Subject matter in which a below ground drive prime mover comprises part of the boring means.

- (1) Note. See this class, subclass 92 for the definition of a below ground tool drive prime mover.

27 Of advance or applied tool weight:

This subclass is indented under subclass 24. Subject matter in which a sensed condition of operation controls a power operated means to initiate, modify, or terminate the advance or axial pressure of a tool upon the formation.

- (1) Note. For the meaning of "advance" see the class definition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 51, for self acting cyclic advance and retraction of a tool or tool shaft.
114, for means to simultaneously feed and rotate a tool from a single mechanical movement, including a means to permit a constant rotation rate regardless of release of feed force or change in feed rate.

SEE OR SEARCH CLASS:

- 173, Tool Driving or Impacting, subclasses 4+ for automatic control of a power operated tool advance causing or controlling means.
408, Cutting by Use of Rotating Axially Moving Tool, subclasses 8+, for control means of that class.

38 In response to drilling fluid circulation:

This subclass is indented under subclass 24. Subject matter in which a sensed characteristic of drilling fluid circulation controls a power operated means to modify the boring operation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 25, for automatic control of fluid pressure below ground.

SEE OR SEARCH CLASS:

- 173, Tool Driving or Impacting, subclass 3 for automatic control of a power operated tool driving or impacting means in response to a condition of a cleansing means.

39 WITH BIT WEAR SIGNAL GENERATING:

This subclass is indented under the class definition. Process or apparatus comprising a step or means for initiating a signal when a specified condition relating to wear of the bit occurs.

SEE OR SEARCH CLASS:

- 73, Measuring and Testing, subclasses 152.44+ for bit wear indicating involving drill depth-rate.
340, Communications: Electrical, subclasses 500+ for electrical automatic condition responsive indicating systems.

40 WITH SIGNALING, INDICATING, TESTING OR MEASURING:

This subclass is indented under the class definition. Process or apparatus combined with a step or means for measuring, testing, signaling, indicating, detecting, registering or recording a condition for the benefit of an observer.

- (1) Note. A boring process or apparatus which inherently gives a signal while performing some boring function is not included unless it includes an added step or apparatus for indicating. For example a mere stop means or abutment which is intended to limit the extent to which a tool may be fed is excluded. Also, a below ground means which is responsive to a condition of the boring means to control the flow of fluid through a passage is excluded unless the means to indicate the change in fluid flow or pressure, or a step of indicating is claimed. Such structure is classified on other features.

- (2) Note. Bore bottom sensing by touching the bottom of the borehole with the boring apparatus is excluded.

- (3) Note. Patents relating to measuring or indicating a condition in a borehole are classified in the appropriate measuring or indicating class. Class 175 takes patents relating to process or apparatus for boring into the earth combined with a measuring or indicating feature, where more than a mere step of boring is

claimed or where details of the boring apparatus are claimed.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 39, for a bit provided with means to initiate a signal when the bit becomes worn.
- 232+, for means movable relative to tool below ground to stop flow toward bore bottom.
- 317+, for means movable relative to tool or shaft to control below ground passage.

SEE OR SEARCH CLASS:

- 33, Geometrical Instruments, subclasses 302 and 304+ for methods of and apparatus for indicating borehole direction by utilizing forces such as terrestrial gravitation or magnetism.
- 73, Measuring and Testing, subclasses 81+ for means to test the hardness of a material, including a penetrator or indenter, subclasses 152.01+ for measuring a condition of the boring means or earth formation in a borehole wherein the test is not purely electrical or purely magnetic and wherein the boring process or the boring apparatus is only nominally claimed.
- 166, Wells, subclasses 250.01+ for processes involving a well, combined with a step of measuring, testing, signaling, indicating, directing, registering or recording a condition, subclass 66 for a well device combined with electrical indicating means, and subclass 113 for a well device combined with nonelectrical measuring, testing or indicating means.
- 173, Tool Driving or Impacting, subclasses 20+ for a signaling or indicating means combined with a tool driving or impacting device.
- 181, Acoustics, subclasses 102+ for subject matter relating to a mechanical acoustic device in a bore hole.
- 235, Registers, appropriate subclasses for a registering process or device, per se.
- 250, Radiant Energy, subclass 254 for methods and apparatus where a nominal step of boring or boring apparatus is claimed in combination with a geo-

logical invisible radiation test, or earth formation or well material irradiation method or apparatus, and subclasses 256+ for methods and apparatus to detect or utilize invisible radiation to test material in or about a well.

- 324, Electricity: Measuring and Testing, subclasses 323+ for subject matter relating to the determination of an electrical characteristic of the subsurface of the earth. A nominal recitation of an earth boring step or means does not preclude classification in Class 324.
- 340, Communications: Electrical, subclasses 853.1+ for a borehole signaling system, and subclasses 500+ for electrical automatic condition responsive indicating systems.
- 342, Communications: Directive Radio Wave System and Devices (e.g., Radar, Radio Navigation), subclasses 5+ for a radar system in a borehole.
- 346, Recorders, appropriate subclasses for a recording process or device, per se.
- 374, Thermal Measuring and Testing, subclass 136 for subsurface temperature determination other than for strata identification.
- 436, Chemistry: Analytical and Immunological Testing, subclasses 25+ for testing or measuring methods involving chemical analysis.
- 702, Data Processing: Measuring, Calibrating, or Testing, subclasses 6+ for data processing, for measuring in a well logging or borehole environment.
- 703, Data Processing: Structural Design, Modeling, Simulation, and Emulation, subclass 10 for mathematical simulation of a fluid well.

41 Ray energy detection or measuring:

This subclass is indented under subclass 40. Subject matter comprising a step or means for detecting the presence of, or measuring the quantity or quality of invisible radiant energy rays, such as for example radioactive emanations or phosphorescence or fluorescence.

SEE OR SEARCH CLASS:

250, Radiant Energy, subclass 254 for methods and apparatus with a nominal drill apparatus or drilling step combined with a geological invisible radiation test, or earth formation or well material irradiation method or apparatus, and subclasses 256+ for methods and apparatus to detect or utilize invisible radiation to test material in or about a well.

340, Communications: Electrical, subclass 600 for electrical automatic radiant energy responsive indicating systems.

42 Indicating agent released in drilling fluid:

This subclass is indented under subclass 40. Subject matter comprising a drilling fluid system and a step or means for releasing an identifiable substance into the drilling fluid stream which substance when carried above ground by the circulating fluid will indicate to an observer the presence of a condition.

(1) Note. The substance is something which is specifically disclosed for indicating.

44 Providing identifiable indication of core position in situ for core sample orientation:

This subclass is indented under subclass 40. Subject matter comprising a step or means to take a core sample from the formation and a step or means operative during the extraction of the core for indicating the position of the core sample in the formation, so that said core sample may be placed in the same position which it assumed while in the formation for observation after it is brought above ground.

45 Tool position direction or inclination measuring or indicating within the bore:

This subclass is indented under subclass 40. Subject matter comprising a step or means for indicating the position, direction or inclination of a boring tool in a borehole with relation to geographical direction, a characteristic of the borehole or some other preselected point of reference.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

44, for the process or apparatus for indicating the position of a core sample while in situ for the purpose of orientation.

46 Signaling or indicating condition of cutting in cuttings retainer:

This subclass is indented under subclass 40. Process or apparatus comprising a cuttings retainer and a step or means for indicating a condition of cuttings within or entering said cuttings retainer.

48 Measuring or indicating drilling fluid (1) pressure, or (2) rate of flow:

This subclass is indented under subclass 40. Subject matter relating to a drilling fluid system forming a part of the boring means and a step or means to (1) measure or indicate the pressure of the drilling fluid or (2) measure or indicate the rate of flow of said drilling fluid at a specified location in said system.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclasses 290+, 700+ and 861+ for volume or rate of flow meters, liquid level or depth gauges, and fluid pressure gauges, respectively.

340, Communications: Electrical, subclasses 603+ for electrical automatic fluent material responsive indicating systems.

49 Transparent inspection feature:

This subclass is indented under subclass 40. Subject matter comprising a step or means for encasing a part of the boring means or cuttings in a transparent enclosure such that said enclosed boring means or cuttings may be visually observed or inspected.

50 Indicating, testing or measuring a condition of the formation:

This subclass is indented under subclass 40. Subject matter comprising a step or means for determining the characteristics of the earth formation traversed by a boring tool.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 41, for indicating, measuring or testing a condition of the formation involving the detection or measuring of ray energy.
- 44, for indicating, measuring or testing a condition of the formation involving taking of a core sample.
- 48, for indicating, testing or measuring a condition of the formation involving a change in drilling fluid pressure or rate of flow.

SEE OR SEARCH CLASS:

- 73, Measuring and Testing, subclasses 81+ for measuring the hardness of a material by employing a device which measures the force required to penetrate the material, and subclasses 152.01+ for measuring and testing, relating to the earth formation in a borehole.
- 324, Electricity: Measuring and Testing, subclasses 323+ for a process or means for measuring an electrical characteristic of the earth formation in or around a borehole.

51 WITH SELF-ACTING CYCLIC ADVANCE AND RETRACTION OF TOOL OR TOOL SHAFT:

This subclass is indented under the class definition. Process or apparatus combined with a step or means requiring no other control by an operator other than the initial starting or pre-setting of the condition of operation, for the tool or tool shaft to follow a complete cycle of operation of advance and retraction or retraction and advance returning to its original or starting position and then stopping.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 27, for automatic control of tool advance.

SEE OR SEARCH CLASS:

- 173, Tool Driving or Impacting, subclass 19 for a tool driving or impacting device which is advanced and retracted through a cycle by a self-acting means.

- 408, Cutting by Use of Rotating Axially Moving Tool, subclasses 14+ for machines of that class type including stopping upon completion of operation.

52 WITH MAGAZINE FOR SUCCESSIVELY MOVING UNCONNECTED, ORIENTED TOOL OR SHAFT SECTIONS TO USE POSITION:

This subclass is indented under the class definition. Process or apparatus combined with a holding of storage means or steps for carrying a plurality of separate disconnected tools or tool shaft sections, said holding or storage means or steps including separately removing and positioning a tool or a tool shaft section from said holding or storage position into a use position with the previously removed and positioned tool or tool shaft section.

SEE OR SEARCH CLASS:

- 166, Wells, subclasses 378+ for processes of placing removing, constructing or assembling well elements.
- 221, Article Dispensing, appropriate subclasses and the search there noted in Lines With Other Classes and Within This Class and References to Other Classes, for dispensing of articles of general utility.

53 ENLARGEMENT OF EXISTING PILOT THROUGHBORE REQUIRING ACCESSIBILITY TO EXISTING OPPOSITE BORE ENDS TO INSERT AND REMOVE TOOL:

This subclass is indented under the class definition. Process or apparatus including a step of, or apparatus peculiar to increasing the diameter of an existing through borehole (spaced entrance and exit points) wherein certain parts of either the boring apparatus used must be located outside of end of the existing borehole at some time during the boring operation.

SEE OR SEARCH CLASS:

- 405, Hydraulic and Earth Engineering, subclasses 132+ for tunneling machines.

54 BORING BY BELOW GROUND RECIRCULATION OF UNSUPPORTED ELEMENTS (E.G., SHOT):

This subclass is indented under the class definition. Process or apparatus comprising a step or means for continuously recirculating within the bore a plurality of unsupported elements such as shot or pellets to cause such elements to directly impinge upon and disintegrate the formation.

- (1) Note. The elements must be recirculated entirely within the bore for classification in this subclass. Drilling fluid provided with unsupported particles which circulate from above ground into the bore is excluded.
- (2) Note. The elements (e.g., shot or pellets) need not be claimed for classification in this subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

380, for cutters comprising unsupported abrading particles (e.g., shot) where there is no means to recirculate the particles.

SEE OR SEARCH CLASS:

15, Brushing, Scrubbing, and General Cleaning, subclasses 95+ for cleaning by shotting.
451, Abrading, subclasses 2+ for a condition responsive control for sandblasting and subclasses 75+ for a sandblasting machine.

55 TOOL ACTUATION BY REACTION OF ROTATING ECCENTRIC MASS:

This subclass is indented under the class definition. Process or apparatus comprising a step or means for driving the boring tool which includes a mass or weight mounted to travel in an orbital path with the center of gravity of the mass or weight being spaced from the center of the path in which it travels, the reaction of said mass or weight on its mounting being transmitted to the boring tool through the means mounting the mass or weight for rotation.

SEE OR SEARCH CLASS:

74, Machine Element or Mechanism, subclass 61 for mechanical movements for converting rotary motion to or from reciprocating or oscillating motion by means of unbalanced weights.
173, Tool Driving or Impacting, subclass 49 for a tool driving or impacting device actuated by a means reacting to the rotation of an eccentric mass.
209, Classifying, Separating, and Assorting Solids, subclass 367 for actuating devices for reciprocating sifters having unbalanced weights.

56 NATURAL VIBRATION CHARACTERISTIC OF AN ELEMENT OF BORING MEANS RELATED (1) TO NATURAL VIBRATION CHARACTERISTIC OF ANOTHER ELEMENT, OR (2) TO FREQUENCY OF AN IMPOSED MOTION:

This subclass is indented under the class definition. Process or apparatus comprising a step or means relating to an element or part of the boring means which has a property affecting its natural period of vibration when it is impacted or elastically deformed which bears a relationship to (1) a similar property of another element or part of the boring means or (2) the frequency or period of vibration of the force causing the impacts or deformations of the first element.

- (1) Note. The relationship of vibration characteristics must be specifically described but the claims need recite only some feature which has been described as relating to the vibration characteristics for classification in this subclass.
- (2) Note. A mere shock absorber, such as a spring or rubber element, is excluded from this subclass unless it is described as having a particular relationship to the vibration characteristics of another part or the imposed motion.

SEE OR SEARCH THIS CLASS, SUBCLASS:

1, for boring devices combined with means to generate or detect seismic shocks.

55, for boring tools actuated by the reaction of a rotating eccentric mass.

rial from the earth or disintegrating hard material in situ.

SEE OR SEARCH CLASS:

166, Wells, subclass 249 for processes for vibrating the earth to fracture the formation and subclasses 177.1+ for apparatus for causing vibrations to fracture the formation.

299, Mining or In Situ Disintegration of Hard Material, subclass 14 for a process of recovering valuable material from the earth or breaking up hard material in situ, including a step of disintegrating by directly applying vibration.

57 PROCESSES:

This subclass is indented under the class definition. Processes.

(1) Note. Processes classified in this subclass comprise, for example, processes of manipulating drills, drill rods or expanding reamers to drill or ream a borehole or processes of operating various types of drill rig power supplies and the like.

(2) Note. Subclasses 1 through 56 includes both processes and apparatus, and processes relating to the subject matter provided for in those subclasses will be found therein.

SEE OR SEARCH CLASS:

37, Excavating, subclass 195 excavating processes not otherwise classified.

144, Woodworking, subclass 365 for a woodworking process of turning, boring or drilling.

166, Wells, subclasses 244.1+ for well processes which may include a step of well boring.

173, Tool Driving or Impacting, subclass 1 for a process limited to the operation of a tool driving or impacting device. If steps peculiar to performing an earth boring operation are included, classification will be in Class 175.

299, Mining or In Situ Disintegration of Hard Material, subclasses 10+ for a process of recovering valuable mate-

58 Sampling of earth formations:

This subclass is indented under subclass 57. Processes comprising drilling a definite sample of earth from the borehole or from the surrounding earth formation for testing or measuring purposes.

(1) Note. The manner of taking the sample may be the taking of a core during drilling, collecting chips or cuttings dislodged by drilling or removing a plug from the sidewall of previously formed borehole, but these steps must be set forth as earth sampling steps to be classified in this subclass.

(2) Note. Sampling apparatus as such is difficult, in some instances, to distinguish from similar nonsampling apparatus and thus apparatus has been classified not on the function of sampling but on its drilling or boring function in general. Only in those instances where the sampling feature is a distinguishing characteristic have the patents been so classified.

SEE OR SEARCH THIS CLASS, SUBCLASS:

3, for processes or devices for severing a core by means of an explosive or explosion.

4, for processes or devices in which a core receiver is driven into a formation by an explosion.

20, for a process or apparatus for boring without earth removal, combined with a step or means for removing an earth sample.

44, for processes or apparatus providing identifiable indication of core position in situ for core sample orientation.

49, for process or apparatus having means or steps for observing a sample.

77, for apparatus in which a sample receptacles, generally of the side-wall type, is fed laterally without rotation from a carrier.

78, for sample taking tools which are motor fed laterally of a carrier, generally to take a side-wall sample.

- 308, for below ground receptacles for cuttings.
403, and the search there noted for core taking tools.

59 Retaining fluid or taking separate fluid sample:

This subclass is indented under subclass 58. Processes comprising the step of (1) maintaining the natural fluid content of the earth sample or (2) taking a discrete sample of the fluid occurring in the borehole or its surrounding earth formations.

- (1) Note. Processes including the step of taking a single sample comprising a solid and liquid, as for example a sample of drill cuttings and drilling fluid, are not included in this subclass unless there is some additional step of maintaining the natural fluid content of the solid earth portion of the sample.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 232+, for apparatus in which a subsurface sample is delivered to the surface at the same pressure existing at the bottom of the borehole.

SEE OR SEARCH CLASS:

- 166, Wells, subclass 264 for processes of sampling well fluids, per se.

60 Transporting sample to surface by fluid:

This subclass is indented under subclass 58. Processes comprising the step of moving the sample from the bottom of the borehole to the surface of the earth by entrainment in a fluid.

- (1) Note. The mere step of transporting or carrying to the surface of cuttings by drilling fluid without a specific sampling step is not included. Such processes are classified in subclasses 65+.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 66, for processes of drilling with fluid and treating the used fluid above ground to remove drill cuttings from the fluid.

61 Boring curved or redirected bores:

This subclass is indented under subclass 57. Processes comprising drilling or forming a borehole in which the axis of the borehole is (1) curved or arcuate, (2) two straight line portions intersecting at an angle or (3) a straight line portion and a curved portion.

- (1) Note. Processes of reaming or enlarging the diameter of a borehole or cutting slots longitudinally of the borehole are not included.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 4, for process and devices involving driving a core receiver into the earth formation usually in a lateral direction by an explosion.
73+, for apparatus having means traveling with a tool to constrain it to bore along a curved path.
77, for side wall sampling tool fed laterally without rotation from inaccessible hole.
78, for means carried by housing insertable in inaccessible hole to advance side wall tool laterally.
79+, for tool shaft advanced relative to guide insertable in inaccessible hole to change direction of advance.
231, for means movable relative to tool below ground to control eccentric fluid emission.

62 Boring horizontal bores:

This subclass is indented under subclass 57. Processes comprising the making of a horizontal bore either from the surface or from an accessible hole.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 61, for processes which may direct a bore in a horizontal direction or form a horizontal bore from an inaccessible bore or hole.

SEE OR SEARCH CLASS:

- 299, Mining or In Situ Disintegration of Hard Material, subclasses 10+ for a process of recovering valuable material from the earth or disintegrating

- hard material in situ and including forming horizontal tunnels.
- 405, Hydraulic and Earth Engineering, subclasses 138+ for a method or apparatus for forming a lined tunnel; and subclass 154.1 for a method or apparatus of laying, retrieving, manipulating, or treating a pipe or cable in a subterranean or submarine location.
- 64 Chemical reaction with earth formation or drilling fluid constituent:**
This subclass is indented under subclass 57. Processes comprising (1) introducing a material into a borehole to react chemically with the in situ earth formation to form the borehole or (2) introducing a material into the borehole during drilling to react chemically with a material present in the drilling fluid.
- (1) Note. The term "during drilling" is defined as that period in which the actual drilling or hole making step is in progress and does not include the whole period of time required to form a completed bore in which actual hole making operations may have been temporarily stopped numerous times.
- (2) Note. Drilling fluids generally deposit a cake or mud sheath upon the wall of a bore. Such deposits are not considered cementing, plugging or consolidating in the sense used in the definition of Class 166, subclass 285. However, when one step of a cementing process is done during drilling, as by adding one constituent of a resin type cement in the drilling fluid while drilling, and another step is performed after drilling has stopped, as by adding the remaining constituent of the resin cement, such a process is considered to be performed while drilling has been interrupted and is classified in Class 166 subclasses 285+.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 12, for processes and apparatus for forming earth bores by the combustion of the earth formation material.
- 13, for processes and apparatus for forming earth bores by the application of
- heat with the introduction of a slag forming flux to the bore.
- SEE OR SEARCH CLASS:
- 166, Wells, subclass 300 for well processes involving chemical inter-reaction of introduced material.
- 65 Boring with specific fluid:**
This subclass is indented under subclass 57. Processes comprising providing a liquid or gaseous material in a borehole to facilitate the making of such borehole.
- (1) Note. Since the use of some fluid in drilling is almost universal in this art, patents to be classified in this subclass must specifically describe some step involving more than the conventional use of fluid, for example, merely pumping or circulating fluid or screening cuttings from the fluid would be excluded but steps involving specifically described constituents of the fluid would be included.
- (2) Note. The fluid may be for the purpose of lubricating the drill, removing the cuttings, preventing collapse of the bore wall, etc.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 17, for processes and apparatus for heating or cooling drilling fluid.
- 64, and the search there noted for processes of causing a chemical reaction with the earth formation or drilling fluid constituent.
- 92+, for apparatus in which a below drive prime mover may be operated by drilling liquid flow.
- 207+, for above ground apparatus for handling or supplying drilling fluid to the borehole.
- SEE OR SEARCH CLASS:
- 166, Wells, subclasses 285+ for cementing, plugging or consolidating in a well and particularly Lines With Other Classes and Within This Class in the class definition of Class 166 for the line with Class 175 concerning drilling with fluid and cementing drilling

