TTAB

Docket No.: 368614-3299 TRADEMARK

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE TRADEMARK TRIAL AND APPEAL BOARD

In re Application: Varel International Ind., L.P.

Mark: VULCAN

Serial No.: 76/700730

Class: 07

Filed: December 8, 2009

Examining Attorney: Amy L. Kertgate
Law Office 113
(571) 272-1943

Certificate of Mailing

Date of Deposit: 11-16-11

I hereby certify that this paper or fee is being deposited with the United States Postal Service with sufficient postage as First Class Mail in an envelope addressed to Trademark Trial and Appeal Board, U.S. Patent and Trademark Office, P.O. Box 1451, Alexandria, VA 22313-1451.

Lisa A. Alcala
(Printed Name)

Lisa A. Alcala
(Signature)

Trademark Trial and Appeal Board
U.S. Patent and Trademark Office
P.O. Box 1451
Alexandria, Virginia 22313-1451

NOTICE OF APPEAL

Applicant hereby appeals to the Trademark Trial and Appeal Board from the decision of the Trademark Examining Attorney dated May 16, 2011, refusing registration.

Payment of in the amount of $100.00 is attached hereto in payment of the appeal fee. It is believed that no additional fee is due. If this is incorrect, the Commissioner is hereby authorized to charge any fees which may be required by this paper to Deposit Account No. 07-0153.

Respectfully submitted,

GARDERE WYNNE SEWELL LLP

11/23/2011 SWILSON1 00000010 76700730

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Date: 11-16-11

Kay Lyn Schwartz
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11-21-2011

U.S. Patent & TMOfc/TM Mail Rcpt Dt. #72

DALLAS 2280171v.1

IN THE UNITED STATED PATENT AND TRADEMARK OFFICE
BEFORE THE TRADEMARK TRIAL AND APPEAL BOARD

In re Application of:	Varel International Ind., L.P.
Serial Number:	76/700730
Filing Date:	December 8, 2009
Mark:	VULCAN
Examining Attorney:	Amy L. Kertgate Law Office: 113 (571) 272-1943

Trademark Trial and Appeal Board
U.S. Patent and Trademark Office
P.O. Box 1451
Alexandria, Virginia 22313-1451

Certificate of Mailing

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Lisa Alcala
(Name of Person Mailing Document)

Lisa A. Alcala
(Signature)

Dear Sir:

REQUEST FOR RECONSIDERATION AND STAY OF APPEAL PENDING RECONSIDERATION

Applicant respectfully requests that the Examiner reconsider the Response to Final Office Action ("Response") and that the appeal filed with the Trademark Trial and Appeal Board be suspended until such time as the Examining Attorney has had the opportunity to consider and act on the previously filed Response.

It is believed that no additional fee is due. If this is incorrect, the Commissioner is hereby authorized to charge any fees which may be required by this paper to Deposit Account No. 070153.

Respectfully submitted,

Date: 11-16-11

By: Kay Lyn Schwartz

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COPY

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November 16, 2011

Commissioner for Trademarks
P.O. Box 1451
Alexandria, Virginia 22313-1451

Re: In re Application of: Varel International Ind., L.P.
Mark: VULCAN
Serial No.: 76/700730
Our File: 368614-3299

Dear Sir:

Enclosed for filing with the Patent and Trademark Office, please find the following:

1. Response to Final Office Action dated May 16, 2011 including Exhibits A-D;
2. Copy of Notice of Appeal and Request for Reconsideration filed with TTAB; and
3. Postcard.

It is believed that no additional fee is due. If this is incorrect, the Commissioner is hereby authorized to charge any fees that may be required by this paper to Deposit Account 07-0153.

Respectfully submitted,

Gardere Wynne Sewell LLP

Kay Lyn Schwartz

KLS/la
Enclosures
DALLAS 2280167v.1

Certificate of Mailing

Date of Deposit: 11-16-11

I hereby certify that this paper or fee is being deposited with the United States Postal Service First Class Mail service under 37 CFR 1.10 on the date indicated above and is addressed to Commissioner for Trademarks, P.O. Box 1451, Alexandria, VA 22313-1451.

Lisa Alcala
(Printed Name)

Lisa A. Alcala
(Signature)

Attorney Docket: 368314-3299

TRADEMARK: VULCAN
Serial No. 76/700730
Examining Atty: Kertgate, Amy L.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Varel International Ind., L.P.
Serial Number:	76/700730
International Class:	07
Filed:	December 8, 2009
Examining Attorney:	Amy L. Kertgate Trademark Examining Attorney Law Office 113 (571) 272-1943
Mark:	VULCAN

Commissioner for Trademarks
P.O. Box 1451
Alexandria, Virginia 22313-1451

RESPONSE TO OFFICE ACTION

The above-identified application has been carefully reviewed in light of the Official Action, made final, mailed May 17, 2011. It is believed that each of the objections raised by the Examining Attorney is satisfied by this response.

Section 2(d) Refusal – Likelihood of Confusion

The Examining Attorney has made the Section 2(d) rejection final, refusing registration of the above-identified mark on the basis that Applicant's mark, when used with the identified goods, is likely to be confused with U.S. Reg. No. 3,815,974 citing Trademark Act § 2(d), 15 U.S.C. § 1052(d); TMEP § 1207. This rejection is respectfully traversed and reconsideration and withdrawal of the Examining Attorney's rejection are requested in light of the following arguments and authorities.

<u>The marks are not identical</u>

Applicant's mark is not identical to the cited Registrant's mark. Applicant's mark is "VULCAN." In contrast, the cited Registrant's mark (noted below), is a highly stylized mark containing an initial letter "V" (which contains associated stylization suggesting movement), the letters "UL", which are then followed by the letters "CAN". The letters "CAN" are demarked/emphasized from the rest of the mark with a line element/stylization above the letters, as shown below:

The emphasis of "CAN" is highly relevant to consideration of the mark as a whole, such that when spoken, the mark may be pronounced, "Vul" "CAN" with more emphasis on the "CAN" part of the mark, the same way someone might say they are able to accomplishing something when encountering resistance (e.g., I <u>CAN</u> do it if you let me). The commercial impression created by the mark clearly encompasses the latter part of the mark (the "CAN" element) which is set apart from the mark with the over-arching line element, suggesting that "VUL" <u>CAN</u>...do it, "VUL" <u>CAN</u> get the job done, etc.

Contrary to the Examining Attorneys' assertion, the marks are not identical visually, in sound, meaning, or commercial impression. Applicant respectfully submits that the marks at issue create different commercial impressions, and the first prong of the test for likelihood of confusion is not met. The marks are not legally similar.