- with fluid and cementing and subclass 300 for placing two or more materials into a well which chemically react with each other.
- 184, Lubrication, appropriate subclasses for lubrication of general utility.
- 299, Mining or In Situ Disintegration of Hard Material, subclasses 16+ for a process of breaking down valuable or hard material by direct contact with fluid.
- 406, Conveyors: Fluid Current, subclass 197 for processes of fluid current conveying.
- 507, Earth Boring, Well Treating, and Oil Field Chemistry, subclasses 100+ for well drilling compositions and earth boring processes which involve no more than the mere use of such compositions or a compound.
- 520, Synthetic Resins or Natural Rubbers, appropriate subclasses, particularly Class 523, subclasses 130+ for a composition containing a synthetic resin or natural rubber having utility in sealing fissures or crevices in stone, rock or other subterranean formations or in consolidating a formation in a well or in cementing a well or to processes or preparing said composition.
- 66 Treating spent or used fluid above ground:**
This subclass is indented under subclass 65. Processes comprising the step of subjecting drilling fluid which has been returned to the surface of the earth from the borehole to a physical or chemical treatment at the surface.
- (1) Note. The treatment at the surface must include more than the mere addition of a material which is to be effective down the borehole, such as adding material to a gaseous drilling fluid to prevent wetting of cuttings or to a liquid drilling fluid to prevent lost circulation, see subclasses 68 and 72, respectively.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 88, for vehicle or conveyor for carrying cuttings laterally of bore axis.
- 206+, for apparatus for treating drilling fluid.
- 207+, for apparatus for cuttings or flushing fluid handling means at the bore entrance including chutes, etc.
- 67 Boring by fluid erosion:**
This subclass is indented under subclass 65. Processes comprising the making of a borehole or the performance of a reaming operation by the use of a stream of pressurized fluid to dislodge the earth formation.
- (1) Note. Practically all drilling operations which use a circulating drilling fluid have jets in the drill head to wash loose cuttings away from the drill during operation and the claiming of such jetting or washing steps, even without the claiming of a step of using a drill, are excluded from this subclass.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
- 11+, for processes by directly applying heat to fluidize or comminute which may include erosion.
- 422, for earth boring nozzles, per se, and the search there noted.
- SEE OR SEARCH CLASS:
- 166, Wells, subclass 312 for well cleaning processes involving the use of a liquid introduced from the top of the well.
- 299, Mining or In Situ Disintegration of Hard Material, subclass 17 for a process of breaking down valuable or hard material in situ by jetting.
- 405, Hydraulic and Earth Engineering, subclasses 55+ for the formation of an underground fluid storage cavity including a step of means for delivering a stream of pressurized fluid to form or enlarge the cavity; subclass 226 for a method of embedding a marine structure in the bed of a body of water using fluid jets; and subclass 248 for a pile with fluid jet means to assist in sinking or positioning the pile.
- 68 Anti-agglomeration treatment of gaseous drilling fluid:**
This subclass is indented under subclass 65. Processes comprising the step of treating a gaseous drilling fluid with a material to prevent

- the agglomerating or wetting by liquid occurring naturally in the borehole of the cuttings loosened during drilling.
- 69 Combined liquid and gaseous fluid:**
This subclass is indented under subclass 65. Processes comprising the use of liquid and gaseous materials as the fluid circulated in the borehole.
- (1) Note. Processes in which a gas under pressure is provided over a liquid drilling fluid wherein the gas is not circulated through the drill or through fluid in the bottom of the borehole are not included. See this class subclass 71.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
205, for apparatus in which a liquid drilling fluid is in contact with a pressurized gas.
212, for above ground drill fluid handling or supply means for supplying a pressurized gas.
- 70 Plural distinguishable liquids:**
This subclass is indented under subclass 65. Processes comprising drilling with two or more liquids which remain separated in the borehole due to their mutual immiscibility, difference in specific gravities, manner of placement in the borehole, or other characteristics.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
11+, in which plural liquids such as kerosene and water may be introduced in boring by directly applying heat to fluidize or comminute.
- 71 Gaseous fluid or under gas pressure:**
This subclass is indented under subclass 65. Processes comprising (1) drilling with a gaseous fluid as the circulating drilling fluid or (2) the placing of a gas under pressure in the borehole during drilling either along or over a liquid drilling fluid.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
69, and the search there noted for combined liquid and gaseous supply.
- 72 Prevention of lost circulation or caving:**
This subclass is indented under subclass 65. Processes comprising the step of treating a sub-surface earth formation during drilling (1) to prevent the loss of drilling fluid into such formation or (2) to prevent the earth formation of the bore wall from collapsing into the earth bore.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
64, for processes including a chemical reaction with the formation or a drilling fluid constituent during drilling.
- SEE OR SEARCH CLASS:
166, Wells, subclasses 285+ and the search there noted for processes of cementing, plugging or consolidating a sub-surface earth formation while drilling is interrupted.
- 73 MEANS TRAVELING WITH TOOL TO CONSTRAIN TOOL TO BORE ALONG CURVED PATH:**
This subclass is indented under the class definition. Apparatus comprising means carried by or movable with a tool while drilling to cause the tool to drill a bore or segment of a bore having a nonlinear axis.
- (1) Note. Tools which are asymmetrical in shape or which have a means biasing them laterally of a bore and which would enlarge the bore in a lateral direction if rotated are not included even though they are disclosed as bore deflection tools when used as impact devices, see this class subclasses 398+ for such devices.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
61, for processes of drilling curved or redirected bores.
231, for means movable relative to tool below ground to control eccentric fluid emission.
325.1+, and the search there noted for bore wall engaging guide means.
398+, for nonsymmetrical bits which may be disclosed as bore deflecting tools (See (1) Note above).

74 Sectional guide or shaft having means to lock sections in angular relation while boring:

This subclass is indented under subclass 73. Apparatus wherein the means for causing the tool to drill a curved bore comprises a tool shaft or a means adapted to direct the course of the tool which is made up of units or segments, generally pivotally connected to one another, movable to be positioned at an angle to one another in the direction of the bore axis and means engageable with the segments to hold them in their angularly related position.

SEE OR SEARCH THIS CLASS, SUBCLASS:

256, for releasable means normally holding joined shaft sections in angular relation.

SEE OR SEARCH CLASS:

285, Pipe Joints or Couplings, subclass 118 for knuckle type pipe joints with actuating means.

75 Normally curved guide or shaft:

This subclass is indented under subclass 73. Apparatus wherein the means to cause the tool to bore a curved hole comprises a member to direct the tool or a shaft for driving the tool which has or is formed to assume a nonlinear shape in the direction of boring.

SEE OR SEARCH CLASS:

464, Rotary Shafts, Gudgeons, Housings, and Flexible Couplings for Rotary Shafts, appropriate subclasses for flexible rotary shafting and shaft housings.

76 Axially spaced opposed bore wall engaging guides:

This subclass is indented under subclass 73. Apparatus wherein the means for causing the tool to drill a curved bore comprises means carried by the tool or tool shaft at points axially spaced along the bore axis and extending in opposite directions laterally from the tool or tool shaft to engage the bore wall.

(1) Note. One of the bore wall engaging means may comprise an annular means surrounding the tool or tool shaft.

77 SIDE WALL TOOL FED Laterally WITHOUT ROTATION FROM INACCESSIBLE HOLE:

This subclass is indented under the class definition. Apparatus comprising means for cutting the earth which cuts without requiring rotation of the cutting means about an axis coincident with its direction of advance, said cutting means being fed from an inaccessible hole.

(1) Note. For the meaning of "inaccessible hole", see the class definition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

79, and the search there noted for tool advance guides.

SEE OR SEARCH CLASS:

166, Wells, subclass 100 for a lateral probe sealed against a well wall which has similar structure.

78 MEANS CARRIED BY HOUSING INSERTABLE IN INACCESSIBLE HOLE TO ADVANCE SIDE WALL TOOL Laterally:

This subclass is indented under the class definition. Apparatus comprising a supporting or carrying means insertable in an inaccessible hole, said supporting or carrying means providing a housing with an opening for the boring tool, and means is provided in the housing to advance the tool from the housing through the opening in a direction at an angle to the path of travel of the housing on being inserted in the inaccessible hole.

(1) Note. For the meaning of "inaccessible hole", see the class definition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

79, and the search there noted for tool advance guides.

SEE OR SEARCH CLASS:

166, Wells, subclass 100 for lateral probes sealed against a well wall which have similar type structure.

79 TOOL SHAFT ADVANCED RELATIVE TO GUIDE INSERTABLE IN INACCESSI-

BLE HOLE TO CHANGE DIRECTION OF ADVANCE:

This subclass is indented under the class definition. Apparatus comprising a tool shaft and a means engageably by the shaft as the shaft is advanced to change the direction of advance of the shaft, said means being insertable in an inaccessible hole.

- (1) Note. For the meaning of "inaccessible hole", see the class definition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 4, for processes and devices involving driving a core receiver into the earth formation usually in a lateral direction by an explosion.
- 77, for a side wall tool fed laterally without rotation from an inaccessible hole.
- 78, for means carried by housing insertable in an inaccessible hole to advance side wall tool laterally.
- 220, and the search there noted for devices with above ground guides for a relatively advancing tool.

SEE OR SEARCH CLASS:

- 166, Wells, subclass 55.3 for apparatus for perforating or cutting a slot in a well casing having a cam or wedge actuated cutter, subclass 100 for lateral probes or seals engaging a well wall which have similar structure and subclasses 117.5+ for lateral diverting means (e.g., whipstocks) for tools, per se, which are used in wells or boreholes.

80 Tool telescopes over guide having surface set at angle in hole:

This subclass is indented under subclass 79. Apparatus in which the means changing the direction of advance comprises a rod or mandrel having a shaft engaging surface which is set in the hole at an angle to the original direction of advance, the shaft receiving the rod or mandrel in a telescoping relationship to be guided in a different direction thereby.

81 With anchor for guide engaging hole side wall:

This subclass is indented under subclass 79. Apparatus in which the means changing the direction of advance has combined therewith means to engage or penetrate a side wall of the hole to resist movement of the direction changing means either longitudinally or radially of the hole.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 230, and the search there noted for bore wall or casing engaging anchor.

SEE OR SEARCH CLASS:

- 166, Wells, subclass 117.6 for lateral diverting means for cutting tools per se which are secured in operative position by well conduit engaging means.

82 Guide carried by shaft to operative position:

This subclass is indented under subclass 79. Apparatus in which the means changing the direction of advance is supported by the tool shaft and moved into an operative position in the hole thereby.

83 With clutch means acting between shaft and guide:

This subclass is indented under subclass 82. Apparatus in which the means changing the direction of advance and the tool shaft are provided with means for preventing their relative rotation which is manipulable, usually by relative longitudinal movement, to permit relative rotation therebetween.

- (1) Note. A mere shearable pin or bolt or other frangible connector between the redirecting means and the tool is excluded and will be found in subclass 82.

SEE OR SEARCH CLASS:

- 166, Wells, subclass 237 for detents and clutches particularly adapted for use in wells.

84 WITH ABOVE-GROUND CLEANER FOR BORING MEANS:

This subclass is indented under the class definition. Apparatus wherein the apparatus is provided with means normally positioned above the ground (e.g., outside the borehole) to clean the apparatus or some portion thereof. Said cleaning means may include wiping, scraping, brushing or flushing with a fluid.

- (1) Note. A mere conduit for cleaning or drilling fluid is not considered to be a means to clean the tool shaft.

SEE OR SEARCH THIS CLASS, SUBCLASS:

209+, for a fluid or cuttings directing or receiving means engaging the bore entrance, through which extends a tool shaft, and a seal means between said means and the tool shaft which allows axial movement of said tool shaft relative to said means.

SEE OR SEARCH CLASS:

- 15, Brushing, Scrubbing, and General Cleaning, appropriate subclasses, particularly subclasses 104.03+ for pipe and tube cleansers.
- 166, Wells, subclasses 82.1 and 86.1+ and the search there noted for seals or wipers for reciprocating member.
- 414, Material or Article Handling, subclasses 416.04 and 416.09-416.12 for a pusher plate type ejec for emptying a receptacle.

85 WITH ORIENTING OR RACKING MEANS FOR UNCONNECTED TOOLS OR SECTIONS OF SHAFT OR CASING:

This subclass is indented under the class definition. Apparatus including (1) a means to cause the movement of unconnected tools, rods, tubings, or casing in a direction lateral to the bore axis and to and/or from a position in vertical alignment with the bore axis or (2) a structure particularly adapted to store unconnected tools, rods, tubings, or casings and which is laterally spaced from vertical alignment with the bore axis, (i.e., fourble board).

- (1) Note. The term "unconnected" is defined as meaning that the tool, rods,

tubing, or casing are not assembled in drilling relationship with the drive or advancing means, for example. However, the tool may be connected to a section of rod, or several sections of rod, tubing, or casing may be connected together as a unit and considered "unconnected" for classification in this subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 52, for magazine for successively moving unconnected, oriented tool or shaft sections to use position.
- 161, for means to move tool laterally of bore axis to dump.

SEE OR SEARCH CLASS:

- 182, Fire Escape, Ladder, or Scaffold, subclass 114 for scaffolds combined with a sucker rod support.
- 211, Supports: Racks, appropriate subclasses for racks, and particularly subclass 70.4 for pipe racks.
- 414, Material or Article Handling, subclasses 22.51+ for pipe racking mechanism.

86 WITH BELOW-GROUND PERSONAL ACCOMMODATION:

This subclass is indented under the class definition. Apparatus combined with means positioned within a hole being bored for supporting, enclosing, protecting or otherwise accommodating a person in the hole while it is being bored.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 219, and the search there noted for above ground apparatus in general with particular accommodations for personnel.

87 CONVERTIBLE:

This subclass is indented under the class definition. Apparatus adapted to perform functions other than earth boring or to perform an earth boring function in a different manner in response to (1) removal of a significant portion of the apparatus and/or (2) installation of additional parts or (3) by substantial rearrangement of the existing parts.

- (1) Note. Many patents in this art disclose substituting one form of tool reciprocating device for another type. Such structure has been excluded as not performing an earth boring function in a different manner for the purpose of this definition and will be found below.
- (2) Note. Merely rendering parts (which are present in the apparatus) operative or inoperative by a manual adjustment or by actuation of a control mechanism (e.g., clutch) have been excluded as not constituting a substantial rearrangement of existing parts for the purpose of this subclass.
- (3) Note. Merely replacing one type of earth boring tool or cutter element with a different type of earth boring tool or cutter element has been excluded since it is common in this art to interchange tools depending on the type of formation encountered. However, substituting a tool or element which has no earth boring function for an earth boring tool has been included.
- (4) Note. The change in the apparatus must include more than merely adjusting or reversing a part which has no material effect on the overall functioning of the apparatus. Such structure is classified below as indicated by the search notes.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 114, for a device in which a common prime movement feeds and rotates a tool, and in which an adjustment, may be effected to provide an independent feed or rotation of the tool.
- 382+, and the search there noted for a cutter element which is adjustable relative to a bit head.
- 386, for a bit having a pilot portion which is used only at the initial stages of the boring operation and which is removed after the bore has been started.

SEE OR SEARCH CLASS:

- 254, Implements or Apparatus for Applying Pushing or Pulling Force, subclasses 29+ for means for pulling stuck pipes or rods otherwise than by impact.

88 WITH MEANS CARRYING CUTTINGS LATERALLY OF BORE AXIS COMPRISING (1) CHUTE, (2) CONVEYER, OR (3) VEHICLE:

This subclass is indented under the class definition. Apparatus in which an above ground means is provided to transport cuttings in a direction perpendicular to the borehole axis which does not require conveying by a fluid current, such means comprising an endless or screw conveyor, open chute or vehicle, but not including a tubular conduit which is utilized in a fluid system.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 207+, for other above ground means including tubular conduits for handling cuttings or flushing fluid.

SEE OR SEARCH CLASS:

- 193, Conveyors, Chutes, Skids, Guides, and Ways, and the search there noted for conveyors of general utility.

89 TOOL ELEMENT OR CONTINUOUSLY DRIVEN FLEXIBLE OR ARTICULATED ENDLESS MEMBER:

This subclass is indented under the class definition. Apparatus in which a cutting means is carried through recurring cycles on a driven member forming a closed circuit, said member composed of a rope, cable, chain, hinged elements, or like structure.

- (1) Note. This subclass does not include apparatus in which the support for the flexible or articulated endless member is adapted to be moved laterally relative to the bore axis as the cutter cuts unless the lateral movement of said support takes place entirely below ground. Compare Classes 37, 172 and 299 for apparatus for forming a ditch, furrow or kerf.

- (2) Note. The cutting means may consist of teeth or digging buckets.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 88, for conveyor means to move cuttings transversely of bore axis.
 172, for a tool drive means combined with an endless flexible conveyor for transporting cuttings.
 338, for rolling cutter bit or element with endless carrier.

SEE OR SEARCH CLASS:

- 37, Excavating, subclasses 353+ and 462+ for ditchers or excavators.
 172, Earth Working, subclasses 95+, 100 and 542 for a rotary separating digger and a tooth or blade on an endless carrier.
 299, Mining or In Situ Disintegration of Hard Material, subclasses 29+ for a mining machine having a chain type cutter head, and subclasses 82.1+ for a chain type cutter head.

90 Flexible or articulated member carried on support swingable or laterally movable relative to bore axis:

This subclass is indented under subclass 89. Apparatus in which a flexible or articulated member is carried on a support which is adapted to move all or a portion of said member radially relative to the axis of the bore to undercut or slot the wall of the borehole.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 263+, for cutter elements laterally shiftable below ground.

91 BORING MEANS INCLUDING A CONTINUOUSLY ROTATING BIT DESCRIBING A NONCIRCULAR CROSS-SECTIONAL BORE:

This subclass is indented under the class definition. Apparatus in which (1) a single cutting means rotating through recurring cycles, or (2) a combination of cutting means carried on a common support and including at least one cutting means rotating through recurring cycles, is particularly adapted to form in a single advance

a bore which is noncircular in a plane perpendicular to the bore axis.

- (1) Note. Included in this subclass, for example, are a pair of rotating cutters forming a pair of overlapping, circular bores.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 89+, for cutters carried on a flexible or articulated member and adapted to form a noncircular bore.
 108, for common drive or advancing means for concurrently boring along laterally spaced axes.

SEE OR SEARCH CLASS:

- 125, Stone Working, subclasses 12+, for stone saws.
 299, Mining or In Situ Disintegration of Hard Material, subclasses 29+ for a mining machine which may include a rotary cutter and form a noncircular opening and subclasses 79.1+ for a cutter which may be rotary and adapted to form a noncircular opening.
 408, Cutting by Use of Rotating Axially Moving Tool, subclass 30 for wood-working augers or cutting square holes.

92 WITH BELOW-GROUND TOOL DRIVE PRIME MOVER:

This subclass is indented under the class definition. Apparatus including a means adapted to drive a boring tool through recurring cycles comprising a means commonly called a motor which is adapted to convert a source of energy into simple mechanical motion, said motor being so related to the boring tool that it enters the borehole and advances with the boring tool as the boring tool performs its earth boring function.

- (1) Note. The boring means including the motor need not be claimed as being located in the borehole. The mere disclosure that the boring means is of the type in which the drive motor for the tool advances into the bore with the tool is sufficient for classification in this subclass.

- (2) Note. Mere subsurface mechanical motion converting boring tool drive means, such as for example, vanes on a tool shaft which contact the fluid in the borehole and causes the tool to rotate as the shaft is reciprocated are not considered motors for this subclass.
- (3) Note. A compilation of all types of motors will be found in the notes to the class definition of Class 60.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 6, for underwater tool drive means.
 26, for automatic control of boring means including a below ground prime mover
 323, and search there noted for a tool shaft provided with an exteriorly disposed helical structure for imparting rotary motion to the shaft in response to a reciprocation of said shaft.

SEE OR SEARCH CLASS:

- 15, Brushing, Scrubbing, and General Cleaning, subclasses 104.05+ for inside pipe and tube cleaners which may be motor driven.
 173, Tool Driving or Impacting, appropriate subclass for a means for driving or impacting a tool, not limited to a specific art. If means, such as specific shape of the work contacting portion of an earth boring tool, bore engaging guide or anchor, etc., are included, classification will be in Class 175.

- 93 Below-ground (1) generation of motive fluid, or (2) storage of motivating energy:**
 This subclass is indented under subclass 92. Apparatus in which (1) the motor is fluid operated, and means are provided within the borehole for generating or imparting energy to the motive fluid, (2) means are provided within the borehole for storing a source of motivating energy for operating the motor.

- 94 With below-ground feed means:**
 This subclass is indented under subclass 92. Apparatus including means positioned within the borehole which functions to feed the tool in

the boring operation with, or relative to, the tool drive means.

- (1) Note. For the meaning of "feed", see the class definition.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 162, and the search there noted for an above ground means to feed to tool.

- 95 Plural below-ground drive prime movers:**
 This subclass is indented under subclass 92. Apparatus comprising a plurality of drive motors positioned within the borehole.

- 96 Plural cutter elements driven by individual prime movers:**
 This subclass is indented under subclass 95. Apparatus wherein the tool is composed of a plurality of relatively movable cutting elements, each of said cutting elements being driven by a separate motor.

- 97 With means to anchor prime movers support to bore wall:**
 This subclass is indented under subclass 92. Apparatus including means to secure the motor support to the bore wall against either axial or rotary movement or both.

- (1) Note. For the meaning of "bore wall", see the class definition.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 230, and search there noted for means to anchor a boring means to the bore wall.

- 98 Expansible anchor:**
 This subclass is indented under subclass 97. Apparatus in which said means may be selectively expanded or retracted to or from engagement with the bore wall.

SEE OR SEARCH CLASS:

- 166, Wells, subclasses 206+ for an expansible anchor or casing for wells.

- 99 Fluid-operated:**
 This subclass is indented under subclass 98. Apparatus in which said means is operated by pressure fluid.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 228, for fluid pressure operated lubricant feed for bit.
- 247+, for a core receiver removable through a below ground tool shaft by fluid pressure or provided with a pressure fluid operated latch.
- 250, for a fluid actuated core retaining or severing means.
- 267+, for a cutter element shifted laterally relative to a bit head below ground by fluid pressure.
- 271+, for a cutter element shifted relative to a bit head below ground with a latch operated by a fluid pressure.
- 296+, for fluid operated below ground hammer or impact device.

SEE OR SEARCH CLASS:

- 166, Wells, subclasses 120+ and 212 for fluid pressure expansible anchors.

100 Discharge passage for motive fluid directed toward bore entrance:

This subclass is indented under subclass 92. Apparatus in which the motor is fluid operated and means are provided for exhausting a portion of the fluid which operates the motor from the motor or motor housing into the bore in a direction extending toward the bore entrance.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 324, for a tool shaft which may be provided with means to induce fluent flow comprising fluid outlet ports in said shaft extending in a direction toward the bore entrance.

101 With positive connection between tool and support shaft for rotary below ground motor:

This subclass is indented under subclass 92. Apparatus in which the motor is a rotary type motor supported by a rotatable shaft extending into the bore, and in addition to the motor is a means provided for connecting said rotatable support shaft to the tool in a driving relationship.

102 With below-ground conveyer or impeller for removal of cuttings:

This subclass is indented under subclass 92. Apparatus including means located within the bore for removing cuttings from the bore comprising either (1) an endless flexible carrier or (2) a means to induce fluent flow (e.g., pump or helical screw).

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 324, and the search there noted, for other means to induce fluent flow including a pump.

103 With above-ground means:

This subclass is indented under subclass 92. Apparatus including means intended to function and remain above ground.

104 Electric:

This subclass is indented under subclass 92. Apparatus in which the motor is of the type which converts electrical energy into mechanical motion.

SEE OR SEARCH CLASS:

- 318, Electricity: Motive Power Systems, and the search there noted for electric motor.