The goods are not the same, or related

As the marks are not identical, the Examining Attorney must show that there is more than just a "viable relationship" between the goods. *See In re Shell Oil Co.*, 992 F.2d 1204, 26 USPQ2d 1687 (Fed. Cir. 1993); In re Opus One Inc., 60 USPQ2d 1812 (TTAB 2001); and *In re Concordia International Forwarding Corp.*, 222 USPQ 355 (TTAB 1983). As has been made of record, the respective goods of the Applicant and cited Registrant are totally different. And furthermore, the respective different goods are not related and would be marketed differently to very sophisticated consumers purchasing different products for different applications. The case law is clear that if the goods in question are not related or marketed in such a way that they would be encountered by the same persons in situations that would create the incorrect assumption that they originate from the same source, then, even if the marks are identical (which these are not), confusion is not likely. *See, e.g., Quartz Radiation Corp. v. Comm/Scope Co.*, 1 USPQ2d 1668, 1669 (TTAB 1986) (holding QR for coaxial cable and QR for various apparatus used in connection with photocopying, drafting, and blueprint machines not likely to cause confusion because of the differences between the parties' respective goods in terms of their nature and purpose, how they are promoted, and who they are purchased by); *Shen Mfg.Co. v. Ritz Hotel Ltd.*, 393 F.3d 1238, 1244-45, 73 USPQ2d 1350, 1356 (Fed. Cir. 2004) (reversing TTAB's holding that contemporaneous use of RITZ for cooking and wine selection classes and RITZ for kitchen textiles is likely to cause confusion, because the relatedness of the respective goods and services was not supported by substantial evidence); *Local Trademarks, Inc. v. Handy*

Boys Inc., 16 USPQ2d 1156, 1158 (TTAB 1990) (finding liquid drain opener and advertising services in the plumbing field to be such different goods and services that confusion as to their source is unlikely even if they are offered under the same marks).

The goods are completely different

The cited Registrant's mark is for a specialized core drilling bit. Applicant's goods, in contrast, are not bits, but rather cutters which are installed on a different type of bit, a rotary drag bit used for a completely different type of application. Applicant's PDC "cutter" is not a bit, but rather is a highly specialized product, incorporated as a component in the end product of a rotary drag bit. Applicant's goods are entirely different from the Registrant's goods.

The goods are not "related"

The Examining Attorney provides various printouts and alleges that they demonstrate that the Applicant's and Registrant's goods are "related "(i.e., alleging that PDC cutters can be used in the mining and geotechnical fields, and core drill bits are used in the oil and gas industry). Applicant's submits that a close examination of the evidence submitted by the Examining Attorney shows this is not the case.

Take for example, the first printout (attached hereto as **Exhibit A**) which appears to be an excerpt from a news article. Reading the article in context, the article does not relate to "core drill bits" (as was what was entered as a search term), but rather, drill bits that are at the essence or "core" of the company's technology (i.e., "The disposition of these assets will allow [Company]...to increase its focus on the delivery of our core drill bit technologies."). Similarly, the printout attached hereto as **Exhibit B** appears to be random paragraphs coupled together, some of which reference the term "core drilling" (in the context of describing this particular drilling technique), and other paragraphs reference the term "PDC Cutter"). Applicant respectfully submits that the fact that two terms appear in an article together does not make those products "related" for purposes of a likelihood of confusion determination.

Many of the articles produced by the Examining Attorney actually show the complete contrast between Applicant's goods and the cited Registrant's goods. Take for example, the material attached hereto as **Exhibit C**. This appears to be an article referencing various "drill types". As noted in Exhibit C, "there are two basic types of drills: drills which produce rock chips, and drills which produce core samples." Diamond core drilling utilizes an annular diamond-impregnated drill bit attached to the end of hollow drill rods to cut a cylindrical core of solid rock. Core drilling is "much slower than reverse circulation (RC) drilling due the hardness of the ground being drilled". "Diamond rigs need to drill slowly to lengthen the life of drill bits and rods, which are very expensive." "Core samples are retried via the use of a "lifter tube" a hollow tube lowered inside the rod. As the core is drilled, the core barrel slides over the core as it is cut" (which is then later removed from the hole, and the core sample is then removed from the core barrel).

In contrast, rotary drilling is used to "wear away at the cutting face" because "there is no need to return intact samples to the surface for assay (as in core drilling, noted above) as the objective is to reach a formation containing oil or natural gas." *See* **Exhibit C**.

The channels of trade/consumers are different, and the consumers are highly sophisticated

In addition to the differences in the relevant goods, the channels of trade and the consumers of the cited Registrant's goods and the Applicant's goods are different. The cited registrant's goods for the specific type of core drilling bit – designed for a specific purpose –

core drilling - would be sold to sophisticated consumers in the core drilling and geotechnical industries engaged in core drilling. Likelihood of confusion is not found where the purchasers of the goods and services at issue are sophisticated. *M&G Electronics Sales Corp. v. Sony Kabushiki Kaisha*, 250 F. Supp. 29, 104 (E.D. N.Y. 2003). Clearly, the consumers of the respective different goods of the respective different marks would not be confused in encountering the marks at issue.

As the Federal Circuit has recognized, circumstances suggesting care in purchasing tend to minimize any likelihood of confusion. *See, e.g., In re N.A.D., Inc.*, 754 F.2d 996, 999-1000, 224 USPQ 969, 971 (Fed. Cir. 1985) (concluding that, because only sophisticated purchasers exercising great care would purchase the relevant goods, there would be no likelihood of confusion merely because of the similarity between the marks NARCO and NARKOMED); *See also In re Homeland Vinyl Prods., Inc.*, 81 USPQ2d 1378, 1380, 1383 (TTAB 2006). Like Registrant's goods, Applicant's goods would be purchased by sophisticated industrial customers only after careful consideration.

Furthermore, the price point for the respective goods at issue range from ***$1000*** to ***$100,000*** ***per article***. *See* **Exhibit D**. As courts have recognized, "the greater the value of an article the more careful the typical consumer can be expected to be." *See e.g. McGregor =-Doniger, Inc. v. Drizzle, Inc.*, 599 F.2d 1126, 1137 (2nd Cir. 1979). Applicant respectfully submits that the sophisticated industrial consumer engaged in drilling oil and gas wells, as compared to the different sophisticated consumer engaged in core drilling, would have different and specific needs in the types of equipment necessary for successfully drilling such specialized wells. Given the technical nature of the different applications, in addition to the expense involved in purchasing components to be used in such specialized operations, great care will be exercised by the professional buyer before purchasing any goods.

In summary, the realities of the marketplace are such that the relevant consumers purchasing the very specialized, different, goods sold by the Applicant and Registrant under the respective different marks would not in any way be confused.

CONCLUSION

It is incumbent upon the Examining Attorney to make the realistic appraisal of the likelihood of prospective purchasers being confused as to the source, origin or sponsorship of Applicant's goods vis-à-vis those goods of the cited registration. The Applicant's mark and the cited mark, as well as the goods offered by Applicant and goods offered by Registrant, are not the same. Any potential confusion caused by any minor overlap of Applicant's goods and the cited Registrant's goods is de minimus. These factors as well as the others discussed in detail above mitigate in favor of a finding that no likelihood of confusion exists and that the Applicant is entitled to registration of its mark.

For the foregoing reasons, Applicant asserts that no likelihood of confusion will result from its registration of the mark "VULCAN" as used in connection with the identified goods. Applicant respectfully requests reconsideration and withdrawal of the Examining Attorney's rejection under § 2(d) of the Lanham Act.

The present response is intended to fully address each of the issues raised by the Examining Attorney. Applicant's attorney requests that the Examining Attorney contact the undersigned if further clarification is needed or if a telephone conference would be useful in resolving the issues pending in this matter. For the foregoing reasons, it appears that Applicant has complied with the outstanding requirements of the Examining Attorney and the present application is in condition for publication and such action is respectfully requested at the earliest possible date.

It is believed that no additional fee is due. If this is incorrect, the Commissioner is hereby authorized to charge any additional fees, which may be required by this paper to Deposit Account 070153.

Respectfully submitted,

GARDERE WYNNE SEWELL LLP

Date: November 16, 2011

By: Kay Lyn Schwartz

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1601 Elm Street
Dallas, Texas 75201
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EXHIBIT A

OKC-based Quantum Drilling buys Halliburton unit The Journal Record (Oklahoma City, OK) August 11, 2005 Thursday

The Journal Record (Oklahoma City, OK)

August 11, 2005 Thursday

SECTION: NEWS

LENGTH: 174 words

HEADLINE: OKC-based Quantum Drilling buys Halliburton unit

BYLINE: Journal Record Staff

BODY:

... vice president of business development for Quantum. "With the shock absorbers acquired from Security DBS Drill Bits, our customers will benefit by prolonging the life of their drill bits and other down-hole drilling equipment."

Halliburton's Energy Services Groups offers products and services to upstream oil and gas customers.

"The disposition of these assets will allow Security DBS Drill Bits the opportunity to increase its focus on the delivery of our **core drill bit** technologies," said Jim Platt, product manager, with Security DBS Drill Bits.

Quantum has its headquarters in Oklahoma City and regional offices and service centers in Casper, Wyo., and Midland, Texas.

EXHIBIT B

Diamond-bit technology pushes hydraulic, rotation limits Oil & Gas Journal December 23, 1985

Oil & Gas Journal

December 23, 1985

SECTION: TECHNOLOGY; Drilling/production; Pg. 55

Note: This table may be divided, and additional information on a particular entry may appear on more than one screen.

LENGTH: 3473 words

HEADLINE: Diamond-bit technology pushes hydraulic, rotation limits

BYLINE: H. C. Vennin, Cristal Profor, Tarbes, France

BODY:

... hold bottom is then largely a function of fluid rock properties and hydraulics.

The rock-destruction process varies with the type of formation. When drilling formations of low compressive strength, the widely spaced teeth accomplish a considerable gouging and scraping action encouraged by the offset of the cones. In hard formations, the rock destruction is accomplished by a maximum of chipping and crushing action.

Surface set diamond bits. The principle of **core drilling** comes to us from remote antiquity. Modern diamond coring with holes up to a mile long is known to have been applied during the 19th century. For example, it was used in 1864 for drilling blast holes in the Mount Cenis tunnel between France and Italy. Diamond coring for the oil industry was introduced in the 1930s. In the next decade, attempts were made to develop solid diamond ...

... on the cutting elements to penetrate the rock.

Consequently, in order to obtain proper service life on bits, it is necessary to match the formation hardness by using smaller cutting elements on the bits. PDC bits must then be made with smaller cutters, in the same manner as roller bits are made with smaller teeth, and diamond bits with smaller diamonds.

To match this requirement, it is possible to use small **PDC cutters** in the form of angle-shaped, thermally stable compacts to be set and brazed with the bit matrix, giving sharp exposure at the diamond bit surface.

When drilling permeable rocks at greater depth, the rate of penetration is reduced not only by confiding pressure, but also by differential pressure when the mud column pressure exceeds the formation pressure. In this case, fluid filtrate may flow rapidly into the rock leaving filter cake behind.

When the fluid loss is high, the drill front becomes blocked with filter cake and cuttings which will reduce the bit penetration. This phenomenon also refers to the classic chip hold down theory. It is assumed that all three bit types, PDC, roller cone, and diamonds, are diversely affected by the bottom hole scavenging.

Recent articles n6 suggest that the **PDC cutter** is least affected because its cutters are large and well exposed, and therefore can more easily cut through the filter cake and crushed rock to clean the hole as it drills.

Manufacturing technologies. Two different technologies are used in the manufacture of PDC tools. The synthetic cutters can either be assembled on a steel body or on a tungsten-carbide-matrix body.

Steel body bits are preferred by companies having ...

Source: **News & Business > Combined Sources > US Publications** [i]
Terms: "PDC cutters" (Edit Search | Suggest Terms for My Search)
Focus: **"PDC cutters" and "core drilling"** (Exit FOCUS™)
View: KWIC
Date/Time: Monday, May 16, 2011 - 9:28 AM EDT

EXHIBIT C

There are many types and designs of drilling rigs, with many drilling rigs capable of switching or combining different drilling technologies as needed. Drilling rigs can be described using any of the following attributes:

By power used [edit]

- Mechanical — the rig uses torque converters, clutches, and transmissions powered by its own engines, often diesel
- Electric — the major items of machinery are driven by electric motors, usually with power generated on-site using internal combustion engines
- Hydraulic — the rig primarily uses hydraulic power
- Pneumatic — the rig is primarily powered by pressurized air
- Steam — the rig uses steam-powered engines and pumps (obsolete after middle of 20th Century)

By pipe used [edit]

- Cable — a cable is used to raise and drop the drill bit
- Conventional — uses metal or plastic drill pipe of varying types
- Coil tubing — uses a giant coil of tube and a downhole drilling motor

By height [edit]

(All rigs drill with only a single pipe. Rigs are differentiated by how many connected pipe they are able to "stand" in the derrick when needing to temporarily remove the drill pipe from the hole. Typically this is done when changing a drill bit or when "logging" the well.)