105 Reciprocating:

This subclass is indented under subclass 104. Apparatus wherein the electric motor is of the type having a rectilinearly reciprocating part.

SEE OR SEARCH CLASS:

- 310, Electrical Generator or Motor Structure, subclasses 15+ for a reciprocating electric motor, per se.

106 With mechanical motion-converting means:

This subclass is indented under subclass 92. Apparatus including means (e.g., gearing, linkage or cam) for modifying the direction, location or advantage relationship of simple mechanical motion, said means being drivingly interposed between the motor and the tool.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 170+, and the search there noted for other mechanical motion converting means.

319, for below ground mechanical motion converting means relatively moving plural cutting edges.

(e.g., fluid pressure motors having common supply pump) are excluded from this subclass, and are classified in the appropriate feed or drive subclass.

107 Fluid rotary type:

This subclass is indented under subclass 92. Apparatus in which said motor includes an element provided with means upon which a fluid may act to cause a nonreversing motion of said element about an axis.

SEE OR SEARCH CLASS:

173, Tool Driving or Impacting, subclasses 145+ for a tool advance causing or controlling means in which drive and advance originate from the same mechanical element.

SEE OR SEARCH CLASS:

15, Brushing, Scrubbing, and General Cleaning, subclasses 104.061+ and 104.12 for fluid current operated pipe and tube cleaners.

408, Cutting by Use of Rotating Axially Moving Tool, subclasses 129+, for a feed means for a boring, drilling or tapping apparatus.

415, Rotary Kinetic Fluid Motors or Pumps, subclass 903 for a fluid motor disclosed as a well bit drive turbine.

114 Constant rotation rate permitted regardless of (1) release of feed force, or (2) change in feed rate:

418, Rotary Expansible Chamber Devices, for rotary expansible chamber pumps or motors.

This subclass is indented under subclass 113. Apparatus in which the mechanical movement, or means coupling the mechanical movement to the rotary drive and/or feed is adapted to rotate the tool at a uniform speed while permitting (1) complete disconnection of the feed drive or (2) a change in the speed at which the tool is being fed into the work.

108 COMMON DRIVE OR ADVANCING MEANS FOR CONCURRENTLY BORING ALONG LATERALLY SPACED AXES:

This subclass is indented under the class definition. Apparatus including a single means which directly contacts, or is connected through a gearing or otherwise, to at least two boring tools, and the means functions to drive or advance the boring tools along different axes.

SEE OR SEARCH THIS CLASS, SUBCLASS:

27, for automatic control of tool advance.

SEE OR SEARCH THIS CLASS, SUBCLASS:

91, for boring means including at least one rotating cutter which may overlap in boring operation with another cutter to form a bore, which is noncircular in cross-sectional area.

118 With feed anchor in earth wall being bored:

This subclass is indented under subclass 113. Apparatus in which a means is provided to anchor some part of the feed means into the wall which is being bored, whereby the anchor is adapted to directly resist the reactionary pull of the feeding force.

113 WITH MEANS TO SIMULTANEOUSLY FEED AND ROTATE TOOL FROM A SINGLE MECHANICAL ELEMENT:

This subclass is indented under the class definition. Apparatus including means by which a boring tool is simultaneously rotated and fed along the boring axis by a drive originating from one mechanical movement.

(1) Note. The "earth wall being bored", is defined as a generally flat surface, (i.e., the face of the earth or a substantially planar or curved section not exceeding 90° of the side or bottom of a crevice or shaft) into which the bore is being formed, the anchor being usually located in the bore, or at some point closely adjacent the mouth of the bore.

(1) Note. Separate drive and feed motors which are actuated by a common source

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 210, for cuttings directing or receiving means engaging bore entrance, anchored to bore wall.
230, for borewall engaging anchor.

121 Rotary drive for relatively advancing feed screw:

This subclass is indented under subclass 113. Apparatus in which a feed screw moves axially relative to a means which is causing it to rotate.

122 WITH MEANS TO FEED DRIVE:

This subclass is indented under the class definition. Apparatus including a means to feed the tool drive means.

- (1) Note. For the meaning of “feed” and “drive” see the class definition.
(2) Note. If the means is disclosed as performing the function of feeding the tool drive, the means is classified herein whether or not the tool drive is claimed.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 162, and search there noted for above ground means to feed a tool.

SEE OR SEARCH CLASS:

- 173, Tool Driving or Impacting, subclass 141 and see the search notes therein for a tool advance causing or controlling means.

135 WITH ABOVE-GROUND MEANS TO IMPACT AN EARTH-PENETRATING MEANS:

This subclass is indented under the class definition. Apparatus combined with an above ground hammer to deliver, or cause to be delivered an impact or blow to an earth boring means.

- (1) Note. For classification in this subclass the impact or blow must be delivered to a portion of the earth penetrating means and not directly to the earth formation. For example, an above ground hammer for delivering an impact or blow to an earth penetrating means is classified

herein, but an earth penetrating means which is reciprocated to deliver a blow to the formation is excluded.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 189, and the search there noted for means to reciprocate an earth penetrating means.
293+, for a below ground hammer or impact device.

SEE OR SEARCH CLASS:

- 7, Compound Tools, subclasses 143+ for hammers combined with other tools.
72, Metal Deforming, subclasses 429+ for a power hammer of the metal working type.
74, Machine Element or Mechanism, appropriate subclasses for mechanical motion converting means for operating a hammer.
81, Tools, subclasses 463+ for tools combined with impact delivering means and subclasses 20+, for hand operated hammers.
173, Tool Driving or Impacting, subclasses 90+ and see the search notes therein for an impacting device.
227, Elongated-Member-Driving Apparatus, see Class 175, subclass 135.
267, Spring Devices, subclass 137 for a spring device for dampening the movement of an earth-boring impacting tool.
404, Road Structure, Process, or Apparatus, subclass 133 for a tamping device.

161 WITH ABOVE-GROUND MEANS TO MOVE TOOL TO A DUMPING LOCATION OFFSET FROM BORE:

This subclass is indented under the class definition. Apparatus including a means located above ground which is adapted to shift a means lifting earth material from a borehole to a position remote from the bore axis for the purpose of discharging said material at said remote location.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 85, for orienting means for moving unconnected boring means laterally of the bore axis.

162 WITH ABOVE-GROUND MEANS TO FEED TOOL:

This subclass is indented under the class definition. Apparatus including a means necessarily located above ground which functions to feed the tool in the boring operation.

- (1) Note. For the meaning of "feed" see the class definition.
- (2) Note. A handle for directly applying force to a tool shaft without a mechanical motion conversion is excluded. However, a simple relatively movable lever or gear for example would be included even though operated by hand.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 27, for automatic control of advance or applied tool weight.
- 51, for preset control of advance or retraction for tool drive or rotary tool.
- 94, for below ground tool feed means in combination with a below ground tool drive motor.
- 108, for common drive or advancing means for concurrently boring along laterally spaced axes.
- 113, for a single mechanical movement which feeds and rotates a tool.
- 122, for means to feed a tool drive means.
- 203, for above ground means to advance or retract a boring means.
- 321, for below ground feed means incorporated in an axially telescopic tool drive shaft.

SEE OR SEARCH CLASS:

- 144, Woodworking, subclasses 92+ for a boring feed.
- 173, Tool Driving or Impacting, subclasses 141+ for a tool advance causing or controlling means.

- 408, Cutting by Use of Rotating Axially Moving Tool, appropriate subclasses, particularly subclasses 129+ for means for feeding a boring or drilling tool, not peculiar to earth boring usage.

170 WITH TOOL DRIVE PRIME MOVER OR ABOVE-GROUND MECHANICAL MOTION CONVERTING DRIVE MEANS:

This subclass is indented under the class definition. Apparatus including a means adapted to drive a boring tool through recurring cycles comprising (1) a means commonly called a motor which is adapted to convert a source of energy into simple mechanical motion or (2) a means adapted to modify the direction, location, or advantage relationship of simple mechanical motion (e.g., gear or lever).

- (1) Note. A compilation of all types of motors will be found in the notes to the class definition of Class 60.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 6, for underwater tool drive means.
- 24+, for tool drive means with automatic control.
- 54, for boring by below ground recirculating of unsupported elements.
- 55, for tool actuation by reaction of a rotating eccentric mass.
- 92+, for below ground drive motors.
- 106, for below ground mechanical motion converting means drivingly interposed between a below ground drive motor and a tool.
- 108, for common drive or advancing means for concurrently boring along laterally spaced axes.
- 113+, for single prime movement feeding and rotating a tool.
- 135, for above ground means to impact earth penetrating means.
- 319, for below ground mechanical motion converting means relatively moving plural cutting edge.

SEE OR SEARCH CLASS:

- 74, Machine Element or Mechanism, appropriate subclasses for gearing and mechanical movements of general utility.
- 144, Woodworking, subclasses 92+ for wood boring machines.
- 173, Tool Driving or Impacting, appropriate subclass for a device to drive a tool, where no feature is included to make the device peculiar to a specific art, such as specific shape of the work contacting portion of the tool, etc.
- 408, Cutting by Use of Rotating Axially Moving Tool, appropriate subclasses for machines for cutting in the manner of that class.

171 With installing casing:

This subclass is indented under subclass 170. Apparatus including a drive means for a tool which is particularly adapted to installing a separate casing, or a means is specified in addition to the tool drive means for the purpose of installing a casing.

SEE OR SEARCH CLASS:

- 405, Hydraulic and Earth Engineering, subclass 133 for a method or apparatus for forming a shaft with a lining; subclasses 138+ for a means or method of forming a lined tunnel; subclass 154.1 for a method or apparatus for laying, retrieving, manipulating, or treating a pipe or cable in a subterranean or submarine location; and subclasses 232+ for a method or apparatus for installing a hollow pile shell in the earth.

172 With endless flexible conveyor:

This subclass is indented under subclass 170. Apparatus including material transport elements mounted to travel in a circuitous path on a flexible or articulated endless means, and generally for the purpose of conveying cuttings above ground.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 89, for tool element on continuously driven flexible or articulated endless member.

SEE OR SEARCH CLASS:

- 198, Conveyors: Power-Driven, appropriate subclasses for power-driven endless conveyors.

173 With diversely operated shafts extending into bore:

This subclass is indented under subclass 170. Apparatus in which means are provided to simultaneously or consecutively move in a different manner, plural shafts which extend into a bore; the shafts generally consist of two tool drive shafts, or a tool drive shaft and a tool actuating shaft.

189 Drive reciprocates tool:

This subclass is indented under subclass 170. Apparatus in which the tool drive comprises a means to cause substantially rectilinear to and from movement of the tool.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 135, for means to reciprocate a means to impact an earth penetrating means.

SEE OR SEARCH CLASS:

- 60, Power Plants, subclasses 369+ and 537+ for pulsators adapted to reciprocate a tool.
- 74, Machine Element or Mechanism, appropriate subclasses, and particularly subclasses 20 through 62 for reciprocation type mechanical movements.
- 91, Motors: Expansible Chamber Type, appropriate subclass for an expansible chamber type motor adapted to reciprocate a tool.
- 310, Electrical Generator or Motor Structure, subclasses 15+ for reciprocating electric motors.
- 418, Rotary Expansible Chamber Devices, appropriate subclasses for a rotary expansible chamber motor adapted to reciprocate a tool.

195 Rotary drive for a relatively advancing tool (e.g., rotary table):

This subclass is indented under subclass 170. Apparatus in which the drive is of the type commonly called a rotary table, such drive being adapted to remain relatively axially fixed

while the tool shaft being rotated thereby advances relative to the rotary table.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

121, for a rotary drive for a relatively advancing feed screw in a single mechanical movement feeding and rotating a tool, said feed screw generally also comprising the tool drive shaft.

SEE OR SEARCH CLASS:

74, Machine Element or Mechanism, appropriate subclasses, and particularly subclasses 434+ for a gear element, per se.

173, Tool Driving or Impacting, subclasses 165+ for a relatively fixed drive of an advancing tool.

464, Rotary Shafts, Gudgeons, Housings, and Flexible Couplings for Rotary Shafts, subclasses 163+ for a coupling between a rotary drive table and an axially movable drill string.

202 ABOVE-GROUND MEANS FOR RELATIVELY MOVING BELOW-GROUND TOOL ELEMENTS:

This subclass is indented under the class definition. Apparatus comprising the combination of a tool having relatively movable tool elements and a means necessarily remaining outside the mouth of the bore, which is adapted to be actuated to cause relative movement between the tool elements, while the tool is located within the bore.

- (1) Note. The tool elements must be positively relatively moved by the moving means to be classified herein. Those tool elements which are relatively moved by the manipulation of a tool drive shaft only, relative to which they are movably attached (e.g., centrifugal, or bottom engagement expansion), are excluded from this subclass.
- (2) Note. Structure in addition to a mere connecting rod or cable must be claimed as the above ground means.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

173, for drive means including diversely actuated shafts extending into a bore.

203 WITH ABOVE-GROUND MEANS TO ADVANCE OR RETRACT BORING MEANS:

This subclass is indented under the class definition. Apparatus including means located above ground to move a tool, shaft, or any other portion of the boring means in one direction along the axis of the bore or (2) to counter-balance or offset a portion of the weight resting on the tool.

- (1) Note. For classification in this subclass the above ground means to advance or retract the boring means must include more than a mere handle which is held by an operator to support or move the tool toward or away from the bore.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

27, for automatic control of advance means for a boring means.

162, and the search there noted for above ground means to feed a tool.

SEE OR SEARCH CLASS:

173, Tool Driving or Impacting, subclasses 141+ and see the search notes therein for a tool advance causing or controlling means.

205 WITH MEANS PROVIDING PRESSURIZED GAS CONTACT WITH DRILLING LIQUID:

This subclass is indented under the class definition. Apparatus including means which are provided for bringing a stream of gaseous fluid above atmospheric pressure into intimate contact with a body of drilling liquid which liquid is intended to be introduced or directed into a borehole.

- (1) Note. Gaseous fluid at normal atmospheric pressure is not considered as "pressurized", for the purposes of this subclass. However, a statement that a stream consists of compressed gas is sufficient to cause classification herein.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

69, and 71, for drilling processes including the use of pressurized gas.

SEE OR SEARCH CLASS:

173, Tool Driving or Impacting, subclass 74 and see the search noted therein for plural cleansing fluid sources utilized with a tool driving or impacting means.

261, Gas and Liquid Contact Apparatus, appropriate subclasses for gas and liquid contact apparatus of general utility.

206 WITH ABOVE-GROUND MEANS FOR PREPARING OR SEPARATING DRILLING FLUID CONSTITUENTS:

This subclass is indented under the class definition. Apparatus including above ground means by which the drilling fluid is (1) formed or acted upon prior to or during insertion into the borehole to bring about a change in a physical or chemical property or (2) acted upon after the fluid leaves the borehole to remove, separate or subtract substances, including cuttings, from said fluid.

(1) Note. Means for causing entrainment of cuttings in the drilling fluid are not considered to be drilling fluid treating for the purpose of this subclass. However, separating the cuttings from said fluid is classifiable herein.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

17, for heating or cooling the drilling fluid.

65+, for processes of drilling with fluid, particularly subclass 66 for treating used or spent fluid.

205, for pressurized gas contact with drilling fluid.

SEE OR SEARCH CLASS:

95, Gas Separation: Processes, for processes of gas separation, particularly subclasses 241+ for degasification of liquid.

96, Gas Separation: Apparatus, for apparatus for gas separation, particularly subclasses 155+ for degasifying means for liquid.

209, Classifying, Separating, and Assorting Solids, appropriate subclasses.

210, Liquid Purification or Separation, appropriate subclasses.

507, Earth Boring, Well Treating, and Oil Field Chemistry, subclasses 100+ for earth boring compositions.

207 WITH ABOVE-GROUND MEANS FOR HANDLING DRILLING FLUID OR CUTTING:

This subclass is indented under the class definition. Apparatus including means located outside the mouth of the borehole to conduct or circulate drilling fluid or cuttings to or from the borehole.

(1) Note. A tool shaft is not considered to be above ground apparatus for the purposes of this subclass even though a section of the shaft may be recited as above ground in a claim. However, if structure is claimed which is disclosed as always functioning above ground (e.g., supporting swivel, or pipe section larger than the completed bore), the patent will be classified herein even though the structural element is nominally claimed.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

65+, for processes of drilling with fluid.

88, for above ground vehicle or conveyor for carrying cuttings laterally of bore axis.

161, for above ground means to shift tool laterally of bore axis to dump cuttings.

172, for an endless flexible conveyor for removing the cuttings from the bore.

SEE OR SEARCH CLASS:

15, Brushing, Scrubbing, and General Cleaning, subclasses 300.1+ for air blast and/or suction cleaners.

137, Fluid Handling, for fluid handling means of general utility.

166, Wells, subclasses 75.11+ for well heads.

- 173, Tool Driving or Impacting, subclasses 197+ and see the search notes therein for a tool driving or impacting means provided with work cleansing means.
- 184, Lubrication, for lubricating apparatus of general utility.
- 285, Pipe Joints or Couplings, for fluid pipe couplings of general utility and particularly subclasses 272+ for fluid conducting swivels.
- 208 Fluid spray:**
This subclass is indented under subclass 207. Apparatus in which the means consists of a fluid spraying means (e.g., nozzle) which emits fluid adjacent the mouth of the borehole.
- SEE OR SEARCH CLASS:
239, Fluid Sprinkling, Spraying, and Diffusing, for a fluid spraying device, per se.
- 209 Fluid or cuttings directing or receiving means engaging bore entrance:**
This subclass is indented under subclass 207. Apparatus provided with means sealingly engageable with the mouth of the bore and having means to receive a tool shaft therethrough and adapted to (1) catch or contain material which is emerging from the bore or (2) change the direction of movement or flow of material which is emerging from the bore.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
88, for an above ground vehicle or conveyor for carrying cuttings laterally of the bore axis.
- SEE OR SEARCH CLASS:
15, Brushing, Scrubbing, and General Cleaning, subclasses 300.1+ for air blast and/or suction cleaners combined with a fluid cuttings directing or receiving means adapted to engage a bore entrance. Class 175 takes the combination of such means with earth boring means. The inclusion in a claim of structure adapted to support or receive a tool shaft is sufficient for classification in Class 175.
- 166, Wells, subclasses 75.11+ for a well head.
- 251, Valves and Valve Actuation, subclass 1.1 for valve type blowout preventers, per se.
- 277, Seal for a Joint or Juncture, for a generic sealing means or process, subclasses 322+ for a seal for a well apparatus.
- 210 Anchored to bore wall:**
This subclass is indented under subclass 209. Apparatus in which said means extends into the bore and is held in sealed engagement with the bore wall.
- 211 Axially supported by tool shaft:**
This subclass is indented under subclass 209. Apparatus in which the collecting or diverting means is mounted on a tool shaft and means are provided to restrain the same against axial movement in one direction along said tool shaft.
- 212 Pressurized gas supply:**
This subclass is indented under subclass 207. Apparatus including a means to provide a gas at above atmospheric pressure for use in the borehole.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
69, and 71, for processes of drilling with gas under pressure.
134, for means to flush the bore with motive fluid which may be pressurized gas.
205, for pressurized gas contact with flushing liquid.
- SEE OR SEARCH CLASS:
417, Pumps, for gas pumps of general utility.
418, Rotary Expansible Chamber Devices, for rotary expansible chamber pumps, per se.
- 213 With suction pump inlet communicating with bore bottom:**
This subclass is indented under subclass 207. Apparatus including a pumping means, the low pressure side or intake of which is in direct communication with the bottom of the borehole.

- (1) Note. This material generally relates to which is commonly called “reverse circulation”, that is, the direction of flow is opposite to normal drilling circulation in which the pressure side of a pump forces fluid from the bottom of a borehole.
- (2) Note. The pumping means may be located below ground.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

324, and the search there noted for other means to induce fluent flow including a pump.

214 Fluid head on tool shaft having lateral port and axial passage with seal for means reciprocable in the head:

This subclass is indented under subclass 207. Apparatus comprising a tool shaft having a fluid head secured to the end thereof located above ground said head being provided with an axially extending passage which is intersected by a generally perpendicular passage extending from the axially extending passage to the exterior of the head, and having a seal located in the head which is adapted to cooperate with a means movable through the axial passage, or the perpendicular passage and one end of the axial passage.

- (1) Note. Generally the means reciprocable in the head may consist of a core barrel, or a wire line for retrieving a core barrel.

SEE OR SEARCH CLASS:

166, Wells, subclasses 84.1+ for a fluid head of the type classified in Class 166 having a seal for reciprocating member.

277, Seal for a Joint or Juncture, for a generic sealing means or process, subclasses 322+ for a seal for a well apparatus.

215 With tool shaft having plural passages for drilling fluid:

This subclass is indented under subclass 207. Apparatus including a tool shaft which is provided with more than one fluid conduit through a substantial portion of its length.

216 Standpipe:

This subclass is indented under subclass 207. Apparatus including a substantially vertical conduit means which is usually either part of, attached to, or adjacent a derrick, and which is used to conduit fluid from a point located near ground level to a fluid handling element fixed at one end of an axially movable tool shaft.

217 With pump:

This subclass is indented under subclass 207. Apparatus including pump means adapted to cause the drilling fluid to circulate.

- (1) Note. The pump may be located below ground.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

212, for pressurized gas supplying means.
213, for drilling fluid handling systems in which a pump inlet communicates with the borehole bottom.

324, the search there noted, for other means to induce fluent flow including a pump.

218 With valve:

This subclass is indented under subclass 207. Apparatus including valve means to stop or regulate the flow of drilling fluid.

- (1) Note. The valve may be located below ground.

219 WITH PARTICULAR ACCOMMODATION FOR PERSONNEL (E.G., SEAT OR PROTECTOR):

This subclass is indented under the class definition. Apparatus in which the device is provided with a means to support or shelter an attendant (e.g., a seat, platform or cover means) or the device is provided with a safety means to protect the attendant from injury (e.g., a hand guard).

SEE OR SEARCH THIS CLASS, SUB-CLASS:

86, for below ground means for personnel accommodation.

209+, for means positioned adjacent the bore entrance to direct cuttings away from the operator.

220 WITH ABOVE-GROUND GUIDE FOR RELATIVELY ADVANCING TOOL:

This subclass is indented under the class definition. Apparatus including a means located outside the bore entrance which is adapted to remain relatively axially stationary and pilot or direct a tool or means actuating or supporting a tool, as the tool advances during the boring operation.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 7, for a guide base on a marine flow spaced from a buoyant support for the boring apparatus.
- 10, for a submersible vertically movable guide for boring means mounted on a buoyant support.
- 79+, and the search there noted for tool guides insertable in an inaccessible hole.
- 122, and the search there noted for means to feed a drive, said means generally combined with a guide means, or performing a guiding function.
- 135, for above ground means to impact an earth penetrating means which generally includes guide means for a hammer, and particularly subclasses 151+ for drop hammer guide means.

SEE OR SEARCH CLASS:

- 173, Tool Driving or Impacting, appropriate subclass for a means to drive or impact a tool which may include a means to guide the tool or drive, and particularly subclasses 39+ for such means combined with means to adjust the position of the axis of tool advance.
- 384, Bearings, appropriate subclasses, and subclasses 7+ for linear bearings.
- 408, Cutting by Use of Rotating Axially Moving Tool, subclasses 72+ for a gauge block of guiding a drill of general utility into a workpiece.

226 WITH SAMPLE COVERING OR COATING MEANS (1) DISPENSED INTO SAMPLE RECEIVER, OR (2) FLUENT:

This subclass is indented under the class definition. Apparatus in which a substantially undisturbed sample of the formation is covered or

coated with (1) a material which is fed into the sample receiver and applied to the sample as the sample is being taken to enclose or form a cover therefor or (2) a fluent material which is applied to the sample to enclose or coat a portion thereof.

- (1) Note. The fluent material under part (2) must be some fluent material other than the drilling fluid.

227 WITH STORAGE MEANS FOR BIT LUBRICANT CARRIED BY BIT OR SHAFT:

This subclass is indented under the class definition. Apparatus in which the tool, tool shaft or tool housing is provided with a means to retain and/or supply a friction reducing fluid or grease to the cutter or formation disintegrating member or a portion thereof (e.g., the bearings of a rolling cutter).

- (1) Note. Drilling fluid is not considered to be a friction reducing fluid or grease under this definition. Patents in which the drilling fluid is used to lubricate the tool will be found below.
- (2) Note. Structure including specific ducts, passages or a means separate from the drilling fluid passages, if disclosed for the purpose of supplying a friction reducing fluid which is distinct from the drilling fluid is included.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 337, for means to supply drilling fluid to the bearing of a rolling cutter bit.

SEE OR SEARCH CLASS:

- 184, Lubrication, appropriate subclasses, for lubricating devices and systems.
- 384, Bearings, subclass 93 for bearing structure with lubrication means which are adapted for use in roller type rock drill bits and only enough support structure for the bearing and lubrications means. A broadly recited roller cutter bit which may be part of the bearing support, but if the cutting means has any details of how it cutters shape of cutting teeth, etc. Class 175 is the proper place.

228 With fluid pressure-actuated feed means:
This subclass is indented under subclass 227. Apparatus in which the friction reducing fluid is supplied or fed to the cutter or a portion thereof by a fluid pressure or fluid flow operated means usually the fluid pressure or flow of the drilling fluid.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

99, and the search there noted for other pressure fluid operated devices.

229 Rotation of bit actuates lubricant feed means:
This subclass is indented under subclass 227. Apparatus in which the friction reducing fluid is supplied or fed to the cutter or portion thereof by means actuated by the rotation of the tool or the cutter.

230 WITH EXPANSIBLE BORE WALL ANCHOR (E.G., PACKER):

This subclass is indented under the class definition. Apparatus in which the tool, tool shaft or housing is provided with a means which is adapted to expand laterally to engage the wall of the borehole or casing to resist or prevent the movement of the tool, tool shaft or housing or a portion thereof due to the action of gravity or a lifting force.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

81, for an anchor engaging side wall of inaccessible bore for shaft engaging guide.

98, for expansible means to anchor a below ground tool drive motor to a bore wall.

118, for feed anchor in earth wall being bored.

210, for a fluid or cuttings directing or receiving means engaging the bore entrance, said means being anchored to the bore wall.

SEE OR SEARCH CLASS:

166, Wells, subclasses 206+ and the search there noted for an expansible anchor or casing for wells.

231 WITH MEANS MOVABLE RELATIVE TO TOOL BELOW GROUND TO CONTROL ECCENTRIC FLUID EMISSION:

This subclass is indented under the class definition. Apparatus including a means which is movable relative to a tool while the tool is below ground to change the direction of flow nonsymmetrically relative to the bore axis of fluid discharging from the tool, usually to alter the direction of boring.

232 WITH MEANS MOVABLE RELATIVE TO TOOL BELOW GROUND TO STOP FLOW TOWARD BORE BOTTOM:

This subclass is indented under the class definition. Apparatus including a means which is movable below ground relative to a tool or to a part of a tool, whereby the movable means will substantially block the flow of material toward the bottom of the bore, said movable means either blocking the bore, or a passage in the tool or tool shaft.

(1) Note. For classification herein, the flow stopping means must be described as capable of at least preventing the downward flow of fine material such as sand or silt.

(2) Note. If the flow stopping means comprises a line pressure responsive device or check valve, the valve must be capable of stopping downward flow when higher pressure exists on the upper side thereof.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

317+, and the search there noted for means movable relative to a tool or shaft to control a below ground passage.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclasses 863+ for a sampler of general utility.

233 Movable to seal sample receiver at bore bottom pressure:

This subclass is indented under subclass 232. Apparatus in which the movable means seals, or cooperates with another means to seal a sample collecting chamber at the pressure which exists at the bottom of the bore.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

234+, for longitudinally spaced valve seats, wherein longitudinally spaced valves may be arranged, but are not described as sealing a sample receiver at bore bottom pressure.

234 With longitudinally spaced valve seats:

This subclass is indented under subclass 232. Apparatus in which at least two surfaces are spaced along the bore axis, said surfaces being adapted to cooperate with relatively movable flow stopping means.

(1) Note. The longitudinally spaced valve seats may both cooperate with a single movable means, and may be engaged to stop either upward or downward flow.

235 Seat engaged to stop upward flow:

This subclass is indented under subclass 234. Apparatus in which a surface or seat is engaged to stop the flow of material away from the bore bottom.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

318, for upward flow stopping movable means.

236 In sample receiver removable through below-ground tool shaft:

This subclass is indented under subclass 232. Apparatus in which the movable means is located in a means to receive a sample of the formation (undisturbed core, cuttings, etc.), and said sample receiving means is adapted to be taken above ground while the shaft which drives the tool remains in the borehole.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

246+, for a undisturbed sample receiver removable through a tool shaft.

257, and the subclasses there noted for a tool removable or insertable through or around a driving or driven shaft.

237 Means comprises dropped element:

This subclass is indented under subclass 232. Apparatus in which the movable means comprises an element which is described as being

released in the tool shaft after said shaft is in the borehole to travel through a portion of said shaft to flow stopping position.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

270, and the search there noted for a cutter element laterally shiftable below ground, and including a dropped element means.

238 Flow-stopping means includes relatively movable cutter element:

This subclass is indented under subclass 232. Apparatus in which at least part of the relatively movable, flow stopping means comprises a cutter element.

239 With undisturbed core receiver:

This subclass is indented under subclass 232. Apparatus comprising the combination of a relatively movable, flow stopping means and structure adapted to admit and substantially encompass a cylinder of earth formation as it is being defined by an annular type bit.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

236, for flow stopping movable means in sample receiver removable through below ground shaft.

240 Movable means adapted to underlie severed core:

This subclass is indented under subclass 239. Apparatus in which the movable means is adapted to admit the core of material to the core receiver, and then move to flow stopping position to block movement of the core toward bore bottom.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

233, for means movable to seal a sample receiver at bore bottom pressure.

249, for means movable relative to bit to retain or sever a core, but which, per se, are incapable of stopping downward flow of fine material.

- 241 Stops flow by movement about fixed pivot:**
This subclass is indented under subclass 232. Apparatus in which the movable means is pivotally mounted to move from flow permitting to flow blocking position.
- 242 Pivot transverse to tool axis:**
This subclass is indented under subclass 241. Apparatus in which the pivot point comprises an axis which is substantially transverse to the axis along which the tool is forming a bore.
- 243 Resiliently biased or composed of flexible material:**
This subclass is indented under subclass 232. Apparatus in which (1) the movable means is held in a position by a resilient means such as spring or (2) the movable means is composed for flexible material such as rubber (e.g., flap valve).
- 244 WITH MEANS MOVABLE RELATIVE TO TOOL TO RECEIVE, RETAIN, OR SEVER UNDISTURBED CORE:**
This subclass is indented under the class definition. Apparatus including a means which, during normal operation, is displaceable or rotatable relative to the working face of a tool, said means being adapted to have physical contact with a core of material such as is formed by a core type bit to (1) accommodate the core as it is formed, (2) grasp the core after it is formed, or (3) cut or break the already formed core from the formation.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
3, for core severing by explosive means.
44, for a core receiver provided with means to mark the core while being taken for the purpose of orienting the core to its original position while in situ.
46, for a core receiver provided with means to signal or indicate a condition of the core being taken relative to the receiver.
239+, for means movable in tool or tool shaft to stop flow toward bore bottom, combined with an undisturbed sample receiver.
403+, and the search there noted for core forming type bits.
- SEE OR SEARCH CLASS:
299, Mining or In Situ Disintegration of Hard Material, subclass 63 for a mining machine having an endless loop chunk severing cutter.
- 245 Core bit closure relative upwardly movable by core:**
This subclass is indented under subclass 244. Apparatus in which the movable means comprises an element initially closing the core receiving opening in the tool, said means being moved away from the working face of the tool as the core is formed.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
307, for a means adapted to initially cover the cutting edges of a bit.
- 246 Receiver removable through below-ground tool shaft:**
This subclass is indented under subclass 244. Apparatus in which the movable means comprises a structure adapted to cooperate with a tool and hollow tool shaft to receive a core as it is taken, said structure and core then being readily lifted above ground through the center of the tool shaft while the tool shaft remains in the borehole.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
236, for sample receiver removable through below ground tool shaft, said receiver being provided with means movable to stop flow toward bore bottom.
257+, and the subclasses there noted for a tool or sample receiver insertable through a driving or driven tool shaft.
309, for a receptacle of general utility insertable or removable through a below ground tool shaft.
- 247 With fluid pressure-responsive means to remove receiver or operate latch:**
This subclass is indented under subclass 246. Apparatus in which (1) a fluid pressure operated means or surface is provided to move a core receiver toward above ground or (2) a means latching the core barrel in the tool shaft

is actuated to engaged or released position by fluid pressure.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 60, for a process of transporting a sample to the surface by fluid.
- 99, and the subclasses there noted for other pressure fluid operated devices.

248 Core forming cutting edge or element on receiver:

This subclass is indented under subclass 246. Apparatus in which the core receiver is provided with a cutting edge or element which is adapted to participate in the forming of a core of undisturbed material.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 257+, and the search there noted for tool removable or insertable through or around driving or driven shaft.

249 Core-retaining or severing means:

This subclass is indented under subclass 244. Apparatus in which the movable means comprises a means to grasp or make a cut in the core after it has been formed.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 3, for processes or devices for severing a core by means of an explosive or explosion.
- 240, for undisturbed core receiver combined with movable flow stopping means adapted to underlie a severed core.
- 263+, for cutter element laterally shiftable below ground.
- 333, for rolling cutter bits with fixed core breaking means.
- 404, for core forming type bits with fixed core breaking means.

SEE OR SEARCH CLASS:

- 166, Wells, subclasses 55+ for earth embedded well pipe cutters.
- 294, Handling: Hand and Hoist-Line Implements, subclasses 86.1+ for grappling means having structural features adapted to function in a bore hole or similar earth opening.

250 Fluid-actuated:

This subclass is indented under subclass 249. Apparatus in which the core retaining or severing means is moved from one position to another by fluid pressure or flow.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 99, and the subclasses there noted for other pressure fluid operated devices.
- 247, for fluid pressure responsive means to remove a core receiver or operate a means latching a core receiver in a tool shaft.
- 267+, for cutter element shifted relative to bit head below ground by fluid pressure.

SEE OR SEARCH CLASS:

- 294, Handling: Hand and Hoist-Line Implements, subclass 86.15 for well grapples shiftable to engage an object or earth core through a fluid pressure means.

251 Actuated upon relative movement between tool and tool shaft:

This subclass is indented under subclass 249. Apparatus in which a relative movement between the tool and tool shaft (1) moves the core retaining or severing means into engagement with the core or (2) releases the core retaining or severing means so that they can move into core engagement.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 281, and 284, for expansible cutter element shifted by relative longitudinal movement of shaft.

252 Relative rotary movement:

This subclass is indented under subclass 251. Apparatus in which the core retaining or severing means move into core engagement upon relative rotational movement between the tool and tool shaft.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 272, and 273, for expansible cutter element shifted by relative rotary movement between tool and shaft.

253 With element holding retaining or severing means inactive:

This subclass is indented under subclass 249. Apparatus including a means to positively hold the core retaining or severing means out of core contact position until a certain condition or manipulation takes place, said holding means generally being deactivated upon the formation of a substantial length of core.

SEE OR SEARCH THIS CLASS, SUBCLASS:

251+, for retaining or severing means actuated upon relative movement between tool and shaft.

271, 275+ and 290, for expansible cutter elements with latch.

254 Mounted on transverse pivot:

This subclass is indented under subclass 249. Apparatus in which the retaining or severing means moves toward the longitudinal axis of the core by swinging movement about a pivot axis which is substantially transverse to the longitudinal axis of the core.

(1) Note. The pivot axis may shift during the pivotal movement of the retaining or severing means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

263+, for expansible cutters mounted on a transverse pivot.

SEE OR SEARCH CLASS:

294, Handling: Hand and Hoist-Line Implements, subclass 86.29 for pivoted contracting grapples used in a well bore.

255 Sliding wedge type (e.g., slips):

This subclass is indented under subclass 249. Apparatus in which the retaining or severing means is moved toward the longitudinal axis of the core due to wedge like action upon relative bodily longitudinal sliding movement between surfaces on the retaining or severing means and the tool.

SEE OR SEARCH THIS CLASS, SUBCLASS:

279+, and 286+, for expansible cutter element with wedge type expansion means.

422, for a clasp (e.g., a well slip assembly) which separately travels with an earth boring shaft or which cooperates with specifically shaped well structure which stops or actuates the clasp.

SEE OR SEARCH CLASS:

24, Buckles, Buttons, Clasps, etc., appropriate subclasses, and particularly subclass 114.5, for a strap, cable, or pipe button (i.e., trip or stop projection).

188, Brakes, particularly subclass 67 for brake (e.g., a clasp) mechanically connected to a relatively stationary structure and which holds a pipe or rod at various locations along the pipe's or rod's length for short quick linear assembly or disassembly during a work or manufacturing operation, or preparation to a working operation done by the pipe, rod, or a pipe supported tool.

294, Handling: Hand and Hoist-Line Implements, subclasses 86.3+ for grapples that are cammed inwardly to engage an object or earth core within a well bore or similar earth opening.

256 WITH RELEASABLE MEANS NORMALLY HOLDING JOINTED SHAFT SECTIONS IN ANGULAR RELATION:

This subclass is indented under the class definition. Apparatus comprising a tool shaft having sections which are joined together by means permitting relative movement transverse to the longitudinal axis thereof, as by pivoting, and a means which normally holds the two sections of shafting in their angular or bent condition and which may be rendered inoperable to permit the two shaft sections to assume in aligned position.

(1) Note. The releasable means is generally released by the engagement of the tool with the bottom of the borehole.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:
74, for sectional guide or shaft having means to lock sections in angular relation while boring.
- SEE OR SEARCH CLASS:
285, Pipe Joints or Couplings, subclass 118 for knuckle joints in pipes having actuating means to relatively move pipe sections.
- 257 TOOL REMOVABLE OR INSERTABLE THROUGH OR AROUND DRIVING OR DRIVEN SHAFT OR CASING:**
This subclass is indented under the class definition. Apparatus comprising a tool and a shaft or casing to drive the tool or be driven by the tool, said tool being adapted to be connected to or disconnected from driving relation with the shaft or casing by movement either (1) through the inside of said shaft or casing or (2) externally of the shaft or casing in the space between the shaft or casing and the bore wall, the movement of the tool being to or from a position below ground while the shaft or casing is in the borehole and without the removal of the latter from the borehole.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
23, for device for forming a bore without earth removal in which the drive point is retracted through a shaft or casing.
202, for devices having above ground means for relatively moving below ground tool elements.
236, for devices having a sample receiver with below ground means movable relative to a tool to stop flow toward the bore bottom, the sample receiver being removable through a below ground shaft.
246+, for devices having an undisturbed core receiver which is removable through a below ground tool shaft.
309, for devices having a receptacle removable or insertable through a below ground tool shaft.
- 258 Laterally shiftable cutter element movable through shaft:**
This subclass is indented under subclass 257. Apparatus in which the tool comprises a laterally shiftable cutter element (as defined in subclass 263) movable through the inside of a tubular shaft.
- 259 Plural cutter elements longitudinally relatively movable into transverse alignment:**
This subclass is indented under subclass 258. Apparatus in which a plurality of cutter elements are movable through the shaft, said cutter elements being movable relative to each other in the direction of the longitudinal axis of the shaft to an operative position in which the cutting edges of the cutter elements lie in the same transverse plane perpendicular to the longitudinal axis of the shaft.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
265, for plural laterally shiftable cutter elements, per se, which are longitudinally relatively movable into transverse alignment.
- 260 Cutter element engages torque transmitting abutment on shaft when expanded:**
This subclass is indented under subclass 258. Apparatus in which the shaft has an element or portion having a surface which extends substantially longitudinally and radially of the shaft and which is engaged by a portion of the cutter element so that rotary motion about the shaft axis may be transmitted from the shaft to the cutter element or from the cutter element to the shaft.
- (1) Note. For the purposes of this subclass the laterally movable support for a rolling cutter, as defined in subclass 331, is considered to be part of the cutter element since the rolling cutter element itself could not have a torque transmitting surface engaging the shaft.
- 261 With additional torque transmitting abutment on bit head and shaft:**
This subclass is indented under subclass 260. Apparatus in which the cutter element is carried by a bit head and the shaft and bit head are also provided with mutually engaging drive

transmitting surfaces which transmit torque between the shaft and bit head.

262 Tool movable exteriorly of shaft:

This subclass is indented under subclass 257. Apparatus in which the tool is movable to operative position by moving externally of the shaft in the space between the shaft and the bore wall.

SEE OR SEARCH CLASS:

294, Handling: Hand and Hoist-Line Implements, subclass 86.34 for a nominally claimed earth boring means for cutting away earth or rock or a means for removing loose material or metal around a stuck object (e.g., a section of drill pipe) in a borehole combined with means for retrieving the object.

263 CUTTER ELEMENT LATERALLY SHIFTABLE BELOW GROUND (E.G., EXPANSIBLE):

This subclass is indented under the class definition. Apparatus comprising a cutter element carried on a shaft or bit head by means which permits or causes the cutter element to move relative to the shaft or bit head in a direction transverse to the bore axis while the shaft or bit head and cutter element are below ground.

- (1) Note. When the laterally shiftable cutter element comprises a rolling cutter bit element as defined in subclass 331 the lateral shifting movement of the cutter element for classification in this subclass must consist of a movement other than that due to the normal cycle of rotation of the rolling cutter element about its rolling axis. Thus a rolling cutter element which normally rolls about an axis and partakes of a cyclic eccentric motion with a lateral component is not included under this definition but will be found below in subclass 343 for example.

SEE OR SEARCH THIS CLASS, SUBCLASS:

77, for side wall tool fed laterally without rotation from inaccessible hole.
78, for tools which are fed laterally to bore from a recess in a carrier inserted in an inaccessible hole.

90, for tool elements mounted on a continuously driven flexible or articulated endless member which is carried on a support which is swingable or laterally movable.

202, for devices having above ground means for relatively moving below ground tool elements.

256, for tools combined with jointed shaft having a means which normally biases the tool laterally of the bore but which is releasable to permit operation without the bias.

SEE OR SEARCH CLASS:

52, Static Structures (e.g., Buildings), subclasses 155+ for a piercing or expanding earth anchor.

82, Turning, subclass 1.2 for expanding reverse taper wood augers.

166, Wells, subclasses 55+ for cutters for earth embedded well pipe, subclasses 170+ and particularly subclass 174 for well pipe cleaners for expansible well anchors or casing.

294, Handling: Hand and Hoist-Line Implements, subclasses 93+ for an expanding grapple.

411, Expanded, Threaded, Driven Headed, Tool-Deformed, or Locked-Threaded Fastener, subclasses 29+ for expansible anchors provided with cutting teeth for the formation of the bore in which the anchor is to be expanded.

451, Abrading, subclasses 463+ for expansible abrading tool.

264 With separable means holding tool collapsed above ground only:

This subclass is indented under subclass 263. Apparatus in which the cutter element moves outwardly from the shaft axis to operative position and a means is provided which is detachable from the cutter element or bit head and which is temporarily attached to the cutter element above ground to hold the cutter element in an inward or collapsed position, usually to facilitate insertion of the cutter element in the borehole, said means being removed and remaining above ground when the cutter element is placed in the borehole.

SEE OR SEARCH CLASS:

166, Wells, subclasses 85.1+ for above ground apparatus with assembly or disassembly means including means for aiding in inserting a member into or removing a member from a well.

265 Plural cutter elements longitudinally relative movable into transverse alignment:

This subclass is indented under subclass 263. Apparatus in which a plurality of cutter elements are provided, said cutter elements being movable relative to each other in the direction of the longitudinal axis of the shaft to an operative position in which the cutting edges of the cutter elements lie in the same transverse plane perpendicular to the longitudinal axis of the shaft.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

259, for similar cutter elements which are also removable or insertable around or through a driving or driven shaft or casing while the shaft or casing is below ground.

266 Plural selectively shiftable cutter elements:

This subclass is indented under subclass 263. Apparatus in which a plurality of laterally movable cutter elements are provided and means are also provided which permits one of said cutter elements to move laterally while another laterally movable cutter element is temporarily held against such movement.

267 Cutter element shifted by fluid pressure:

This subclass is indented under subclass 263. Apparatus in which the laterally movable cutter element is moved laterally by means of a fluid under pressure acting against the cutter element or a below ground part attached thereto.

- (1) Note. Devices which have a specific description of a fluid jet acting directly on the cutter element to assist in moving it laterally have been classified in this subclass only when the nozzle or outlet for the fluid has been claimed.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

99, and the search there noted for other pressure fluid operated devices.

SEE OR SEARCH CLASS:

166, Wells, subclass 55.8 for fluid pressure actuated, radially movable well pipe cutter and subclass 212 for fluid pressure actuated expanding anchor.

268 With dropped element:

This subclass is indented under subclass 267. Apparatus in which a part is provided which is specifically described as being dropped from above ground to an operative position below ground, said part functioning to cause operation of the fluid shifting means, for example, by (1) operating a latch, (2) providing a fluid reacting surface or (3) operating a valve or other means to permit movement of the cutter element.

- (1) Note. Patents are classified in this subclass which specifically describe the part as being a dropped element even though no such recitation is made in the claims provided the part itself is claimed.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

270, and the subclasses there noted, for other devices employing a dropped element.