- Single — can pull only single drill pipes. The presence or absence of vertical pipe racking "fingers" varies from rig to rig.
- Double — can hold a stand of pipe in the derrick consisting of two connected drill pipes, called a "double stand".
- Triple — can hold a stand of pipe in the derrick consisting of three connected drill pipes, called a "triple stand".

By method of rotation or drilling method [edit]

- No-rotation includes direct push rigs and most service rigs
- Rotary table — rotation is achieved by turning a square or hexagonal pipe (the "Kelly") at drill floor level.
- Top drive — rotation and circulation is done at the top of the drill string, on a motor that moves in a track along the derrick.
- Sonic — uses primarily vibratory energy to advance the drill string
- Hammer — uses rotation and percussive force (see Down-the-hole drill)

By position of derrick [edit]

- Conventional — derrick is vertical
- Slant — derrick is slanted at a 45 degree angle to facilitate horizontal drilling

Drill types [edit]

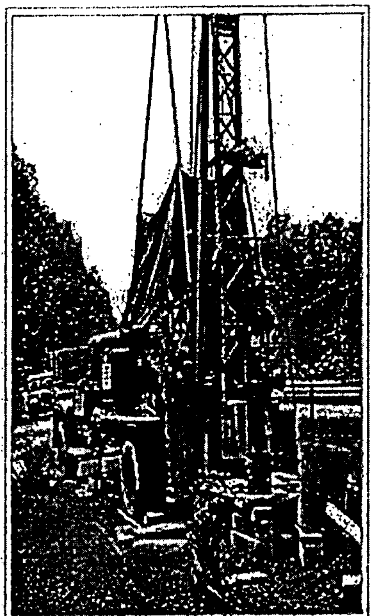
There are a variety of drill mechanisms which can be used to sink a borehole into the ground. Each has its advantages and disadvantages, in terms of the depth to which it can drill, the type of sample returned, the costs involved and penetration rates achieved. There are two basic types of drills: drills which produce rock chips, and drills which produce core samples.

Auger drilling [edit]

Auger drilling is done with a helical screw which is driven into the ground with rotation; the earth is lifted up the borehole by the blade of the screw. Hollow stem auger drilling is used softer ground such as swamps where th hole will not stay open by itself for environmental drilling, screw. Hollow stem auger drilling is used softer ground such as swamps where th hole will not stay open by itself for environmental drilling, geotechnical drilling, soil engineering and geochemistry reconnaissance work in exploration for mineral deposits. Solid flight augers/bucket augers are used inharder ground construction drilling. In some cases, mine shafts are dug with auger drills. Small augers can be mounted on the back of a utility truck, with large augers used for sinking piles for bridge foundations.

Auger drilling is restricted to generally soft unconsolidated material or weak weathered rock. It is cheap and fast.

Percussion rotary air blast drilling (RAB) [edit]



Cable tool water well drilling rig in Kimball, West Virginia. These slow rigs have mostly been replaced by rotary drilling rigs in the U.S.

RAB drilling is used most frequently in the mineral exploration industry. (This tool is also known as a Down-the-hole drill.) The drill uses a pneumatic reciprocating piston-driven "hammer" to energetically drive a heavy drill bit into the rock. The drill bit is hollow, solid steel and has ~20 mm thick tungsten rods protruding from the steel matrix as "buttons". The tungsten buttons are the cutting face of the bit.

The cuttings are blown up the outside of the rods and collected at surface. Air or a combination of air and foam lift the cuttings.

RAB drilling is used primarily for mineral exploration, water bore drilling and blast-hole drilling in mines, as well as for other applications such as engineering, etc. RAB produces lower quality samples because the cuttings are blown up the outside of the rods and can be contaminated from contact with other rocks. RAB drilling at extreme depth, if it encounters water, may rapidly clog the outside of the hole with debris, precluding removal of drill cuttings from the hole. This can be counteracted, however, with the use of "stabilisers" also known as "reamers", which are large cylindrical pieces of steel attached to the drill string, and made to perfectly fit the size of the hole being drilled. These have sets of rollers on the side, usually with tungsten buttons, that constantly break down cuttings being pushed upwards.

The use of high-powered air compressors, which push 900-1150 cfm of air at 300-350 psi down the hole also ensures drilling of a deeper hole up to ~1250 m due to higher air pressure which pushes all rock cuttings and any water to the surface. This, of course, is all dependent on the density and weight of the rock being drilled, and on how worn the drill bit is.

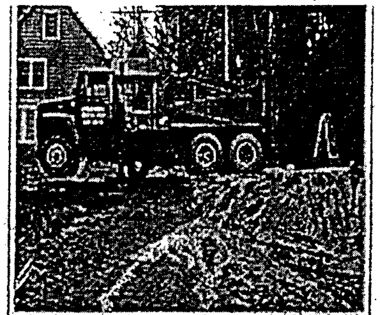
Air core drilling [edit]

Air core drilling and related methods use hardened steel or tungsten blades to bore a hole into unconsolidated ground. The drill bit has three blades arranged around the bit head, which cut the unconsolidated ground. The rods are hollow and contain an inner tube which sits inside the hollow outer rod barrel. The drill cuttings are removed by injection of compressed air into the hole via the annular area between the innertube and the drill rod. The cuttings are then blown back to surface up the inner tube where they pass through the sample separating system and are collected if needed. Drilling continues with the addition of rods to the top of the drill string. Air core drilling can occasionally produce small chunks of cored rock.

This method of drilling is used to drill the weathered regolith, as the drill rig and steel or tungsten blades cannot penetrate fresh rock. Where possible, air core drilling is preferred over RAB drilling as it provides a more representative sample. Air core drilling can achieve depths approaching 300 meters in good conditions. As the cuttings are removed inside the rods and are less prone to contamination compared to conventional drilling where the cuttings pass to the surface via outside return between the outside of the drill rod and the walls of the hole. This method is more costly and slower than RAB.

Cable tool drilling [edit]

Cable tool rigs are a traditional way of drilling water wells. The majority of large diameter water supply wells, especially deep wells completed in bedrock aquifers, were completed using this supply wells, especially deep wells completed in bedrock aquifers, were completed using this drilling method. Although this drilling method has largely been supplanted in recent years by other, faster drilling techniques, it is still the most practicable drilling method for large diameter, deep bedrock wells, and in widespread use for small rural water supply wells. The impact of the drill bit fractures the rock and in many shale rock situations increases the water flow into a well over rotary.