269 Fluid pressure acts against spring biased part:

This subclass is indented under subclass 267. Apparatus in which the laterally movable cutter element or part acted on by the pressure fluid is also acted upon by a resilient means urging the cutter element or part in a direction opposite to that exerted by the pressure fluid.

270 Cutter element shifted by dropped element:

This subclass is indented under subclass 263. Apparatus in which the laterally movable cutter element is moved laterally by means of a part which is specifically described as being dropped from above ground to an operative position below ground.

- (1) Note. Patents are classified in this subclass which specifically describe the part as being a dropped element even though no such recitation is made in the claims provided the part itself is claimed.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 237, for means movable relative to a tool below ground to stop flow toward the bore bottom comprising a dropped element.
- 268, for fluid pressure operated lateral shiftable cutter elements including a dropped element.
- 271, for laterally shiftable cutter elements having a fluid operated latch.

SEE OR SEARCH CLASS:

- 166, Wells, subclass 239 for detent or clutch in well operated by dropped weight.

271 With latch operated by fluid pressure or dropped element:

This subclass is indented under subclass 263. Apparatus in which the laterally movable cutter element is held in one position, either expanded or collapsed, by a movable latch member, said latch member being moved by (1) a fluid under pressure acting against the latch or a part connected thereto or (2) engaging a part which is specifically described as being dropped from above ground to an operative position below ground.

- (1) Note. Patents are classified in this subclass which specifically describe the latch as being operated by fluid pressure or a dropped element even though no such recitation is made in the claims provided the part on which fluid pressure directly acts on the dropped element itself is claimed.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 99, and the subclasses there noted for other pressure fluid operated devices.
- 270, and the subclasses there noted, for other devices operated by a dropped element.

272 Cutter element shifted by relatively longitudinally movable threaded elements:

This subclass is indented under subclass 263. Apparatus in which the laterally movable cutter element is connected to a pair of elements having cooperating screw threaded portions, said elements being relatively movable in a direction parallel to the longitudinal axis of the shaft due to the action of the screw threads to cause the cutter element to move laterally.

273 Cutter element shifted by cam or gear axially rotatable relative to shaft:

This subclass is indented under subclass 263. Apparatus in which the laterally movable cutter element is connected to a cam or gear which is mounted to rotate about an axis substantially coincident with the longitudinal axis of the shaft so that relative movement of the cam or gear and the shaft about said axis will cause the cutter element to move laterally relative to the shaft.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 252, for a core retaining or severing means which is movable on a bit and the movement is caused by relative rotary movement between the bit and tool shaft.

274 With shifting mechanism spring biased to operative position:

This subclass is indented under subclass 263. Apparatus in which the laterally movable cutter element is moved by a mechanism which is biased by a resilient means to move the cutter element to its operative position.

- (1) Note. A mechanism for classification in this subclass includes a system of parts having a link, cam or similar element between the cutter element and the resilient means but a simple link connecting a cutter element and a spring is excluded, see subclass 291 below.

275 With separate latch:

This subclass is indented under subclass 274. Apparatus combined with a movable member which is separate from the laterally movable cutter element and which engages the cutter element or some part of the resiliently biased

- mechanism to hold the cutter element in one position.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
271, for laterally shiftable cutter elements having a latch operated by fluid pressure or a dropped element.
- 276 Frangible or discardable element:**
This subclass is indented under subclass 275. Apparatus in which the movable latch member comprises a part which is destructible or discarded so that the part is used only one time.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
301, for below ground hammer or impact devices with a frangible means to releasably retain the impact member against reciprocation.
307, for a cutting edge cover which is generally frangible or discardable.
- 277 Latch holds mechanism retracted:**
This subclass is indented under subclass 275. Apparatus in which the movable latch member acts to hold the laterally movable cutter element in an inoperative or noncutting position.
- 278 Latch return shifting mechanism to inoperative position:**
This subclass is indented under subclass 277. Apparatus in which the movable latch member also acts on the mechanism to cause the mechanism to be moved to its inactive or inoperative position to permit retraction of the cutter element.
- (1) Note. Generally the latch member engages the lower end of a casing when it is desired to retract the cutter element by lifting the shaft and cutter element and this motion causes the latch member to move the spring mechanism to its inoperative or inactive position.
- 279 Cam or gear means movable to shift cutter element:**
This subclass is indented under subclass 274. Apparatus in which the shaft or bit head is provided with a cam or gear element other than the cutter element which is movable thereon, said element having a portion which engages the
- laterally movable cutter element or a part connected thereto to cause the cutter element to be moved.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
273, for laterally shiftable cutter elements movable by a cam or gear axially rotatable relative to the shaft.
286+, for laterally shiftable cutter elements moved by a longitudinally relative movable cam or gear.
- 280 With forwardly extending noncutting portion:**
This subclass is indented under subclass 279. Apparatus in which the laterally movable cutter element is carried on a bit head or shaft which has a portion extending inwardly toward the axis of the shaft and forward of the cutter element in the direction of boring and which has no cutting function.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
283, for similar laterally shiftable cutter elements in which the cutter elements are longitudinally movable on the shaft.
406+, and the subclasses there noted, for other cutters with a forwardly extending noncutting portion.
- 281 Cutter element substantially longitudinally movable on shaft:**
This subclass is indented under subclass 274. Apparatus in which the laterally movable cutter element is carried on the bit head or shaft so that the cutter element is bodily movable generally longitudinally relative to the bit head or shaft to cause movement of the cutter element.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
251, for a core retaining or severing means actuated by relative movement of bit and tool shaft.
288, for laterally shiftable cutter elements which are movable longitudinally relative to an expanding cam or gear means.

282 Plural elements expanded into single socket:

This subclass is indented under subclass 281. Apparatus comprising a plurality of laterally movable cutter elements which move outwardly from the longitudinal axis of the bit head or shaft to operative position and a single socket or recess on the bit head or shaft which receives in abutting relation a portion of each cutter element when they have been moved to operative position.

283 With forwardly extending noncutting portion:

This subclass is indented under subclass 281. Apparatus in which the laterally movable cutter element is carried on a bit head or shaft which has a portion extending inwardly toward the axis of the bit and forward of the cutter element in the direction of boring and which has no cutting function.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 258+, and the subclasses there noted, for other cutters with a forwardly extending noncutting portion.
280, for similar laterally shiftable cutter elements which are shifted by a movable gear or cam.

284 Cutter element shifted by longitudinally relatively movable parts:

This subclass is indented under subclass 263. Apparatus in which the cutter element is moved laterally by the relative bodily movement of a plurality of parts carried by the bit head or shaft, which parts move relative to each other in the direction of the longitudinal axis of the shaft.

- (1) Note. One of the parts may be the cutter element itself or one of the parts may be a fixed portion of the bit head or shaft.
- (2) Note. The mere pivoting of a cutter element on the bit head or shaft about a fixed pivot is not included since there is no bodily relative movement as required by the above definition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 251, for core retaining or severing means actuated by relative movement of bit and tool shaft.
272, for laterally shiftable cutter elements shifted by relatively longitudinally movable threaded elements.
279+, and 281+, for laterally shiftable cutter elements shifted by longitudinally movable parts which are spring biased to operative position.

285 Toggle or linkage between movable parts:

This subclass is indented under subclass 284. Apparatus in which the laterally movable cutter element is moved by a link or element which is pivotally connected to the cutter element and one of the relatively longitudinally movable parts.

286 Cam or gear engaging cutter element:

This subclass is indented under subclass 284. Apparatus in which one of the relatively longitudinally movable parts comprises the transversely movable cutter element and another of the parts comprises a cam or gear element having a portion engaging the cutter element so that as the parts move longitudinally relative to each other the cutter element will be moved transversely of the bit head.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 279+, for laterally shiftable cutter elements shifted by a cam or gear mechanism which spring biases the cutter to operative position.

287 With separate latch holding cutter element in shifted position:

This subclass is indented under subclass 286. Apparatus combined with a movable member which is separate from the laterally movable cutter element or the cam or gear and which engages a portion of the movable parts to hold the cutter element in the position in which it is displaced laterally of the bit head the maximum distance from the longitudinally axis of the bit head or shaft.

- (1) Note. A latch is considered to be separate from the cutter element, cam or gear

for the purposes of this definition even though it may be formed as a unitary part of these elements if its latching function is independent of the action which moves the cutter element.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

290, and subclasses there noted, for other laterally shiftable cutter elements with latches.

288 Cutter element substantially longitudinally movable on shaft:

This subclass is indented under subclass 286. Apparatus in which the laterally movable cutter element is carried on the bit head or shaft so that the cutter element moves generally longitudinally relative to the bit head or shaft to cause the movement of the cutter element.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

255, for core retaining or severing means of the sliding wedged type.

281+, for a laterally shiftable cutter element longitudinally movable on the shaft by a mechanism which spring biases the cutter to operative position.

289 Cutter element spring biased to retracted position:

This subclass is indented under subclass 286. Apparatus in which the laterally movable cutter element is resiliently urged to move laterally of the bit head or shaft in the direction in which the cutter element would be in an inoperative or noncutting position.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

291, and the search there noted for other spring biased laterally shiftable cutters.

290 With latch:

This subclass is indented under subclass 263. Apparatus combined with a movable member which engages the laterally movable cutter element to hold it in one position.

(1) Note. A mere spring or other resilient element which urges the cutter element

laterally of the bit head is excluded and will be found in subclass 291.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

271, for laterally shiftable cutter elements having a latch operated by fluid pressure or a dropped element.

275+, for laterally shiftable cutter elements having a mechanism spring biasing the cutter to operative position and a separate latch.

287, for laterally shiftable cutter elements moved by a longitudinally relatively movable cam or gear and having a separate latch holding the cutter element in shifted position.

291 Spring biased:

This subclass is indented under subclass 263. Apparatus in which the laterally movable cutter element is resiliently urged to move laterally of the shaft axis.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

254, for core retaining or severing means mounted on a transverse pivot which is generally spring biased.

269, for laterally shiftable cutter elements which are shifted by fluid pressure acting against a spring biased part.

274+, for laterally shiftable cutter elements with a shifting mechanism spring biased to operative position.

289, for laterally shiftable cutter elements moved by a longitudinally relatively movable cam or gear engaging a cutter element which is spring biased to retracted position.

292 Pivoted about substantially longitudinal axis:

This subclass is indented under subclass 263. Apparatus in which the laterally movable cutter element is pivotally mounted on the bit head or shaft to swing about an axis which substantially parallel to the longitudinal axis of the shaft.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

343, for rolling cutters which are eccentrically mounted on a longitudinal axis

and which may be so positioned when inoperative to pass through a casing or bore of smaller diameter than the cutters will cut when operative.

293 BELOW-GROUND (1) HAMMER, OR (2) IMPACT MEMBERS:

This subclass is indented under the class definition. Apparatus comprising (1) a reciprocable member positioned below ground adapted to cause a sudden jar shock or hammer below to the boring apparatus or (2) two telescoping members positioned below ground which members are capable of axial reciprocation with respect to each other and are provided with means to limit said reciprocation, the means for limiting reciprocation being for the purpose of causing an impact or hammer blow or jar to the boring apparatus or a portion thereof.

- (1) Note. The jarring function must be specifically described for classification in this subclass and not left to inference; mere telescoping tool shaft sections which are not disclosed as for the purpose of impacting or jarring a portion of the apparatus below ground are classified below as indicated by the search notes.
- (2) Note. For classification in this subclass the impact or blow must be delivered to a portion of the boring means and not directly to the formation. For example, a below ground device for impacting a bit is classified herein, but a bit which is reciprocated to deliver a blow to the formation is excluded.
- (3) Note. Elements such as tubes, rods or balls which are freely dropped into a tool shaft from the surface to actuate a mechanism or close or otherwise modify a passage located in a portion of a tool or tool shaft located below ground are excluded even though such devices may incidentally cause an impact or jar to the apparatus. Such devices are classified on the basis of the individual functions performed.
- (4) Note. As detailed in the class definition, C, and Lines With Other Classes and

Within This Class, Relationship to Other Classes Which Include Subject Matter Closely Related to Class 175, B, subject matter under this definition includes a below ground lost motion connection, per se, or a below ground lost motion connection combined with a specific joint for connecting the shaft or cable to an art device forming the subject matter for another class. However, inclusion in a claim of specific structure of an art device classified in another class will cause classification in such other class.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 135, and the search there noted for above ground means to impact an earth penetrating means.
- 237, for means movable relative to a tool below ground to stop flow toward the bore bottom, and in which said means comprises a dropped element.
- 268, 270 and 271, for a cutter element which is shiftable laterally relative to a bit head below ground, and in which the expansion of the cutter element is dependent on a dropped element.
- 317+, for means movable relative to a tool or shaft to control a below ground passage means and in which the means includes a dropped element.
- 321+, for axially telescoping tool shaft sections.
- 414+, for an impact type bit.

SEE OR SEARCH CLASS:

- 166, Wells, subclass 178 for specific well structure classifiable, per se, in Class 166 combined with a jar. However, a jar combined with a packer or guide or a shaft being used in a boring operation is classifiable in Class 175.
- 173, Tool Driving or Impacting, subclasses 90+ and see the search notes therein for an impacting device of general utility for imparting blows to a tool. The mere location of an impacting device below ground in an earth bore does not prevent classification in Class 173 but an impacting device which is described as located below ground and is described as (1) a lost motion connection in a tool shaft

- or cable or (2) is claimed in combination with a specific earth boring means such as specific work contacting tool structure, or a packer or guide on a shaft being used in a boring operation is classified in Class 175.
- 285, Pipe Joints or Couplings, subclasses 298+ and the search there noted for pipe joints or couplings having a telescopic or a relative motion connection.
- 294, Handling: Hand and Hoist-Line Implements, subclass 86.18 for grapples adapted to function in a well combined with a jar or impact means to effect a release of the grapple from engagement with an object in a well bore, and subclass 86.23 for grapples adapted to function in a well bore combined with a jar or impact means of general utility within a well bore or similar earth opening. (Included herein are grapples combined with impact means that function to firmly set the grapple in engagement with an object in a well bore or with impact means that function to drive upwardly to release a grapple engaged object that is stuck within a well bore.)
- 464, Rotary Shafts, Gudgeons, Housings, and Flexible Couplings for Rotary Shafts, subclasses 18+ for a flexible coupling between fluid conducting rotary shafts; and subclasses 162+ for a drive coupling facilitating relative axial motion between coupled members.
- 294 Combined with safety joint:**
This subclass is indented under subclass 293. Apparatus combined with a joint between two parts which may be selectively uncoupled below ground independently of other joints in the apparatus, such that one part may be left in the bore while the other part is withdrawn therefrom.
- 295 With noncutting portion forwardly of sleeve impact member having a cutting portion (e.g., reamer):**
This subclass is indented under subclass 293. Apparatus in which the hammer or impact device comprises an outer sleeve provided with cutting edges and mounted for longitudinal sliding movement on a shaft, said shaft having a portion extending forwardly of said sleeve which has a noncutting function.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
406+, and the search there noted for a device having a noncutting portion forwardly of a cutting portion.
- 296 Fluid-operated:**
This subclass is indented under subclass 293. Apparatus in which (1) the hammer or impact device is acted upon and propelled by a body of fluid to deliver a blow (2) a body of fluid acts directly upon the hammer or impact device, or on holding means therefor to restrain said device against movement, and means to relieve the device or holding means from the influence of the restraining fluid to deliver a blow or (3) a means for holding the hammer or impact device against movement is released by a body of fluid to deliver a blow.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
99, and the search there noted for other fluid operated devices.
- 297 Restricted orifice for initially delaying escape of restraining fluid:**
This subclass is indented under subclass 296. Apparatus in which said relieving means comprises a restricted orifice through which said fluid may escape when placed under pressure to allow unrestrained movement of said hammer or impact device after a predetermined amount of said fluid has escaped.
- 298 Continuous unidirectional rotary motion of one telescoping member effects consecutive impacts:**
This subclass is indented under subclass 293. Apparatus in which the telescoping members are provided with means which cooperate to cause repetitive reciprocation of said members relative to each other when one member is continuously turned in the same direction about its axis.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
322, for telescoping shaft sections of a nonjarring type provided with cooper-

ating means for reciprocating said sections relative to each other when one of said sections is continuously rotated in one direction.

299 Resiliently biased:

This subclass is indented under subclass 293. Apparatus in which an elastic member acts upon the hammer or impact device to urge said hammer or impact device toward or away from a jarring position.

SEE OR SEARCH CLASS:

173, Tool Driving or Impacting, subclasses 202+ for an impacting device having a hammer head which is driven by a spring.

300 With releasable means to detachably retain telescoping members against axial reciprocation:

This subclass is indented under subclass 293. Apparatus in which means are provided on one of the telescoping members for engaging and holding the other member against axial movement with said reciprocation limiting means in spaced relation, said holding means being selectively releasable to allow relative axial movement between the members.

301 Frangible:

This subclass is indented under subclass 300. Apparatus in which said holding means comprises an element which is destructible so that said element is used only one time.

SEE OR SEARCH THIS CLASS, SUBCLASS:

276, for a frangible latching means for a spring biased shifting mechanism of an expandable cutter element.

302 Condition for release adjustable:

This subclass is indented under subclass 300. Apparatus in which the holding means is adjustable to vary the manner in which the holding means may be released or the force required to effect release of the holding means.

303 Adjustable below ground:

This subclass is indented under subclass 302. Apparatus in which the adjustment may be effected while the device is in position to perform its intended function within the bore.

304 Resiliently biased latch:

This subclass is indented under subclass 300. Apparatus in which said holding means is held in operative position by means of an elastic element.

305 Telescoping members relatively rotatable:

This subclass is indented under subclass 293. Apparatus in which the telescoping members are so arranged that they may freely rotate relative to each other.

SEE OR SEARCH THIS CLASS, SUBCLASS:

298, for relatively rotatable telescoping members in which continuous unidirectional rotary motion of one member causes repetitive impacts.

306 With means to couple members to prevent relative rotation:

This subclass is indented under subclass 305. Apparatus in which selectively engageable means are provided on the telescoping members for transmitting rotary motion from one member to the other.

307 WITH CUTTING EDGE COVER:

This subclass is indented under the class definition. Apparatus including a means provided to fit over and protect a cutting edge of a bit or cutter element from being damaged or inflicting damage only while the bit or cutter element is not in use, such means being necessarily removed or destroyed either before or simultaneously with the commencement of boring.

SEE OR SEARCH THIS CLASS, SUBCLASS:

383, for a cutter element having plural cutting edges, one of which is carried in nonuse position on the bit head or cutter support.

308 WITH RECEPTACLE:

This subclass is indented under the class definition. Apparatus including a receptacle means having a bottom and side walls for retaining or collecting fluent material and/or junk.

- SEE OR SEARCH THIS CLASS, SUB-CLASS:
232+, for a receptacle having a bottom or portion of a bottom movable below ground to stop flow toward the bore bottom.
244+, and the search there noted for a means movable relative to a bit to receive, retain or sever an undisturbed core.
- SEE OR SEARCH CLASS:
73, Measuring and Testing, subclasses 864.51+ for a sampling implement provided with a receptacle.
166, Wells, subclasses 162+ and the search there noted, for well type receptacles.
- 309 Removable or insertable through below-ground tool shaft:**
This subclass is indented under subclass 308. Apparatus in which the receptacle means may be inserted in and withdrawn from a hollow tool shaft at any time during operation of the boring means.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
246+, for a core receiver removable through a below ground tool shaft.
257+, and the search there noted for a tool or sample receiver insertable through a driving or driven tool shaft or casing.
- 310 With helical conveyor:**
This subclass is indented under subclass 308. Apparatus in which the receptacle is provided with a conveyor or feed screw.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
323, and the search there noted for other devices with a helix or helical structure.
- 311 Suspended below bit:**
This subclass is indented under subclass 308. Apparatus in which the receptacle is suspended in a preformed hole below the cutting portion of the tool.
- 312 Sieve or strainer:**
This subclass is indented under subclass 308. Apparatus in which the receptacle is either porous or is provided with apertures.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
206, for above ground separation of drilling fluid constituents.
- 313 WITH MECHANICAL CLEANER FOR BIT OR CUTTER ELEMENT:**
This subclass is indented under the class definition. Apparatus in which a structure is supported or moved relative to a bit or cutter element so that it will strip, wipe, scrape, or break up adhering accumulations of mud or cuttings from a bit or cutter element.
- (1) Note. Since nearly all relatively moving or rolling cutter elements which are adjacent to another cutter element inherently perform a cleaning action, such structures have been excluded from this subclass and are classified on other structure.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
84, for an above ground cleaner for the boring means.
96, and 319, for below ground drive means for plural relatively movable cutting edges.
341, for plural rolling cutters with intermeshing teeth.
381, for plural cutting edges relatively longitudinally movable during operation.
- SEE OR SEARCH CLASS:
172, Earth Working, subclass 606 for a cleaner for the tool of an earth working implement.
294, Handling: Hand and Hoist-Line Implements, subclasses 50+ for fork tine shovel clearers.
- 314 WITH WELL-TYPE SCREEN:**
This subclass is indented under the class definition. Apparatus combined with means for separating solids from earth fluid flowing into a well conduit.

- (1) Note. The means for separating solids is generally known as a well screen, strainer or filter and may comprise no more than a pipe with a multiplicity of perforations therein. The important factor determining classification in this subclass is the specific description of the use of the means to permit naturally occurring fluid in the earth formation to flow into a well conduit.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 312, for devices combined with a receptacle for cuttings having a sieve or strainer.
320+, for tool shafts which may have holes to permit fluid circulation and subclass 324 in particular for means other than bit structure to induce fluent flow.

SEE OR SEARCH CLASS:

- 166, Wells, subclasses 227+ and the search there noted, for well screens, per se, or for other combinations of well devices with screens.

315 COMBINED:

This subclass is indented under the class definition. Apparatus claimed in combination with features other than means to transmit motion to the formation penetrating means, or means to remove cuttings from the bore, or means to conduct fluid to the earth penetrating means and not provided for in any of the preceding subclasses.

- (1) Note. The means to transmit motion to the earth penetrating means includes means to rotate, reciprocate, impact, feed or stabilize the tool including the tool shaft.
(2) Note. The means to remove cuttings from the bore includes mechanical conveying means or a fluid system which functions to remove cuttings from the bore.
(3) Note. The means to conduct fluid to the tool includes conduits, passages, apertures, valves or closures including pack-

ers positioned between the tool shaft and bore wall for allowing or controlling the flow of fluid to or from the tool.

- (4) Note. The tool includes any device which disintegrates, cuts, dislocates, erodes or compresses the formation to form the bore.
(5) Note. All preceding subclasses must be investigated for particular combinations within this definition as shown by the preceding subclass titles.

SEE OR SEARCH CLASS:

- 7, Compound Tools, appropriate subclasses, for an earth boring tool combined with a nonearth boring tool.