SpeedStar cable tool drilling rig, Ballston Spa, New York

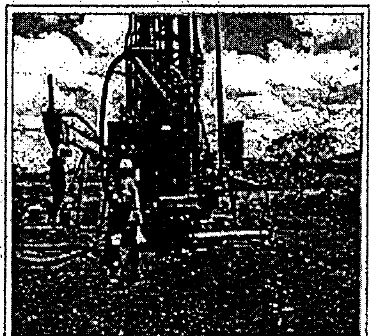
Also known as ballistic well drilling and sometimes called "spudders", these rigs raise and drop a drill string with a heavy carbide tipped drilling bit that chisels through the rock by finely pulverizing the subsurface materials. The drill string is composed of the upper drill rods, a set of "jars" (inter-locking "sliders" that help transmit additional energy to the drill bit and assist in removing the bit if it is stuck) and the drill bit. During the drilling process, the drill string is periodically removed from the borehole and a bailer is lowered to collect the drill cuttings (rock fragments, soil, etc.). The bailer is a bucket-like tool with a trapdoor in the base. If the borehole is dry, water is added so that the drill cuttings will flow into the bailer. When lifted, the trapdoor closes and the cuttings are then raised and removed. Since the drill string must be raised and lowered to advance the boring, the casing (larger diameter outer piping) is typically used to hold back upper soil materials and stabilize the borehole.

Cable tool rigs are simpler and cheaper than similarly sized rotary rigs, although loud and very slow to operate. The world record cable tool well was drilled in New York to a depth of almost 12,000 feet. The common Bucyrus-Erie 22 can drill down to about 1,100 feet. Since cable tool drilling does not use air to eject the drilling chips like a rotary, instead using a cable strung bailer, technically there is no limitation on depth.

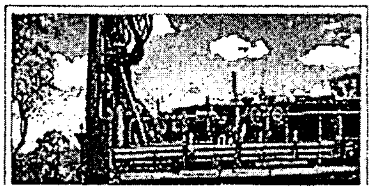
Cable tool rigs now are nearly obsolete in the United States. They are mostly used in Africa or Third-World countries. Being slow, cable tool rig drilling means increased wages for drillers. In the United States drilling wages would average around US$200 per day per man, while in Africa it is only US$6 per day per man, so a slow drilling machine can still be used in undeveloped countries with depressed wages. A cable tool rig can drill 25 feet to 60 feet of hard rock a day. A newer rotary drillcat top head rig equipped with down-the-hole (DTH) hammer can drill 500 feet or more per day, depending on size and formation hardness.

Reverse circulation (RC) drilling [edit]

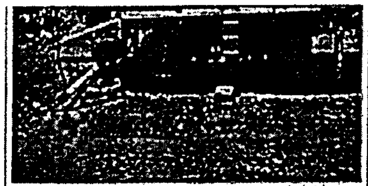
RC drilling is similar to air core drilling, in that the drill cuttings are returned to surface inside the rods. The drilling mechanism is a pneumatic reciprocating piston known as a "hammer" driving a tungsten-steel drill bit. RC drilling utilises much larger rigs and machinery and depths of up to 500 metres are routinely achieved. RC drilling ideally produces dry rock chips, as large air compressors dry the rock out ahead of the advancing drill bit. RC drilling is slower and costlier but achieves better penetration than RAB or air core drilling; it is cheaper than diamond coring and is thus preferred for most mineral exploration work.


Reverse Circulation (RC) rig, outside Newman, Western Australia

Reverse circulation is achieved by blowing air down the rods, the differential pressure creating air lift of the water and cuttings up the "inner tube", which is inside each rod. It reaches the "bell" at the top of the hole, then moves through a sample hose which is attached to the top of the "cyclone". The drill cuttings travel around the inside of the cyclone until they fall through an opening at the bottom and are collected in a sample bag.



The most commonly used RC drill bits are 5-8 inches (13–20 cm) in diameter and have round metal 'buttons' that protrude from the bit, which are required to drill through shale and abrasive rock. As the buttons wear down, drilling becomes slower and the rod string can potentially become bogged in the hole. This is a problem as trying to recover the rods may take hours and in some cases weeks. The rods and drill bits themselves are very expensive, often resulting in in some cases weeks. The rods and drill bits themselves are very expensive, often resulting in great cost to drilling companies when equipment is lost down the bore hole. Most companies will regularly re-grind the buttons on their drill bits in order to prevent this, and to speed up progress. Usually, when something is lost (breaks off) in the hole, it is not the drill string, but rather from the bit, hammer, or stabiliser to the bottom of the drill string (bit). This is usually caused by a blunt bit getting stuck in fresh rock, over-stressed metal, or a fresh drill bit getting stuck in a part of the hole that is too small, owing to having used a bit that has worn to smaller than the desired hole diameter.

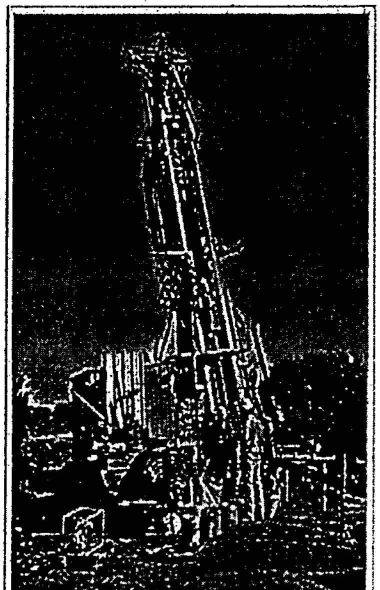

Track mounted Reverse Circulation rig (side view).

Although RC drilling is air-powered, water is also used, to reduce dust, keep the drill bit cool, and assist in pushing cutting back upwards, but also when "collaring" a new hole. A mud called "Liqui-Pol" is mixed with water and pumped into the rod string, down the hole. This helps to bring up the sample to the surface by making the sand stick together. Occasionally, "Super-Foam" (a.k.a. "Quik-Foam") is also used, to bring all the very fine cuttings to the surface, and to clean the hole. When the drill reaches hard rock, a "collar" is put down the hole around the rods, which is normally PVC piping. Occasionally the collar may be made from metal casing. Collaring a hole is needed to stop the walls from caving in and bogging the rod string at the top of the hole. Collars may be up to 60 metres deep, depending on the ground, although if drilling through hard rock a collar may not be necessary.

Reverse circulation rig setups usually consist of a support vehicle, an auxiliary vehicle, as well as the rig itself. The support vehicle, normally a truck, holds diesel and water tanks for resupplying the rig. It also holds other supplies needed for maintenance on the rig. The auxiliary is a vehicle, carrying an auxiliary engine and a booster engine. These engines are connected to the rig by high pressure air hoses. Although RC rigs have their own booster and compressor to generate air pressure, extra power is needed which usually isn't supplied by the rig due to lack of space for these large engines. Instead, the engines are mounted on the auxiliary vehicle. Compressors on an RC rig have an output of around 1000 cfm at 500 psi (500 $L \cdot s^{-1}$ at 3.4 MPa). Alternatively, stand-alone air compressors which have an output of 900-1150cfm at 300-350 psi each are used in sets of 2, 3, or 4, which are all routed to the rig through a multi-valve manifold.

Diamond core drilling

[edit]


Multi-combination drilling rig (capable of both diamond and reverse circulation drilling). Rig is currently set up for diamond drilling.

Diamond core drilling (exploration diamond drilling) utilizes an annular diamond-impregnated drill bit attached to the end of hollow drill rods to cut a cylindrical core of solid rock. The diamonds used are fine to microfine industrial grade diamonds. They are set within a matrix of varying hardness, from brass to high-grade steel. Matrix hardness, diamond size and dosing can be varied according to the rock which must be cut. Holes within the bit allow water to be delivered to the cutting face. This provides three essential functions — lubrication, cooling, and removal of drill cuttings from the hole.

Diamond drilling is much slower than reverse circulation (RC) drilling due to the hardness of the ground being drilled. Drilling of 1200 to 1800 metres is common and at these depths, ground is mainly hard rock. Diamond rigs need to drill slowly to lengthen the life of drill bits and rods, which are very expensive.

Core samples are retrieved via the use of a "lifter tube", a hollow tube lowered inside the rod string by a winch cable until it stops inside the core barrel. As the core is drilled, the core barrel slides over the core as it is cut. An "overshot" attached to the end of the winch cable is lowered inside the rod string and locks on to the "backend", located on the top end of the core barrel. The winch is retracted, pulling the core barrel to the surface. The core does not drop out of the inside of the core barrel when lifted because either a split ring core lifter or basket retainer allow the core to move into, but not back out of the tube.

Once the core barrel is removed from the hole, the core sample is then removed from the core barrel

Diamond core drill bits

core sample is then removed from the core barrel and catalogued. The Driller's offsider screws the rod apart using tube clamps, then each part of the rod is taken and the core is shaken out into core trays. The core is washed, measured and broken into smaller pieces using a hammer or sawn through to make it fit into the sample trays. Once catalogued, the core trays are retrieved by geologists who then analyse the core and determine if the drill site is a good location to expand future mining operations.

Diamond rigs can also be part of a multi-combination rig. Multi-combination rigs are a dual setup rig capable of operating in either a reverse circulation (RC) and diamond drilling role (though not at the same time). This is a common scenario where exploration drilling is being performed in a very isolated location. The rig is first set up to drill as an RC rig and once the desired metres are drilled, the rig is set up for diamond drilling. This way the deeper metres of the hole can be drilled without moving the rig and waiting for a diamond rig to set up on the pad.

Direct push rigs [edit]

Direct push technology includes several types of drilling rigs and drilling equipment which advances a drill string by pushing or hammering without rotating the drill string. While this does not meet the proper definition of drilling, it does achieve the same result — a borehole. Direct push rigs include both cone penetration testing (CPT) rigs and direct push sampling rigs such as a PowerProbe or Geoprobe. Direct push rigs typically are limited to drilling in unconsolidated soil materials and very soft rock.

CPT rigs advance specialized testing equipment (such as electronic cones), and soil samplers using large hydraulic rams. Most CPT rigs are heavily ballasted (20 metric tons is typical) as a counter force against the pushing force of the hydraulic rams which are often rated up to 20 kN. Alternatively, small, light CPT rigs and offshore CPT rigs will use anchors such as screwed-in ground anchors to create the reactive force. In ideal conditions, CPT rigs can achieve production rates of up to 250–300 meters per day.

Direct push drilling rigs use hydraulic cylinders and a hydraulic hammer in advancing a hollow core sampler to gather soil and groundwater samples. The speed and depth of penetration is largely dependent on the soil type, the size of the sampler, and the weight and power the rig. Direct push techniques are generally limited to shallow soil sample recovery in unconsolidated soil materials. The advantage of direct push technology is that in the right soil type it can produce a large number of high quality samples quickly and cheaply, generally from 50 to 75 meters per day. Rather than hammering, direct push can also be combined with sonic (vibratory) methods to increase drill efficiency.

Hydraulic rotary drilling [edit]

Oil well drilling utilises tri-cone roller, carbide embedded, fixed-cutter diamond, or diamond-impregnated drill bits to wear away at the cutting face. This is preferred because there is no need to return intact samples to surface for assay as the objective is to reach a formation containing **oil** or natural **gas**. Sizable machinery is used, enabling depths of several kilometres to be penetrated. Rotating hollow drill pipes carry down bentonite and barite infused drilling muds to lubricate, cool, and clean the drilling bit, control downhole pressures, stabilize the wall of the borehole and remove drill cuttings. The mud travels back to the surface around the outside of the drill pipe, called the annulus. Examining rock chips extracted from the mud is known as mud logging. Another form of well logging is electronic and is frequently employed to evaluate the existence of possible **oil** and **gas** deposits in the borehole. This can take place while the well is being drilled, using Measurement While Drilling tools, or after drilling, by lowering measurement tools into the newly drilled hole.

The rotary system of drilling was in general use in Texas in the early 1900s. It is a modification of one invented by Fauvelle in 1845, and used in the early years of the **oil** **industry** in some of the **oil**-producing countries in Europe. Originally pressurized water was used instead of mud, and was almost useless in hard rock before the diamond cutting bit.[2] The main breakthrough for rotary drilling came in 1901, when Anthony Francis Lucas combined the use of a steam driven rig and of mud instead of water in the Spindletop discovery well.[3]

The drilling and production of **oil** and **gas** can pose a safety risk and a hazard to the environment from the ignition of the entrained **gas** causing dangerous fires and also from the risk of **oil** leakage polluting water, land and groundwater. For these reasons, redundant safety systems and highly trained personnel are required by law in all countries with significant production.