316 WITH RELATIVELY MOVABLE PARTS TO FACILITATE CLEANING WITHOUT DISASSEMBLY:

This subclass is indented under the class definition. Apparatus having parts or portions which are connected together in such a manner as to be movable relative to each other without being completely separated to permit the removal of cuttings from the apparatus.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 232+, for tools with means movable relative to the tool below ground to stop flow toward the bore bottom which may also be moved to permit cleaning of the tool.
308+, for tools combined with receptacles which may have parts which are movable to permit cleaning.
313, for tools combined with a mechanical cleaner for a bit or cutter element.

SEE OR SEARCH CLASS:

- 294, Handling: Hand and Hoist-Line Implements subclasses 49+ for hand-type nonrotary post hole diggers.

317 WITH MEANS MOVABLE RELATIVE TO TOOL OR SHAFT TO CONTROL BELOW-GROUND PASSAGE:

This subclass is indented under the class definition. Apparatus in which a tool or tool shaft is provided with a passage and means movable relative to said tool or tool shaft for regulating

or controlling the flow of fluent material through said passage while the tool or tool shaft is positioned below ground.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 218+, for a valve in combination with above ground means for handling fluid or cuttings.
- 232+, for means movable relative to tool below ground to stop flow toward bore bottom.
- 247+, for fluid pressure responsive means to remove core receiver or operate a receiver latch.
- 250+, for passage control means in a fluid actuated core retaining or severing means.
- 267+, for passage control means in a means to laterally shift a cutter element by fluid pressure.
- 271+, for passage control means in a latch operated by fluid pressure or dropped element.
- 296+, for passage control means in a fluid operated below ground hammer or impact device.

SEE OR SEARCH CLASS:

- 166, Wells, subclasses 107+ and 162+ for well fluid receptacles which include valves and subclasses 316+ for below ground valves peculiar to wells.

318 Valve prevents upward flow:

This subclass is indented under subclass 317. Apparatus in which the means comprises a sub-surface valve so mounted in the tool or tool shaft as to prevent the upward flow of fluent material in the tool or tool shaft.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 233, for means movable to seal a sample receiver at bore bottom pressure.
- 235, for the combination of valve seats engaged by movable means to stop upward and downward flow.

319 BELOW-GROUND MECHANICAL MOTION CONVERTING MEANS RELA-

TIVELY MOVING PLURAL CUTTING EDGES:

This subclass is indented under the class definition. Apparatus comprising a plurality of cutting edges and a mechanical linkage or gearing which is located below ground and which is connected to the cutting edges to cause the cutting edges to move relative to each other.

- (1) Note. Rotation of similar cutting elements, about spaced axes, whether parallel or not, is considered to be relative motion for classification in this subclass.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 96, for a plurality of cutting edges which are moved relative to each other by individual below ground drive motors.
- 106, for below ground mechanical motion converting drive means drivingly interposed between a below ground drive motor and a tool.
- 170+, for above ground mechanical motion converting drive means for tool.
- 263+, and the search there noted, for devices having cutter elements which are laterally shiftable below ground.
- 298, for devices having a below ground hammer or impact device in which continuous unidirectional rotary motion of one telescoping member effects the impacting.

320 WITH TOOL SHAFT DETAIL:

This subclass is indented under the class definition. Apparatus including particulars of a tool shaft.

- (1) Note. For the meaning of "tool shaft", see the class definition.
- (2) Note. The term detail or particulars is meant to exclude mere nominal or broad recitations of a tool shaft. For example, a shaft having a detailed handle fixed thereto or merely stating "hollow tool shaft", "centrally located passage", "convolute tool shaft", etc., would be insufficient, but if said shaft is described as having a particular kind of passage or convolution or multiple passages, etc., the patent will be classified herein.

- (3) Note. For purposes of this subclass, the tool shaft extends between above ground structure and the joint directly above the cutting element that is most closely located to the above ground structure; all structure from the joint above the said cutting element to the most remote bore engaging end of the boring means is considered as part of the tool structure. Likewise, details of the joint structure which are in the tool shaft, but function merely to connect the tool structure to the shaft are excluded as subject material for this subclass, and are classified with the particular tool structure in this class if tool structure is claimed, or in the appropriate joint class if tool structure is not claimed.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 74, for sectional shaft having means to lock sections in angular relation in a means to constrain tool to bore along a curved path.
- 75, for normally curved shaft in a means to constrain tool to bore along a curved path.
- 101, for positive driving connection between tool and support shaft for rotary below ground prime mover.
- 173, with drive means including diversely actuated shafts extending into bore.
- 205, for means providing pressurized gas contact with drilling liquid which may be located in a tool shaft.
- 215, for tool shaft having plural passages for drilling fluid.
- 317+, and the search there noted for means movable relative to tool or tool shaft to control below ground passage.

SEE OR SEARCH CLASS:

- 174, Electricity: Conductors and Insulators, appropriate subclasses for electrical conductors and particularly subclass 47 for combined electrical and fluid conductors.

321 Axially telescoping shaft section:

This subclass is indented under subclass 320. Apparatus in which separate sections of tool shafting cooperate with one another so as to be

slidably extensible or collapsible (e.g., one section slidable within a second section) and including below ground tool advancing devices such as fluid operated expansible chamber feed means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 94, for below ground feed means for a below ground prime mover.
- 257+, and the search there noted for tool removable or insertable through or around driving or driven shaft.
- 293+, for telescoping shaft sections wherein the sections are provided with opposing faces which are adapted to contact upon movement of the sections to cause an impact or jar.

SEE OR SEARCH CLASS:

- 285, Pipe Joints or Couplings, subclasses 298+ for variable length pipe joints.
- 403, Joints and Connections, subclasses 52+ for articulated members in general.
- 464, Rotary Shafts, Gudgeons, Housings, and Flexible Couplings for Rotary Shafts, subclasses 18+ for a flexible coupling between fluid-conducting rotary shafts; and subclasses 162+ for a drive coupling facilitating relative axial motion between coupled members.

322 Telescoping motion related to relative axial rotation or oscillation:

This subclass is indented under subclass 321. Apparatus in which the sections of shafting include means acting between the sections so that the collapsing motion is accompanied by relative motion of the sections about the axis of the shafting (e.g., axial rotation or axial oscillation).

- (1) Note. The axial motion may be specifically described as either (1) causing the collapsing or telescoping or (2) being caused by the collapsing or telescoping of the sections for classification in this subclass.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

298, for devices having a below ground hammer or impact device in which continuous unidirectional rotary motion of one telescoping member effects the impacting.

323 Helix or helically arranged structure:

This subclass is indented under subclass 320. Apparatus including structure other than the structure of a bit providing a helix or portions arranged in a helical manner.

(1) Note. The helix or helically arranged portions usually perform a pumping or conveying function.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

102, for a helix or helically arranged structure in a device which includes a below ground tool drive motor.

310, for a receptacle with a helical conveyor.

388, for a bit having a pilot which is helical.

394+, for a bit with a helical conveying portion.

SEE OR SEARCH CLASS:

15, Brushing, Scrubbing, and General Cleaning, subclass 104.33 for helically shaped sewer cleaners.

324 Means other than tool structure to induce fluent flow:

This subclass is indented under subclass 320. Apparatus including structure other than the structure of the tool which is specifically adapted to cause the circulation of flowable material (e.g., cuttings or drilling fluid) within the tool shaft or borehole.

(1) Note. Since most boring tools normally include or are inherently adapted to cause a degree of impelling or conveying, tool structure is excluded as subject matter for this subclass and is classified in the appropriate tool subclass.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

100, for means to induce fluent flow comprising discharge passages for motive fluid of a below ground fluid operated motor directed toward the bore entrance.

102, for a below ground pump for the removal of cuttings combined with a below ground tool drive motor.

213, for a flushing fluid handling system in which a pump inlet communicates with the bore bottom.

217, for an above ground means for handling drilling fluid or cuttings including a pump which may be positioned below ground.

323, and the search there noted for a helix or helically arranged structure on a tool shaft for inducing fluid flow.

SEE OR SEARCH CLASS:

166, Wells, subclasses 62, 68 and 105+ for an eduction pump or plunger in a well.

417, Pumps, appropriate subclasses for pumps of general utility.

418, Rotary Expandable Chamber Devices, appropriate subclasses for rotary expandable chamber devices, per se.

325.1 Shaft carried guide or protector:

This subclass is indented under subclass 320. Apparatus in which a means on the tool shaft directs, positions, or shields a drillstring or a portion thereof.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

73+, for bore wall engaging guides which act to constrain the tool to bore along a curved path.

97+, for a below ground tool drive motor in which the motor support is provided with means for engaging the bore wall.

323, for a tool shaft having helical impeller or conveyor structure engaging the bore wall.

399, for nonsymmetrical bits provided with bore wall engaging guide means.

408, for bits having means on the bit to centralize or stabilize the bit.

SEE OR SEARCH CLASS:

166, Wells, subclasses 117.5+ for means guiding an insertable element laterally of bore axis and subclasses 241.1+ for means positioning a well device within a well.

325.2 Coupled between shaft sections or bit and shaft section:

This subclass is indented under subclass 325.1. Apparatus where the guide or protecting means is (1) a discrete device connecting two axially spaced shaft sections or (2) a shaft section and a bit in which the tool shaft or portion is specifically adapted to hold the bore wall guide or protector means.

325.3 With bore wall engaging means rotatable relative to shaft section (e.g., with bearings):

This subclass is indented under subclass 325.2. Apparatus where a borehole contacting device is mounted on the shaft section in a manner that allows the shaft section to rotate while the guide or protector means is substantially fixed in the borehole.

SEE OR SEARCH CLASS:

384, Bearings, subclasses 29+ for a cylindrical linear bearing of general use; if borehole or well contacting structure is disclosed or claimed, placement is in Class 175, subclasses 325.1+.

325.4 Having removable inserts:

This subclass is indented under subclass 325.2. Apparatus where a bore wall contacting portion is readily placed in or removed from a slot or an aperture in the guide or protector means.

325.5 Surrounding existing shaft section:

This subclass is indented under subclass 325.1. Apparatus where the guide or protector encircles and is secured to the shaft.

325.6 Held by a fastener parallel to shaft axis:

This subclass is indented under subclass 325.5. Apparatus where the guide or protector means encircles and is fixed to the shaft by a securing means having a longitudinal axis equidistant to the longitudinal axis of the tool shaft.

325.7 Held by discrete fastening means tangential to shaft axis:

This subclass is indented under subclass 325.5. Apparatus where the guide or protector means encircles and is fixed to the shaft by a securing means having a longitudinal axis that touches a single point of a planar circle whose center is the longitudinal axis of the tool shaft.

326 Engaging means advances in adjacent hole:

Apparatus under subclasses 325.1+ in which at least a portion of the guide means advances with the tool, and is described as larger than the area of bore being formed so that the advance is guided by a surface (generally a performed bore) that is laterally spaced from the bore currently being formed by the tool.

327 BIT OR BIT ELEMENT:

This subclass is indented under the class definition. Apparatus comprising (1) a tool having a cutter element or cutting edge which is disclosed as specifically adapted to mechanically contact and selectively cut, disintegrate or dislocate portions of masonry, stone, rock or earth formations to form or enlarge a hole or bore therein or (2) subcombinations of such a tool not otherwise classified.

(1) Note. Cutter element is defined as any portion of a bit that comprises a cutting edge and a body portion that is specifically formed to be movably or immovably engaged or connected to a supporting structure (i.e., bit head) which supporting structure by itself has no disintegrating function but serves as an intermediate member for connecting the cutter element to a drive shaft.

(2) Note. Cutting edge is defined as that portion of the cutter element or bit that initially contacts and cuts, disintegrates or dislocates the earth formation, said edge may be composed of a surface which is usually sharpened or chisel shaped; however, any projection or surface the sole purpose of which is to cut disintegrate or dislocate the formation which it contacts is included under the term cutting edge.

SEE OR SEARCH CLASS:

- 30, Cutlery, appropriate subclasses for cutlery of general utility.
- 37, Excavating, appropriate subclasses, particularly subclasses 446+ for digging edge of scoops.
- 51, Abrasive Tool Making Process, Material, or Composition, for an abrasive tool making process, material, or composition in general.
- 52, Static Structures (e.g., Buildings), subclasses 155+ for a piercing or expanding earth anchor.
- 76, Metal Tools and Implements, Making, subclasses 102 and 108.1+ for blanks and processes for making drills.
- 111, Planting, subclass 99 for dibbles for planting.
- 125, Stone Working, subclasses 36+ for stone working tools including drills adapted to bore a hole in stone not in situ.
- 144, Woodworking, for a woodworking machine including cutting edges.
- 172, Earth Working, subclasses 681+ and the search there noted for earth working tools.
- 241, Solid Material Comminution or Disintegration, appropriate subclasses, and particularly subclasses 291+ for apparatus for breaking up solid material.
- 299, Mining or In Situ Disintegration of Hard Material, subclass 79.1 for a cutter head or tooth for mining or disintegrating hard material in situ.
- 407, Cutters, for Shaping, for a metal working cutter.
- 408, Cutting by Use of Rotating Axially Moving Tool, subclasses 186+ and 199+ for a tool of that class type.
- 433, Dentistry, subclass 165 for dental tool bits.
- 451, Abrading, for an abrading tool of general utility, and particularly subclasses 490+ for a tool support for a flexible-member abrading tool, subclasses 526+ for a flexible-member abrading tool, per se, and subclasses 540+ for a rigid abrading tool.
- 606, Surgery, subclasses 80+, for bone drills and subclasses 167+, for cutting, puncturing or piercing tools in general.

328 Magnetized or with magnet:

This subclass is indented under subclass 327. Apparatus in which the bit is provided with a magnet or with a magnetized portion.

- (1) Note. The magnet or magnetized portion may comprise either a permanent magnet or an electromagnet.
- (2) Note. A bit that may become magnetized during use is excluded.

SEE OR SEARCH CLASS:

294, Handling: Hand and Hoist-Line Implements, subclass 65.5 for a grapple adapted to be used in a borehole and provided with a magnet.

331 Rolling cutter bit or rolling cutter bit element:

This subclass is indented under subclass 327. Apparatus comprising a rotary bit in which a cutter element or carrier for a fixed cutter is rotatably mounted thereon so that the cutter element or carrier may roll or tend to roll on a surface of the bore as the bit is rotated.

- (1) Note. Patents have been classified in this and indented subclasses which claim a portion of a bit which is specifically described as a roller cutter bit even though the roller cutter element is not claimed.
- (2) Note. An endless flexible member mounted to roll about journals on the bit head in response to rotation of said head is considered a rolling cutter and is classified in this and indented subclasses.
- (3) Note. The term "readily detachable" as employed in the notes to this and indented subclasses refers to constructions which may be disassembled by employing only conventional hand tools. Patents which claim that the various parts or subassemblies may be separated by a cutting torch and new components welded together, have not been treated as involving readily detachable components although some of these patents refer to such welded parts as being detachable.

SEE OR SEARCH CLASS:

- 15, Brushing, Scrubbing, and General Cleaning, subclass 104.13 for pipe cleaners having similar rollers.
- 172, Earth Working, subclasses 518+ for rolling, rotating or orbitally moving earthworking tools.
- 299, Mining or In Situ Disintegration of Hard Material, subclass 86 for a cutter head for mining or disintegrating hard material having a rolling cutter.

332 Core forming-type bit:

This subclass is indented under subclass 331. Apparatus in which the rolling cutter element or a fixed cutting edge of the bit is so arranged that the bit makes an annular cut in the formation and leaves a central undisturbed portion of the formation in the form of a cylinder.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 403+, and the search there noted for other core forming type bits.

333 With core-breaking means:

This subclass is indented under subclass 332. Apparatus in which the bit is further provided with means to disintegrate the undisturbed cylindrical portion of the formation after it has been formed.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 404, and the search there noted for other core forming type bits having core breaking means.

334 Bit with leading cutter forming smaller diameter initial bore:

This subclass is indented under subclass 331. Apparatus in which the rolling cutter element or a fixed cutting edge of the bit forms a first bore of definable diameter, and a trailing rolling cutter or fixed cutting edge increases the diameter of the first bore so that the boring outline of the bit will describe at least one peripheral axial step.

- (1) Note. Since many rolling cutting bits include toothed rolling cutter elements which will individually form "steps" due to inclination of the cutter relative to the

bit axis, or varying tooth lengths, such patents are excluded from this subclass and classified on other rolling cutter bit features.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 385+, for a nonroller type bit having a pilot cutter.

335 Leading fixed cutter:

This subclass is indented under subclass 334. Apparatus in which the leading cutter or pilot comprises a cutter element or cutting edge other than a rolling cutter element or portion thereof.

336 Rolling cutter bit with fixed cutter:

This subclass is indented under subclass 331. Apparatus in which the bit includes a cutter element or cutting edge other than a rolling cutter element or portion thereof.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 335, for a rolling cutter bit provided with a fixed pilot cutter.

337 With drilling fluid supply to bearing:

This subclass is indented under subclass 331. Apparatus in which the cutter element is rotatably mounted on a bearing and in which drilling fluid is supplied to the bearing to clean, cool or lubricate such bearing.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 227+, for storage or conduit means for bit lubricant other than drilling fluid.
- 339+, for other drilling fluid conduit structure in a rolling cutter bit.

SEE OR SEARCH CLASS:

- 384, Bearings, subclass 93 for bearing structure with lubrication means which are adapted for use in roller type rock drill bits and only enough support structure for the bearing. The lubricant can be drilling fluid. The support can be broadly recited roller cutter bit but not details of the cutter relating to cutting, or lubricating a cutter.

338 With rotary or endless carrier:

This subclass is indented under subclass 331. Apparatus in which the rolling cutter element is rotatably mounted on an endless or rotary carrier so that both the rolling cutter element and the carrier may roll or tend to roll on a surface of the bore as the bit is rotated.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

89, for tool element on continuously driven flexible or articulated endless member.

339 With drilling fluid conduit details:

This subclass is indented under subclass 331. Apparatus in which the bit is provided with a particular nozzle, passage or conduit to supply drilling fluid to the cutting edge of the rolling cutter element or to the surface of the formation being disintegrated.

- (1) Note. Since nearly all earth boring tools under subclass 331 are provided with some form of drilling fluid supply, a mere nominal recitation of a fluid nozzle or passage has been excluded.
- (2) Note. The fluid nozzle, passage or conduit need not define a tubular structure, it may form only a portion of the wall of the fluid conducting means.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

227+, for storage and conduit means for a bit lubricant other than the drilling fluid.

332+, for a core forming type roller bit provided with fluid conduit details.

337, for a drilling fluid supply to a roller cutter element bearing.

340 Fluid conduit lining or element (e.g., slush tube or nozzle):

This subclass is indented under subclass 339. Apparatus in which the means to supply drilling fluid comprises (1) a coated or treated passage or (2) a distinct element which is limited in use to conducting, directing, or blocking the drilling fluid.

- (1) Note. A fluid conducting element under part (2) of the definition which is also a

cutter element or a bit is classified either with subclass 339 or is classified on other bit structure.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

227+, for a storage and conduit means for lubricant other than drilling fluid for a bit.

332+, for a core forming type roller bit provided with a fluid conduit lining or element.

337, for a drilling fluid supply to a roller cutter element bearing.

393, for a fluid conduit lining or fluid conducting, directing or blocking element for a bit other than a roller type bit.

341 Plural rolling cutters with intermeshing teeth:

This subclass is indented under subclass 331. Apparatus in which the bit is provided with a plurality of rolling cutter elements which cutter elements are provided with cutting edges arranged in circumferential rows about each cutter element, and which rows are positioned on each of the cutter elements so that the cutting edges of one row interfit the cutting edges of an adjacent cutter element row.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

319, for plural rolling cutter elements provided with cutting edges arranged in circumferential rows about each cutter so that the cutting edges of one cutter element interfit the cutting edges of the other cutter element in driving relation.

SEE OR SEARCH CLASS:

241, Solid Material Comminution or Disintegration, subclass 236 for intermeshing plural rotating crushing surfaces in a comminuting device.

342 Adjustable cutter element:

This subclass is indented under subclass 331. Apparatus in which means are provided to selectively hold the rolling cutter element in different positions with respect to the bit head.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

382+, for an adjustable nonrolling cutter element.

343 Wobbling cutter:

This subclass is indented under subclass 331. Apparatus in which (1) the rolling cutter element is mounted on an axis which is spaced from, or inclined to the geometric axis of the cutter or cutting edge, or (2) in which the rolling cutter element is loosely held on its rotary supporting means so that it may continually shift laterally as it rolls.

(1) Note. The loosely supported cutters are usually disks which slide on part of the bit head to effect a self-sharpening function.

344 Noncutting portion forwardly of rolling cutter (e.g., reamer):

This subclass is indented under subclass 331. Apparatus in which the rolling cutter element is carried on a bit having a portion extending inwardly toward the axis of the bit and forwardly of the cutter element in the direction of boring and which has no cutting function.

(1) Note. The noncutting portion can be located between claimed cutting portions and patents which claim cutting portions spaced longitudinally of the bore axis will be classified in this subclass even though no noncutting portion is specifically recited.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

295, for a device having a noncutting portion forwardly of a sleeve impact member having a cutting portion thereon.

406+, for a bit having a noncutting portion forwardly of the cutting portion and in which the cutting portion is a nonrolling cutter.

345 Longitudinal axis cutter:

This subclass is indented under subclass 344. Apparatus in which the rolling cutter element is mounted on the bit head on an axis which

extends in the same general direction as the axis of the bit.

(1) Note. The cutter axis has been considered as extending in the general direction of the axis of the bit when it is disclosed as inclined to the axis of the bit at an angle of less than 30°.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

348+, for a rolling cutter element mounted on a bit on a longitudinal axis.

346 Separable support for cutter axle:

This subclass is indented under subclass 345. Apparatus wherein the rolling cutter element is mounted on an axle which is supported on the bit by means of two or more spaced readily detachable supporting devices.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

363, for a transverse axis rolling cutter element mounted on an axle which is supported on the bit by means of two or more spaced readily removable supporting devices.

347 Removable axle or bushing:

This subclass is indented under subclass 345. Apparatus wherein the rolling cutter element is mounted on an axle or bushing which is removably fastened to the bit by a means which is readily detachable.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

346, for axles which are supported by a supporting device which supporting device is detachably connected to the bit.

364, for a transverse axis rolling cutter element which is mounted on an axle or bushing which is removably fastened to the bit.

348 Longitudinal axis cutter:

This subclass is indented under subclass 331. Apparatus in which the rolling cutter element is mounted on the bit head on an axis which extends in the same general direction as the axis of the bit.

- (1) Note. The cutter may have cutting means on its periphery or on its radial face.
- (2) Note. The cutter axis has been considered longitudinal when it is disclosed as inclined to the axis of the bit at an angle of less than 30°.