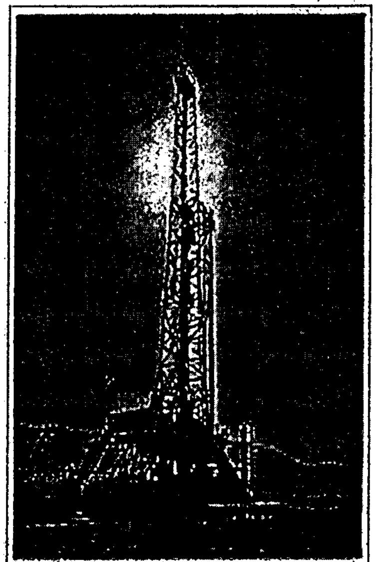
Sonic (vibratory) drilling [edit]

A sonic drill head works by sending high frequency resonant vibrations down the drill string to the drill bit, while the operator controls these frequencies to suit the specific conditions of the soil/rock geology. Vibrations may also be generated within the drill head. The frequency is generally between 50 and 120 hertz (cycles per second) and can be varied by the operator.

Resonance magnifies the amplitude of the drill bit, which fluidizes the soil particles at the bit face, allowing for fast and easy penetration through most geological formations. An internal spring system isolates these vibrational forces from the rest of the drill rig.

Limits of the technology [edit]

Drill technology has advanced steadily since the 19th century. However, there are several basic limiting factors which will determine the depth to which a bore hole can be sunk.



An oil rig

All holes must maintain outer diameter; the diameter of the hole must remain wider than the diameter of the rods or the rods cannot turn in the hole and progress cannot continue. Friction caused by the drilling operation will tend to reduce the outside diameter of the drill bit. This applies to all drilling methods, except that in diamond core drilling the use of thinner rods and casing may permit the hole to continue. Casing is simply a hollow sheath which protects the hole against collapse during drilling, and is made of metal or PVC. Often diamond holes will start off at a large diameter and when outside diameter is lost, thinner rods put down inside casing to continue, until finally the hole becomes too narrow. Alternatively, the hole can be reamed; this is the usual practice in oil well drilling where the hole size is maintained down to the next casing point.

For percussion techniques, the main limitation is air pressure. Air must be delivered to the piston at sufficient pressure to activate the reciprocating action, and in turn drive the head into the rock with sufficient strength to fracture and pulverise it. With depth, volume is added to the in-rod string, requiring larger compressors to achieve operational pressures. Secondly, groundwater is ubiquitous, and increases in pressure with depth in the ground. The air inside the rod string must be pressurised enough to overcome this water pressure at the bit face. Then, the air must be able to carry the rock fragments to surface. This is why depths in excess of 500 m for reverse circulation drilling are rarely achieved, because the cost is prohibitive and approaches the threshold at which diamond core drilling is more economic.

Diamond drilling can routinely achieve depths in excess of 1200 m. In cases where money is no issue, extreme depths have been achieved, because there is no requirement to overcome water pressure. However, circulation must be maintained to return the drill cuttings to surface, and more importantly to maintain cooling and lubrication of the cutting surface.

Without sufficient lubrication and cooling, the matrix of the drill bit will soften. While diamond is the hardest substance known, at 10 on the Mohs hardness scale, it must remain firmly in the matrix to achieve cutting. Weight on bit, the force exerted on the cutting face of the bit by the drill rods in the hole above the bit, must also be monitored.

A unique drilling operation in deep ocean water was named Project Mohole.

Research of new drilling technologies [edit]

Limits of the conventional contact drilling technologies caused strengthen of the research of new non-contact effective drilling technologies. There were several attempts to achieve sufficient results of the research which would negate disadvantages of current contact technology. The best known are technologies based on the utilization of water jet, chemical plasma, hydrothermal spallation or laser. The research teams round the world have been developing these technologies for the long time.

Nowadays, utilization of high energetic electrical plasma shows very promising in deep drilling applications. This approach has potential to replace conventional drilling technologies because of several advantages. It would be able to produce boreholes with large constant diameter without frequent replacement of the drill bits. It would decrease time and money consumption. This technology is in the research phase and need a strong support, but it can bring a large shift in drilling segment.

Causes of deviation [edit]

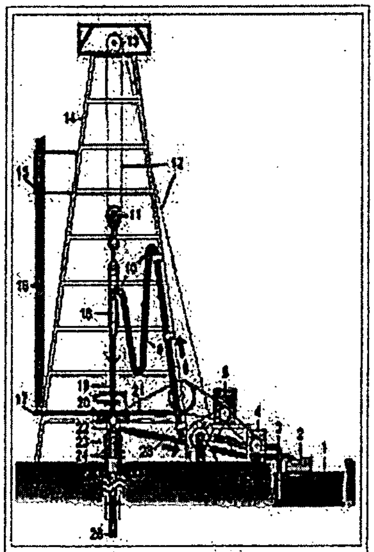
Most drill holes deviate slightly from their planned trajectory. This is because of the torque of the turning bit working against the cutting face, because of the flexibility of the steel rods and especially the screw joints, because of reaction to foliation and structure within the rock, and because of refraction as the bit moves into different rock layers of varying resistance. Additionally, inclined holes will tend to deviate upwards because the drill rods will lie against the bottom of the bore, causing the drill bit to be slightly inclined from true. It is because of deviation that drill holes must be surveyed if deviation will impact the usefulness of the information returned. Sometimes the surface location can be offset laterally to take advantage of the expected deviation tendency, so the bottom of the hole will end up near the desired location. Oil well drilling commonly uses a process of controlled deviation called directional drilling (e.g., when several wells are drilled from one surface location).

Rig equipment [edit]

Drilling rigs typically include at least some of the following items: See Drilling rig (petroleum) for a more detailed description.

- Blowout preventers: (BOPs)

The equipment associated with a rig is to some extent dependent on the type of rig but (#23 & #24) are devices installed at the wellhead to prevent fluids and gases from unintentionally escaping from the borehole. #23 is the annular (often referred to as the "Hydril", which is one manufacturer) and #24 is the pipe rams and blind rams. In the place of #24 Variable bore rams or VBR's can be used; they offer the same pressure and sealing capacity found in standard pipe rams, while offering the versatility of sealing on various sizes of drill pipe, production tubing and casing without changing standard pipe rams. Normally VBR's are used when utilizing a tapered drill string (when different size drill pipe is used in the complete drill string).