SEE OR SEARCH THIS CLASS, SUBCLASS:

345+, for rolling cutter reamers which are mounted on an axis extending longitudinally of the bit.

349 With transverse axis cutter:

This subclass is indented under subclass 348. Apparatus in which an additional rolling cutter element is mounted on an axis extending transversely of the bit head.

350 Laterally offset cutter axis:

This subclass is indented under subclass 331. Apparatus in which the axis of the rolling cutter element is offset from a radial vertical plane containing the longitudinal axis of the bit.

- (1) Note. The purpose of offsetting the cutter axis is to obtain a sliding or scraping cut but enough radial component is usually provided for the cutter axis to cause the cutters to roll as well as slide.

351 Disk blade:

This subclass is indented under subclass 350. Apparatus in which the rolling cutter element comprises a cutting wheel having a smooth, unbroken, sharpened, cutting edge at its periphery.

- (1) Note. This subclass includes plural disk cutters mounted on different axes offset from each other as well as from the drill head axis.
- (2) Note. Bits employing only offset, serrated disks having a stepped or undulating edge have been treated as having a toothed cutting edge and are classified in subclass 350.

SEE OR SEARCH THIS CLASS, SUBCLASS:

373, for earth boring cutter disks, per se, or with broadly recited supporting structure.

352 Plural coaxial cutters:

This subclass is indented under subclass 351. Apparatus in which an additional rolling cutter element is mounted generally coaxially with the disk cutter.

- (1) Note. The additional cutter may be a disk or a toothed cutter and may rotate either with respect to or in unison with the disk cutter, (e.g., integral coaxial or spool cutters).

353 Cone or frustum rolling cutter:

This subclass is indented under subclass 350. Apparatus in which the rolling cutter element comprises an axially elongated roller which tapers in diameter along its axis.

354 Axle rotatable with cutter:

This subclass is indented under subclass 331. Apparatus in which the rolling cutter element is provided with a rotatably mounted supporting member which is integral therewith or fixed thereto to rotate therewith.

- (1) Note. The rotatable shaft or shank may have a plurality of cutting members secured thereto.

SEE OR SEARCH THIS CLASS, SUBCLASS:

352, for coaxial cutters which may be supported on a common rotary axis, the cutters being on a laterally offset axis and at least one cutter being a disk.

355 Circumferentially displaced cutter axes:

This subclass is indented under subclass 331. Apparatus comprising a plurality of rolling cutter elements in which the axis of one cutter element lies in a diametric plane containing the bit axis while the axis of another cutter element is disposed in a plane which is displaced from said diametric plane through an angle measured in a plane perpendicular to the bit axis.

356 Stub axle only:

This subclass is indented under subclass 355. Apparatus in which all of the cutter elements are journaled on a separate axle or pin supported at one end only in cantilever fashion.

357 Detachable multiaxis support or spider:

This subclass is indented under subclass 355. Apparatus in which all of the cutter elements are journaled on a separate axle or pin supported by a frame, bracket, or securing means which is readily detachable from the bit head in such manner that all of the axles or pins may be detached simultaneously.

358 Mutually contacting cutter supports:

This subclass is indented under subclass 355. Apparatus in which all of the cutter elements are journaled on a separate axle or pin which intersect, abut, or otherwise engage each other under the bit head so as to support or brace each other.

(1) Note. Additional brace means may be interposed between the head and the region of intersection or engagement of the cutter supports.

359 With bearing or seal details:

This subclass is indented under subclass 358. Apparatus provided with a specific bearing or seal structure.

(1) Note. Since nearly all rolling cutter elements employ some form of bearing, nominally recited bearing structures as defined in (1) Note to subclass 371, have been excluded and the patent has been classified on the basis of the remaining features.

SEE OR SEARCH THIS CLASS, SUBCLASS:

371+, for bearings and seals in other combinations with cutter structure and see the notes thereunder.

SEE OR SEARCH CLASS:

277, Seal for a Joint or Juncture, for a generic sealing means or process, subclasses 358+ for a relatively rotatable radially extending sealing face member (e.g., face, mechanical, etc.)

or subclasses 500+ or a dynamic circumferential contact seal for other than a piston.

360 Cross axle with stub axle:

This subclass is indented under subclass 331. Apparatus comprising a plurality of rolling cutter elements and in which one cutter is journaled on an axle or pin disposed transversely of the bit axis and which axle or pin is supported at spaced points and another rolling cutter element is journaled on an axle or pin supported at one end only and extending in cantilever fashion.

(1) Note. The stub axle may be a continuation of the cross axle.

SEE OR SEARCH THIS CLASS, SUBCLASS:

355, 357 and 358+, for rolling cutters on cross and stub axles which are circumferentially displaced in a horizontal plane about the bit axis.

361 Cross axle:

This subclass is indented under subclass 331. Apparatus in which the rolling cutter element is journaled on an axle or pin disposed transversely of the bit axis and which axle or pin is supported at spaced points.

(1) Note. The cross axle may consist of a plurality of stub axles connected together (for example, by a sleeve or by welding) to form a continuous axle.

SEE OR SEARCH THIS CLASS, SUBCLASS:

356, for stub axles which merely abut each other.

362 Vertically disaligned cross axle sections:

This subclass is indented under subclass 361. Apparatus comprising a plurality of rolling cutter elements disposed on axes which extend in a single diametric plane through the bit, and which are (1) angularly related to each other within the plane, or (2) offset vertically from each other within the plane.

SEE OR SEARCH THIS CLASS, SUBCLASS:

350+, for cutters on laterally offset axes.

- 355+, for cutters on axes which are disposed in angularly related diametric planes.
- 363 Separable supports:**
This subclass is indented under subclass 361. Apparatus in which (1) one or more of the spaced supporting devices for the cross axle are readily detachable from the bit head to release the axle or (2) the bit head consists of plural mating sections which are readily detachable from each other to release the cross axle.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
- 346, for a rolling cutter element journaled on a longitudinal axle, which axle is supported at spaced points by readily removable supporting devices.
- 357, and 366, for similar detachable supports for circumferentially displaced cutter axles and for stub axles, respectively.
- 364 Removable cross axle or bushing:**
This subclass is indented under subclass 361. Apparatus in which the axle is in the form of a pin, bearing or bushing which is removably fastened to the bit head by a means which is readily detached.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
- 354, for detachable, rotatably mounted axles.
- 363, for cross axles which are supported by a member which is detachably connected to the head.
- 367+, for detachable stub axles.
- 365 Outwardly directed stub axle:**
This subclass is indented under subclass 331. Apparatus in which the rolling cutter element is journaled on axle or pin which is supported at its inner end only in cantilever fashion and extends radially away from the center of the bit head.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
- 356, for stub axles which are circumferentially spaced and which may be outwardly directed.
- 366 Separable support for stub axle:**
This subclass is indented under subclass 331. Apparatus in which the rolling cutter element is journaled on an axle or pin supported at one end only in cantilever fashion on an arm, leg or bracket which is removably connected to the rest of the bit head by a means which is readily detachable.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
- 357, for plural circumferentially spaced rolling cutter elements journaled on separate axles or pins which are supported by a means which is readily detachable from the bit head to simultaneously detach all of the axles or pins.
- 363, for cross axle supports which are detachably connected to the bit head.
- 367 Detachable stub axle, bushing or bearing:**
This subclass is indented under subclass 331. Apparatus in which the rolling cutter element is journaled on an axle or pin supported at one end only in cantilever fashion, said axle or pin being either (1) readily detachable, or (2) provided with a bearing or bushing which is readily detachable therefrom.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
- 364, for cross axles which are removably connected to part of the bit.
- 368 Releasable cutter securing device:**
This subclass is indented under subclass 367. Apparatus in which means are provided to secure the cutter element to the removable axle, pin, bushing or bearing and which is releasable to free the cutter element after the removal of the axle, pin, bushing or bearing.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
- 369+, for other releasable cutter securing devices.
- 369 Stub axle cutter securing means:**
This subclass is indented under subclass 331. Apparatus in which the rolling cutter element is journaled on an axle or pin, supported at one end only in cantilever fashion and provided

with a particular means to rotatably secure the rolling cutter element with respect to the axle or pin.

- (1) Note. The securing means need not be releasable and may be intended to permanently secure the cutter to the stub axle (e.g., “snap connections”). Patents which merely recite that the cutter is “releasable” have been classified on the basis of other claimed features and cross-referenced into this subclass when appropriate.

SEE OR SEARCH THIS CLASS, SUBCLASS:

368, for releasable means to secure a rolling cutter to a detachable stub axle.

370 Released by antifriction bearing disassembly:

This subclass is indented under subclass 369. Apparatus in which the rolling cutter element is journaled on the axle or pin by a bearing having rolling elements which may be removed from their races to provided for removal of the rolling cutter element.

371 With bearing or seal details:

This subclass is indented under subclass 331. Apparatus provided with a specific bearing or seal structure.

- (1) Note. Since nearly all rolling cutters employ some form of bearing, nominally recited bearing structures have been excluded and such patents have been classified on the basis of the cutting features claimed. A claim reciting a “bearing sleeve”, a “roller bearing”, or a “ball bearing having inner and outer races” would be considered to involve a mere nominal recitation of bearing structure but patents claiming specific locations of bearings with respect to the cutters; specific bearing shape, characteristics or materials, or bearings which detachably secure the cutters to their axles have been considered to involve more than nominal bearing structure. For example, a claim reciting “a bushing having a hard faced bearing surface” or “a pair of ball bearings engaging shoulders in the roll-

ing cutter” would be classified in this or the indented subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

359, 364, 367+, and 370, for bearing or seal structures of the type there provided.

SEE OR SEARCH CLASS:

277, Seal for a Joint or Juncture, for a generic sealing means or process, subclasses 358+ for a relatively rotatable radially extending sealing face member (e.g., face, mechanical, etc.) or subclasses 500+ or a dynamic circumferential contact seal for other than a piston.

384, Bearings, subclass 94 for bearing structure with a seal which are adapted for use in roller type rock drill bits and only enough support structure for the bearing, the drill bit can be broadly recited as a support for the bearing but not details of cutting, teeth, etc.

372 Antifriction type:

This subclass is indented under subclass 371. Apparatus in which the bearing is an antifriction bearing employing rolling elements.

SEE OR SEARCH THIS CLASS, SUBCLASS:

370, for antifriction bearings which may be disassembled to release a rolling cutter from its support axle.

373 Disk cutter:

This subclass is indented under subclass 331. Apparatus in which the rolling cutter element comprises a wheel having an unbroken, sharpened cutting edge portion at its periphery.

- (1) Note. Serrated disks having a stepped or undulating edge have been treated as toothed cutting edge despite the fact that they may be termed “disks” in the claims and are classified on other structure.

SEE OR SEARCH THIS CLASS, SUBCLASS:

351, and 352, for disk cutters in a bit having laterally offset cutter axis.

SEE OR SEARCH CLASS:

- 30, Cutlery, subclass 347 and the search there noted for rotary blade cutters of general utility.
- 172, Earth Working, subclass 604 for a disc earth working tool, per se.

374 Specific or diverse material:

This subclass is indented under subclass 331. Apparatus in which the bit or any portion thereof is composed of (1) two or more different materials, (2) a single material which has been treated to provide portions of the bit with specific properties which properties are different from the properties of another portion or (3) a specific material.

- (1) Note. The mere recitation under part (3) of metal, iron or steel, per se, is excluded. However, specifying iron and steel or different types of iron or steel would be included under part (1).
- (2) Note. The specific material under part (3) may be identified by its properties (e.g., ductile, soft, hardened, etc.).
- (3) Note. Under part (1) a rolling cutter element having an insert connected thereto would be included since the cutter element and insert would normally be composed of diverse material.
- (4) Note. A bit provided with a welded, brazed or soldered joint is considered formed of diverse material and is classified under this definition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 425+, for a nonroller type bit composed of specific or diverse material.

SEE OR SEARCH CLASS:

- 76, Metal Tools and Implements, Making, subclasses 102 and 108.1+ for processes of making augers and drills usually of specific material.

375 Welded:

This subclass is indented under subclass 374. Apparatus in which portions of the bit are connected together by (1) heating the parts to a

plastic or fluid state and allowing the metals to flow together with or without the addition of other molten metal or (2) connecting the parts by means of melted or fluid metal (e.g., solder).

- (1) Note. This subclass includes depositing weld material on a part of the bit as, for example, to form a wear surface or a cutting edge.
- (2) Note. The mere recitation in a claim that parts of a bit are connected has been included in this subclass provided there is a specific description that the connection has been formed in the manner set forth in the definition of this subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 376, for a nonroller type bit having a welded portion.

376 Nonsymmetrical bit (e.g., nontracking):

This subclass is indented under subclass 331. Apparatus in which the external physical form or shape of the bit is such that the bit has (1) no more than one plane of bilateral symmetry passing through a line coinciding with the longitudinal axis of the drive shaft for the bit and (2) no radial symmetry about an axis coinciding with the longitudinal axis of the drive shaft for the bit.

- (1) Note. For the purposes of this subclass an element has bilateral symmetry when each part thereof lying on one side of a plane passing there through has a corresponding part lying on the opposite side of the plane at an equal distance from the plane and on a line through the parts and perpendicular to the plane. An element has radial symmetry when it can be divided into a plurality of segments radially about the axis of symmetry each of which has the same shape and size and the sum of the radial angles of all the segments equal 360 degrees.
- (2) Note. Patents in which the claims would meet the terms of the definition of this subclass because only a portion of a specifically described bit has been claimed are excluded if the entire bit as described would not meet the terms of the defini-

tion. Such patents have been classified on other features.

- (3) Note. The external form of the bit is considered to include the configuration and location of rolling cutter elements, cutting edges, fluid or cuttings conveying ports or the shape of the bit head, however, a lug or recess or opening for the purpose of connecting the parts of the bit or the bit to the drive shaft are not included, such as, for example, an opening for a single set screw or a flat on the bit head to be received in a socket. Also, the internal shape of fluid, cuttings or core conveying passages are not included. Also, not included is structure where the sole nonsymmetrical feature of the bit resides in the shape or position of teeth or cutting edges on the individual rolling cutters, if all the rolling cutters are identical in shape and size and are symmetrically arranged on the bit head.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 341, for a nonsymmetrical rolling cutter bit in which the cutter edges on one roller cutter intermesh with the cutting edges of an adjacent roller cutter.
- 378, for a rolling cutter element, per se, with irregular tooth rows.
- 398+, for a nonsymmetrical nonroller type bit.

377 Spiral rib or tooth row:

This subclass is indented under subclass 331. Apparatus in which the rolling cutter element is provided with a portion which has a cutting edge or edges arranged along a line or series of lines extending around the circumference of the element and simultaneously extending in a direction along the axis of the cutter element (e.g., helical).

378 Irregular tooth cutter row:

This subclass is indented under subclass 331. Apparatus in which the rolling cutter element has (1) a row of circumferential cutting edges of nonuniform size, shape, or pitch or other cutting edge arrangements (e.g., spacing) which are adapted to prevent repeated engagement or "tracking" of the cutting edges with the

same point on the earth formation or (2) a plurality of circumferential rows of cutting edges and in which there is an abrupt change in shape or pitch between adjacent rows.

- (1) Note. Under part (2) a mere gradual change in size or shape of the cutting edges to allow for the taper of the cutter element is excluded.

SEE OR SEARCH CLASS:

- 15, Brushing, Scrubbing, and General Cleaning, subclass 104.13 for pipe cleaning cutter wheels which have irregularly spaced teeth for the same purpose.

379 Cutting edge self-renewable during operation:

This subclass is indented under subclass 327. Apparatus in which the bit is provided with (1) relatively movable parts which are adapted to move during operation to provide a new cutting edge or (2) a body in the form of repeating similar structure extending longitudinally of the bit such that a new cutting edge is provided when the original cutter edge becomes worn.

- (1) Note. Under part (2) a mere homogeneous bit body which inherently wears away is excluded, some specific repeating structure, such as for example, separate defined layers of specific material, symmetrically arranged apertures in the bit body or a cutter element combined with a backing member made of different material such that as the cutter element and backing member wear an effective cutting edge will be provided, is necessary for classification under this definition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 331+, for rolling cutter bits having plural cutting edges which are used successively and continuously.
- 382+, for adjustable cutter elements which are not adjustable during operation and particularly subclass 383 in which the adjustment is for the purpose of presenting a different cutting edge.

409, for a homogeneous bit-body made of some specific abrasive resistant material.

380 Unsupported abrading particle type (e.g., shot):

This subclass is indented under subclass 327. Apparatus in which the bit is particularly adapted to receive and restrain unsupported abrasive particles between its outer end and the bore bottom, said particles forming the cutting edge of the bit.

(1) Note. For classification under this definition the abrasive particles must be described as separate elements such as shot or other pellets insertable into the bore. Drilled chip particles which may incidentally function to disintegrate the formation are excluded.

(2) Note. The abrasive particles need not be claimed for classification in this subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

54, for shot or pellets which are recirculated by the drilling fluid and act or aid in disintegrating the formation.

381 Cutting edges relatively longitudinally movable during operation:

This subclass is indented under subclass 327. Apparatus in which the bit is provided with a plurality of cutter elements or cutting edges which elements or edges are connected to the bit in such a manner as to permit axial movement of one cutter element or cutting edge relative to another during normal operation of the bit.

SEE OR SEARCH THIS CLASS, SUBCLASS:

319, and the search there noted for other devices having relatively moving plural cutting edges.

382 Adjustable cutter element:

This subclass is indented under subclass 327. Apparatus in which the bit is provided with a movable cutter element and means to selectively hold said cutter element in different positions with respect to the bit head.

(1) Note. A mere clamp which cooperates with a member such that by loosening the clamp the member could be set in any desired position and reclamped is not considered to be adjustable. However, any specific structure such as selectively usable apertures, teeth, slots, etc., for the purpose of permitting the selective change of the relative positions of two parts is included under this definition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

263+, for cutter elements laterally shiftable below ground.

342, for an adjustable rolling cutter bit.

379, for cutting elements which are renewable during operation.

381, for plural cutting edges which are relatively longitudinally movable during operation.

412+, for cutter elements detachably mounted in a bit head by means of clamps or other securing devices.

SEE OR SEARCH CLASS:

172, Earth Working, subclasses 734+ for an adjustable earth working tool.

408, Cutting by Use of Rotating Axially Moving Tool, subclasses 186+ for an adjustable tool of that class type.

383 Adjustment presents different cutting edge:

This subclass is indented under subclass 382. Apparatus in which the cutter element may be selectively held in different positions for the purpose of placing a different cutting edge in operative position for engaging the formation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

379, for a cutter element adjustable during operation to present a new cutting edge.

SEE OR SEARCH CLASS:

172, Earth Working, subclass 735 for an earth working tool which is adjustable to present different working portions.

- 384 Radially adjustable:**
This subclass is indented under subclass 382. Apparatus in which the cutter element is adapted to be selectively held in different positions for the purpose of increasing the circular outline of the cutting edge as the bit is rotated.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
202, for devices operable from the surface to control position of tool or cutter element.
263+, for a cutter element which is laterally shiftable during operation.
- SEE OR SEARCH CLASS:
172, Earth Working, subclasses 741+ for a laterally adjustable earth working tool.
- 385 Bit with leading portion (e.g., pilot) forming smaller diameter initial bore:**
This subclass is indented under subclass 327. Apparatus in which the bit is provided with a leading or pilot cutting edge or portion which forms a first bore of definable diameter, and a trailing cutting edge which increases the diameter of the first bore so that the boring outline of the bit will describe at least one peripheral axial step.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
334+, for rolling cutter bits with a leading cutter forming a smaller diameter initial bore.
- SEE OR SEARCH CLASS:
408, Cutting by Use of Rotating Axially Moving Tool, subclasses 195, 196, 211, 212, 215+, and 223+ for a cutting tool of that class type having a leading pilot or cutting edge.
- 386 Leading portion is separable starter:**
This subclass is indented under subclass 385. Apparatus in which the leading or pilot portion comprises a readily removable starter element for cooperating with the trailing portion to form a shallow, accurately positioned bore, the trailing portion then being described as usable independently of the starter element to continue the boring operation.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
248, for similar structure comprising a core receiver removable through a below ground drill string.
- 387 Leading portion is core forming type:**
This subclass is indented under subclass 385. Apparatus in which the leading or pilot portion has a cutter element or cutting edge so arranged that the bit makes an annular cut in the formation, leaving a central undisturbed portion of the formation in the form of a cylinder.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
403+, and the search there noted for other core forming type bits.
- 388 Leading portion is a screw:**
This subclass is indented under subclass 385. Apparatus in which the leading or pilot portion describes a helical convolution, said convolution extending through at least 180°.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
394+, and the search there noted for other helical boring structure.
- 389 Impact type:**
This subclass is indented under subclass 385. Apparatus in which the cutting edges of the bit are of the type which disintegrate the formation by percussive action.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
346+, for an impact type bit, per se.
- 390 Plural larger diameter steps:**
This subclass is indented under subclass 389. Apparatus in which the cutting edges of the impact bit are arranged so that the boring outline of the bit will describe at least two peripheral axial steps.
- 391 Plural larger diameter steps:**
This subclass is indented under subclass 385. Apparatus in which the cutting edges of the bit are arranged so that the boring outline of the bit will describe at least two peripheral axial steps.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

390, for impact type bits which describe plural larger diameter steps.

392 Leading portion is forked rotary type:

This subclass is indented under subclass 385. Apparatus comprising a rotary bit in which the leading or pilot portion is provided with two or more axially extending branches terminating in cutting edges.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

387, for bits having a core forming leading portion, and generally defining axial leading branches.

421, and the search there noted for bits having axially extending branches terminating in cutting edges.

393 With fluid conduit lining or element (e.g., slush tube):

This subclass is indented under subclass 327. Apparatus in which the bit is provided with means to conduct fluid comprising (1) a coated or treated passage or (2) a distinct element which is limited in use to fluid conducting, directing or blocking a fluid passage.

(1) Note. Under (2) of the definition, only those fluid conducting elements are included which do not form fundamental parts of the bit structure (e.g., a fluid conducting element which also functions to attach or connect cutter elements to a bit head or tool shaft is classified with the bit or cutter structure).

(2) Note. The fluid conducting element may form only a portion of the wall of the fluid conduit.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

339+, and the search there noted for other drilling fluid nozzle or conduit details and particularly subclass 340 for a removable nozzle or conduit element in a roller cutter bit.

SEE OR SEARCH CLASS:

299, Mining or In Situ Disintegration of Hard Material, subclass 81 for a cutter head for mining or disintegrating hard material having an internal fluid passage.

394 With helical-conveying portion:

This subclass is indented under subclass 327. Apparatus in which the bit is provided with a screw shaped surface extending axially thereof for conveying cuttings away from the end of the bit, said screw shaped surface extending through a convolution of at least 180°.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

310, for receptacles with helical conveying structure.

323, for a tool shaft provided with an external helix or conveyor.

388, for bits having a screw pilot.

SEE OR SEARCH CLASS:

52, Static Structures (e.g., Buildings), subclass 157 for an auger type earth anchor.

299, Mining or In Situ Disintegration of Hard Material, subclass 87.1 for a cutter head for mining or disintegrating hard material having a helical cutting or conveying portion.

408, Cutting by Use of Rotating Axially Moving Tool, subclass 230 for a twist drill of general utility.

395 Impact type:

This subclass is indented under subclass 394. Apparatus in which the cutting edge of the bit is of the type which is adapted to disintegrate the formation by percussive action.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

414+, for impact type bits, per se.

396 Axially parallel side wall with transverse cuttings retaining portion:

This subclass is indented under subclass 327. Apparatus in which the bit includes a portion laterally spaced from the axis of the bit, and substantially parallel to said axis, and another portion substantially perpendicular to said first

portion, said other portion extending from said first portion toward said axis, said portions being specifically described as adapted to lift cut material from the borehole.

- (1) Note. The function of retaining cuttings must be specifically described and not left to inference.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

308+, and the subclasses there noted for receptacles and receptacle like structures.

397 Forked rotary nontracking:

This subclass is indented under subclass 327. Apparatus comprising a rotary type bit having a plurality of axially extending cutter elements or cutting edges which elements or edges contact the bottom of the bore and are spaced radially different distances from the longitudinal axis of rotation so that as the bit is rotated a portion of a cutter element or cutting edge engages a portion of the bore bottom not engaged by any other cutter element or cutting edge.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

258, for a bit having a noncutting portion forwardly of a cutting portion.

376, for a roller bit having nontracking cutting edges.

385+, for a bit including a leading portion (e.g., pilot) forming a smaller diameter initial bore.

421, for symmetrical inwardly stepped forked rotary type.

398 Nonsymmetrical bit:

This subclass is indented under subclass 327. Apparatus in which the external physical form or shape of the bit is such that the bit has (1) no more than one plane of bilateral symmetry passing through a line coinciding with the longitudinal axis of the drive shaft for the bit and (2) no radial symmetry about an axis coinciding with the longitudinal axis of the drive shaft for the bit.

- (1) Note. For the purposes of this subclass an element has bilateral symmetry when each part thereof lying on one side of a

plane passing therethrough has a corresponding part lying on the opposite side of the plane at an equal distance from the plane and on a line through the parts and perpendicular to the plane. An element has radial symmetry when it can be divided into a plurality of segments radially about the axis of symmetry each of which has the same shape and size and the sum of the radial angles of all the segments equals 360 degrees.

- (2) Note. Patents in which the claims would meet the terms of the definition of this subclass because only a portion of a specifically described bit has been claimed are excluded if the entire bit as described would not meet the terms of the definition. Such patents have been classified on other features.

- (3) Note. The external form of the bit is considered to include the configuration and location of cutter elements, cutting edges, fluid or cuttings conveying ports or the shape of the bit head, however, a lug or recess or opening for the purpose of connecting the parts of the bit or the bit to the drive shaft are not included, such as, for example, an opening for a single set screw or a flat on the bit head to be received in a socket. Also the internal shape of fluid, cuttings or core conveying passages are not included.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

376, for a nonsymmetrical roller type bit.

394+, for a bit having a helical conveying portion.

397, for a forked rotary nontracking bit.

399 With bore wall engaging guide:

This subclass is indented under subclass 398. Apparatus in which the bit is provided with means engaging the wall of the bore being formed to position the bit or direct its course.

- (1) Note. For classification in this subclass the guide means must be an element other than the body of the bit which may incidentally function as a guide. However, a modification of the bit body to provide ribs, projections or the like

which are specifically described as positioning or directing the bit are included in this subclass.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 73+, for bore wall engaging guides which act to constrain the tool to bore along a curved path.
408, and the search there noted for a bit provided with a bore wall engaging guide.

400 Nonsymmetrical arrangement of opening for cuttings or fluid:

This subclass is indented under subclass 398. Apparatus in which the bit is provided with one or more openings to permit the ingress or egress of either fluid or formation cuttings, the arrangement of the opening or openings with respect to the longitudinal axis of the drive shaft for the bit being nonsymmetrical both bilaterally and radially as required by the definition of subclass 398.

- (1) Note. For classification in this subclass the arrangement of the fluid or cuttings openings themselves must be nonsymmetrical regardless of whether or not the remainder of the bit is nonsymmetrical. Thus a bit which is nonsymmetrical in shape but has a central opening on the shaft axis or a plurality of equally spaced openings about the shaft axis is not included.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 231, for means movable relative to a tool to control eccentric fluid emission.

401 Cutting edges facing in opposite axial directions:

This subclass is indented under subclass 327. Apparatus in which the bit is provided with longitudinally spaced cutting edges, the cutting edges at one spacing facing in one axial direction and the cutting edges at a different spacing facing in the opposite axial direction of the bit.

402 Casing shoe type:

This subclass is indented under subclass 327. Apparatus in which the bit is of the type commonly called "casing shoe", and which is

adapted to be positioned on the end of a tubular conduit to facilitate the entry of such conduit into a preformed bore by reaming or cutting any projections on the bore wall by means of cutting edges provided on said shoe.

- (1) Note. For classification in this subclass the device must be specifically described as a casing shoe and not left to inference.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 403+, and the search there noted for a bit specifically described for forming a core.

SEE OR SEARCH CLASS:

- 166, Wells, subclass 242.8 for a casing shoe which has no cutting or reaming function.

403 Core forming type:

This subclass is indented under subclass 327. Apparatus in which the cutter element or cutting edge of the bit is so arranged that the bit makes an annular cut in the formation and leaves a central undisturbed portion of the formation in the form of a cylinder.

- (1) Note. Patents which specifically describe forming a core of the earth formation have been classified in this subclass even though the claims do not recite the forming of a core.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 4, for processes or devices in which a core receiver is driven into a formation by an explosive.
244+, and the search there noted for a core forming type bit combined with means movable relative thereto to receive, retain, or sever an undisturbed core.
332+, for a rolling cutter bit of the core forming type.
387, for a bit with a leading or pilot portion forming a smaller diameter initial bore in which the leading or pilot portion is core forming type.
402, for similar structure described for use as a casing shoe.

- 405.1, for a core forming type bit including diamond as a specific material.
- 421, for a forked rotary bit having structure which may permit the formation of a core.

SEE OR SEARCH CLASS:

- 73, Measuring and Testing, subclasses 864.44+ for a sampling and tolling implement.
- 125, Stone Working, subclass 20 for disk cutting saws for stone working.
- 408, Cutting by Use of Rotating Axially Moving Tool, subclasses 204+ for annular drills.

404 With core-breaking means:

This subclass is indented under subclass 403. Apparatus in which the bit is further provided with means to disintegrate the undisturbed cylindrical portion of the formation after it has been formed.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 249+, for undisturbed core retaining or severing means.
- 333, for a rolling cutter bit of the core forming type having core breaking means.

405 Impact or percussion type:

This subclass is indented under subclass 403. Apparatus in which the cutting edge of the bit is of the type which is adapted to disintegrate the formation by a forceful contact or a repetitive striking action.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 4, for core tubes driven into a formation by an explosion.
- 414+, for impact type bits, per se.

405.1 Includes diamond:

This subclass is indented under subclass 403. Apparatus in which the cutter element or cutting edge of the bit contains the very hard crystalline form of the element carbon.

406 Noncutting portion forwardly of cutting portion (e.g., reamer):

This subclass is indented under subclass 327. Apparatus in which the cutter element or cutting edge is carried on a bit which has a portion extending inwardly towards the axis of the bit and forwardly of the cutter element or cutting edge in the direction of boring and which has no cutting function.

- (1) Note. The noncutting portion can be located between claimed cutting portions and patents which claim cutting portions spaced longitudinally of the bore axis will be classified in this subclass even though no noncutting portion is specifically recited.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 295, for a device having a noncutting portion forwardly of a sleeve impact member having a cutting portion thereon.
- 311, for receptacle suspended below a bit.
- 344+, for a bit having a noncutting portion forwardly of a cutting portion and in which the cutting portion is a rolling cutter.
- 385+, for bits having a leading or pilot portion forming a smaller diameter bore ahead of a trailing larger diameter cutting portion.
- 401, for reamers having additional upwardly directed cutting edges.
- 404, for a bit having a noncutting portion forwardly of a cutting portion, and in which the cutting portion is positioned within a core bit and functions as a core breaking means.

407 Impact type:

This subclass is indented under subclass 406. Apparatus in which the cutting edge of the bit is of the type which is adapted to disintegrate the formation by percussive action.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 389+, for impact type bit with leading portion forming smaller diameter bore.
- 414+, for impact type bits, per se.

408 With bit guide or bore wall compacting device:

This subclass is indented under subclass 327. Apparatus provided with (1) means on the bit for centralizing or stabilizing the bit in the bore or (2) a device to smooth or compress together the material which makes up the wall surface of the bore.

- (1) Note. For classification under this definition the guide or compacting device must be an element other than the body of the bit which may incidentally function as a guide or compacting device. However, a modification of the bit body such as ribs or projections which are disclosed as for the purpose set forth herein is classified under this definition.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 325.1+, and the search there noted for tool shafts having bore wall engaging means.
 394, for a bit provided with a peripheral helical conveying portion which incidentally functions as a bit guide.
 399, for a nonsymmetrical bit provided with a bore wall engaging guide.
 406+, for a bit having a noncutting portion forwardly of the cutting portion, and in which said noncutting portion functions as a guide.

412 Plural separable cutter elements:

This subclass is indented under subclass 327. Apparatus in which the bit is provided with two or more cutter elements, said elements being detachably secured to the bit head.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 331+, for plural separable rolling cutter elements.
 382+, for detachably mounted cutter elements which are adjustable.

SEE OR SEARCH CLASS:

- 408, Cutting by Use of Rotating Axially Moving Tool, subclasses 199+.

413 Independently attachable:

This subclass is indented under subclass 412. Apparatus in which each cutter element can be separately attached or detached from the bit head without attaching or detaching the other elements.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 331+, for plural separable rolling cutter elements in which the rolling cutters are independently attachable.

SEE OR SEARCH CLASS:

- 37, Excavating, subclasses 446+ for cutting edges attachable to an excavating scoop.

414 Impact or percussion type:

This subclass is indented under subclass 327. Apparatus in which the cutting edge of the bit is of the type which is adapted to disintegrate the formation by a forceful contact or a repetitive striking action.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 19+, for drive points which are driven into the earth usually by impact.
 389+, for impact bits having a leading portion forming a smaller diameter initial bore.
 395, for an impact type bit provided with a helical cuttings conveying portion.
 398+, for a nonsymmetrical impact type bit.
 405, for a core forming impact type bit.
 407, for an impact type bit provided with a noncutting portion forwardly of the cutting portion.

SEE OR SEARCH CLASS:

- 125, Stone Working, subclasses 40+ for impact type tools for working on stone after it has been removed from its position in the earth.
 299, Mining or In Situ Disintegration of Hard Material, subclass 100 for a percussive cutter head for mining or disintegrating hard material.

415 Combined with rotary:

This subclass is indented under subclass 414. Apparatus in which the cutting edge is formed to disintegrate the formation as a result of simultaneous rotary and a forceful contact or a repetitive striking action.

- (1) Note. The dual function of formation disintegrating by rotary and percussive or impact action must be specifically described for classification in this subclass and not left to inference.

SEE OR SEARCH THIS CLASS, SUBCLASS:

331+, for rolling cutters which roll on the bottom of the bore and impact the formation due to the rolling motion.

416 Noncircular bore cutter:

This subclass is indented under subclass 414. Apparatus in which the bit is formed so as to normally cut a hole which is noncircular in cross section.

- (1) Note. The bit must be specifically disclosed as cutting a hole of noncircular cross section for classification in this subclass.

SEE OR SEARCH CLASS:

408, Cutting by Use of Rotating Axially Moving Tools, subclass 30 for a wood boring bit adapted to bore a noncircular hole.

417 With internal-fluid passage:

This subclass is indented under subclass 414. Apparatus in which the bit is provided with a drilling fluid passage enclosed within the body of the bit and having an inlet or exhaust port opening to the outside of the bit.

SEE OR SEARCH THIS CLASS, SUBCLASS:

339+, and 393, for a bit provided with a lined fluid passage or where the fluid passage includes a nozzle.

405, for a core forming impact type bit.

418 Plural openings:

This subclass is indented under subclass 417. Apparatus in which the passage has a plurality of inlet or exhaust ports.

419 Cruciform:

This subclass is indented under subclass 417. Apparatus comprising a plurality of cutting edges which lie in perpendicular planes intersecting at a line coinciding with the longitudinal axis of the bit.

420 Cruciform:

This subclass is indented under subclass 414. Apparatus comprising a plurality of cutting edges which lie in perpendicular planes intersecting at a line coinciding with the longitudinal axis of the bit.

SEE OR SEARCH THIS CLASS, SUBCLASS:

419, for a cruciform bit provided with a fluid passage.

420.1 Insert:

This subclass is indented under subclass 414. Apparatus in which the cutting edge of the bit is formed of a relatively small element of abrasive resistant material which is inserted in a slot or aperture in the bit and secured therein.

420.2 Includes diamond:

This subclass is indented under subclass 420.1. Structure including diamond as a specific material.

421 Symmetrical forked rotary type (e.g., fish-tail):

This subclass is indented under subclass 327. Apparatus comprising a rotary type bit provided with at least two axially extending branches terminating in cutting edges, the configuration of said axially extending branches and cutting edges being such that (1) more than one plane of bilateral symmetry may be passed through an axis coinciding with the rotary axis of the bit or (2) radial symmetry is presented about an axis coinciding with the rotary axis of the bit.

- (1) Note. See (1) Note of subclass 398 for definition of bilateral and radial symmetry.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 331+, for a rolling cutter bit in which the rolling cutters form axially extending branches.
- 392, for a rotary bit having a forked forwardly extending portion forming a smaller diameter initial bore.
- 397, for a nontracking rotary type bit having axially extending branches terminating in cutting edges.
- 398+, for a nonsymmetrical forked bit.
- 403+, and the search there noted for a core type bit having axially extending symmetrical forked portions.
- 414+, for an impact type bit comprising axially extending, symmetrical branches terminating in cutting edges.

423 WEDGING SLIP ASSEMBLY FOR SUPPORTING A PIPE OR ROD:

This subclass is indented under the class definition. Subject matter wherein a tapered clasp structure, when lowered into an opening in a separate hole drilling related structure, e.g., a spider or rotary table, is cammed into gripping and suspending engagement with a drilling tube or stem passing through the opening.

- (1) Note. The slip usually temporarily suspends a string of connected pipes or rods during the attaching or detaching of different sections to the string which is being lowered into or taken out of a drill hole.
- (2) Note. The earth boring tool itself is usually not claimed.
- (3) Note. Details of the separate hole drilling related structure may not be claimed.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 255, for earth boring or penetrating means including core retaining means of the sliding wedge type.

SEE OR SEARCH CLASS:

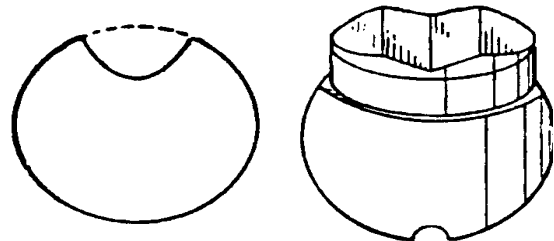
- 24, Buckles, Buttons, Clasps, etc., particularly subclass 114.5 for a strap cable, or pipe button, i.e., a trip or stop projection.

- 73, Measuring and Testing, particularly subclasses 831+ and 856+ for clamping, holding or supporting structure peculiar to or having a sole disclosure for use in specimen measuring and testing.
- 74, Machines Element or Mechanism, particularly subclasses 144+ for an intermittent gripping device for moving a member (e.g., a polish rod); and subclasses 579+ for a pitman or connecting rod and its gripping device.
- 166, Wells, particularly subclasses 75.11+ for above ground apparatus for wells including slips for well pipes or casings which are not involved in the drilling of the well and are more permanent in nature; and subclasses 206+ for an expansible anchor or casing. See the class definition of Class 175, section III for the line between Classes 166 and 175.
- 173, Tool Driving or Impacting, particularly subclasses 213+ for a structure which grips and rotates a pipe or rod to move it into and out of a material.
- 188, Brakes, particularly subclass 67 for a brake mechanically connected to a relatively stationary structure and which holds a pipe or rod at various locations along the pipe's or rod's length for short, quick linear assembly or disassembly during a work or manufacturing operation, or preparatory to a working operation, done by the pipe, rod, or a pipe supported tool.
- 211, Supports: Racks, appropriate subclasses for rack structure which supports an article against the pull of gravity or holds it in a storage position.
- 248, Supports, appropriate subclasses for structure which supports an article against the pull of gravity or holds it in a storage position.
- 254, Implements or Apparatus for Applying Pushing or Pulling Force, appropriate subclasses for a clasp attached to a work pushing or pulling implement or apparatus.
- 269, Work Holders, appropriate subclasses for a clamp which hold an article (e.g., a pipe or rod) while modifying work is done on it, or while a plurality

- of articles are being located in an assembled arrangement.
- 279, Chucks or Sockets, appropriate subclasses for a chuck or socket which grips a pipe, rod, or tool which is intended to be rotated or repeatedly reciprocated by an unclaimed power boring source.
- 285, Pipe Joints or Couplings, appropriate subclasses for pipe joints or couplings for drilling shafts and subclasses 123.15+ and 123.3+, in particular, for pipe joints or couplings for well related pipes or casings through which fluid may flow.
- 294, Handling: Hand and Hoist-Line Implements, particularly subclasses 86+ and 102 for a grapple which is disclosed for gripping articles (e.g., well pipes or rods) being moved between two locations by either a hand or cable lifting force.
- 424 MISCELLANEOUS (E.G., EARTH-BORING NOZZLE):**
This subclass is indented under the class definition. Subject matter not provided for in other subclasses.
- (1) Note. This subclass includes, for example, drill motor housing guide saddles and an art collection of nozzles peculiarly adapted to boring in the earth by fluid flow or jetting.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
11+, for heat applying nozzles.
220, for guide saddles combined with an above ground guide for a relatively advancing tool.
327+, for a bit or bit element having a nozzle.
- SEE OR SEARCH CLASS:
37, Excavating, subclasses 322 and 323 for suction type dredges with jet diggers.
166, Wells, subclasses 222+ for whirling or lateral discharge or projectable nozzles for use in a well.
173, Tool Drive or Impacting, subclasses 197+ and see the search notes therein for a tool driving or impacting means
- provided with a work cleansing means and including a fluid nozzle.
- 239, Fluid Sprinkling, Spraying, and Diffusing, appropriate subclasses for nozzles of general utility.
- 405, Hydraulic and Earth Engineering, subclass 248 for pile installation utilizing a fluid discharge nozzle.
- 425 Specific or diverse material:**
This subclass is indented under subclass 327. Apparatus in which the bit or any portion thereof is composed of either (1) two different materials, (2) a single material which has been treated to provide portions of the bit with specific properties which are different from the properties of another portion or (3) a particular material to which significance is attributed.
- (1) Note. Under part (3), the mere recitation of iron or steel, per se, is excluded. However, specifying both iron and steel would be included under part (1).
- (2) Note. Under part (3), a specific material need not be named as such but may be identified by its properties (e.g., ductile, malleable, hardened).
- (3) Note. A bit provided with a welded brazed or soldered joint is considered to be formed of diverse materials.
- SEE OR SEARCH THIS CLASS, SUBCLASS:
332+, for a core forming roller type bit.
339+, and 393, for a bit having a nozzle or slush tube which may be made of a specific material or a material different from the bit.
374+, for a rolling cutter bit made of a specific material.
403+, for a core forming type bit.
428+, for a compact.
420.2, for an impact type bit including diamonds.
434, for a bit including a diamond.
- SEE OR SEARCH CLASS:
51, Abrasive Tool Making Process, Material, or Composition, for an abrasive tool making process, material, or composition of general utility.

- 76, Metal Tools and Implements, Making, subclasses 102 and 108.1 for processes of making augers and drills usually of specific materials.
- 125, Stone Working, appropriate subclasses for stone working tools including diamond material, and particularly subclass 30.01 for precious stone working and subclass 39 for diamond, surface traversing tools.
- 428, Stock Material or Miscellaneous Articles, subclasses 544+ for stock material or intermediate articles which are all metal or have adjacent metal components, including specific materials used in drill bits, where no specific drill-bit structure is claimed.

- (1) Note. A circle with a notch is considered noncircular and a cutting face in the form of a sine wave is considered nonplanar.



426 Insert:

This subclass is indented under subclass 425. Apparatus in which the cutting edge of the bit is a relatively small element of abrasion resistant material which is at least partially enclosed within a slot or aperture in the bit and secured therein.

427 For a mine roof drill bit type:

This subclass is indented under subclass 426. Apparatus where the insert is in a cutting tooth secured with connecting means to a cutter head for obtaining solid state valuable minerals.

428 Preformed cutting element (e.g., compact) mounted on a distinct support (e.g., blank, stud, shank):

This subclass is indented under subclass 426. Structure where the insert comprises an earth contacting portion that is fixed to a backing or substructure which is then placed in the bit aperture.

429 Including a nozzle:

This subclass is indented under subclass 428. Structure which is combined with a fluid spraying means.

430 Having a Noncircular or nonplanar cutting face:

This subclass is indented under subclass 428. Structure in which the earth contacting portions either (1) defines a line or curve which is other than circular or (2) includes points which are not coplanar.

431 Having a particular orientation or location:

This subclass is indented under subclass 428. Structure where significance is attributed to (1) the compact's alignment or (2) the arrangement of both the compact and support.

- (1) Note. The alignment would include the rake angle.

432 With support detail:

This subclass is indented under subclass 428. Structure in which significance is attributed to a structural feature of the backing or substructure portion.

433 Having a specified thermal property:

This subclass is indented under subclass 428. Structure wherein a property of the compact or support material has a specific temperature or temperature range.

434 Diamond:

This subclass is indented under subclass 425. Apparatus in which the very hard, crystallized form of the element carbon, commonly called a "diamond" is included as a specific material in the structure of the bit.

435 Welded, brazed, or soldered:

This subclass is indented under subclass 425. Apparatus in which portions of the bit are connected together by (1) locally heating the parts to a fluid state and allowing the base metals to flow together with or without the addition of other molten metal or (2) connecting the parts by means of a dissimilar fluid metal having a lower melting point.

- (1) Note. This subclass includes depositing weld material on a part of the bit as, for example, to form a wear surface or a cutting edge.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 375, for a rolling cutter bit having a welded portion.
- 434, for diamond bits including welding.

END