Simple diagram of a drilling rig and its basic operation

- Centrifuge: an industrial version of the device that separates fine silt and sand from the drilling fluid.
- Solids control: solids control equipments for preparing drilling mud for the drilling rig.
- Chain tongs: wrench with a section of chain, that wraps around whatever is being tightened or loosened. Similar to a pipe wrench.
- Degasser: a device that separates air and/or gas from the drilling fluid.
- Desander / desilter: contains a set of hydrocyclones that separate sand and silt from the drilling fluid.
- Drawworks: (#7) is the mechanical section that contains the spool, whose main function is to reel in/out the drill line to raise/lower the traveling block (#11).
- Drill bit: (#26) device attached to the end of the drill string that breaks apart the rock being drilled. It contains jets through which the drilling fluid exits.
- Drill pipe: (#16) joints of hollow tubing used to connect the surface equipment to the bottom hole assembly (BHA) and acts as a conduit for the drilling fluid. In the diagram, these are "stands" of drill pipe which are 2 or 3 joints of drill pipe connected together and "stood" in the derrick vertically, usually to save time while tripping pipe.
- Elevators: a gripping device that is used to latch to the drill pipe or casing to facilitate the lowering or lifting (of pipe or casing) into or

out of the borehole.

- Mud motor: a hydraulically powered device positioned just above the drill bit used to spin the bit independently from the rest of the drill string.
- Mud pump: (#4) reciprocal type of pump used to circulate drilling fluid through the system.
- Mud tanks: (#1) often called mud pits, provides a reserve store of drilling fluid until it is required down the wellbore.
- Rotary table: (#20) rotates the drill string along with the attached tools and bit.
- Shale shaker: (#2) separates drill cuttings from the drilling fluid before it is pumped back down the borehole.

See also [edit]

- Boring
- Flame jet drill
- Mineral exploration
- Oil platform
- Oil well
- Pumpjack
- Subsea

Mining portal

References [edit]

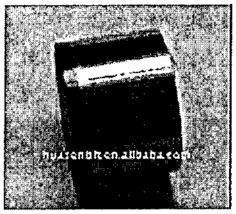
1. ^ Baars, D.L.; Watney, W.L.; Steeples, D.W.; and Brostuen, E.A (1989). [HTTP://www.kgs.ku.edu/Publications/Oil/primer12.html *Petroleum, a primer for Kansas*] (Educational Series, no. 7 ed.). Kansas Geological Survey. pp. 40. Retrieved 18 April 2011. "After the cementing of the casing has been completed, the drilling rig, equipment, and materials are removed from the drill site. A smaller rig, known as a workover rig or completion rig, is moved over the well bore. The smaller rig is used for the remaining completion operations."
2. ^ This article incorporates text from a publication now in the public domain: Chisholm, Hugh, ed (1911). "Petroleum". *Encyclopædia Britannica* (Eleventh ed.). Cambridge University Press.
3. ^ Roughnecks, Rock Bits And Rigs: The Evolution Of Oil Well Drilling Technology In Alberta, 1883-1970 By Sandy Gow, Bonar Alexander Gow Published by University of Calgary Press, 2005 ISBN 1-55238-067-X

External links [edit]

- OSHA guide for drilling rigs
- Soil boring with Rotary drilling
- Borehole drilling rig gallery

Categories: Drilling technology | Petroleum engineering | Petroleum geology | Oilfield terminology

EXHIBIT D



See larger image: PDC cutter

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Processing Type: Forging

Model Number: 0804,1004,1308,1608,1908,1913

Certification: ISO

Use: Coal Mining

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Packaging Detail: wooden case

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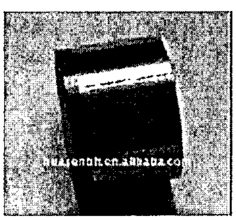
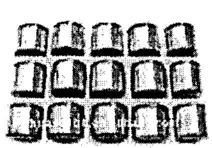
Specifications

1PDC cutters for oil well drilling

2Abrasiveness 1:380,000. Impact resistance:520J

3Diamond thickness is increased to 2.0





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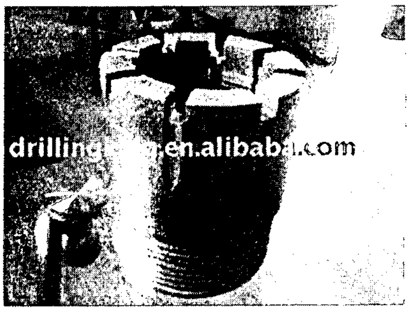
Impregnated diamond core drill bits



See larger image: Impregnated diamond core drill bits

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Place of Origin: Henan China (Mainland)	**Brand Name:** ZM	**Model Number:** All types
Type: Core Drill Bit	**Material:** Cobalt Steel Alloys	**Use:** Well Drilling
Type: NQ, BQ, NQ3, NWG, HQ, T2, etc.		

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T series: T36, T46, T56, T66, T76, T86
Z series: Z46, Z56, Z66, Z76, Z86, Z101, Z116, Z131, Z146
B series: B36, B46, B56, B66, B76, B86, B101, B116, B131, B146
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November 16, 2011

Trademark Trial and Appeal Board
U.S. Patent and Trademark Office
P.O. Box 1451
Alexandria, Virginia 22313-1451

Re:	Mark:	VULCAN
	Owner:	Varel International Ind., L.P.
	Serial No.:	76/700730
	Our File No.:	368614-3299

Dear Sir:

Enclosed for filing with the Patent and Trademark Office, please find the following:

1. Notice of Appeal;
2. Request for Reconsideration and Stay of Appeal Pending Reconsideration;
3. Copy of Response to Final Office Action dated May 16, 2011 including Exhibits A-D;
4. USPTO credit card form in the amount of $100 for the Notice of Appeal Fee; and
5. Return Postcard.

It is believed that no additional fee is due. If this is incorrect, or if any other fee is necessary, the Commissioner is hereby authorized to charge any fees that may be required by this paper to Deposit Account No. 07-0153.

Respectfully submitted,

Kay Lyn Schwartz

KLS/la
Enclosures
DALLAS 2280181v.1

Certificate of Mailing

Date of Deposit: 11-16-11

I hereby certify that this paper or fee is being deposited with the United States Postal Service First Class Mail service on the date indicated above and is addressed to the Trademark Trial and Appeal Board, U.S. Patent and Trademark Office, P.O. Box 1451, Alexandria, VA 22313-1451.

Lisa A. Alcala
(Printed Name)

(Signature)

Docket No.: 368614-3299 TRADEMARK

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE TRADEMARK TRIAL AND APPEAL BOARD

In re Application:	Varel International Ind., L.P.
Mark:	VULCAN
Serial No.:	76/700730
Class:	07
Filed:	December 8, 2009
Examining Attorney:	Amy L. Kertgate Law Office 113 (571) 272-1943

Certificate of Mailing

Date of Deposit: 11-16-11

I hereby certify that this paper or fee is being deposited with the United States Postal Service with sufficient postage as First Class Mail in an envelope addressed to Trademark Trial and Appeal Board, U.S. Patent and Trademark Office, P.O. Box 1451, Alexandria, VA 22313-1451.

Lisa A. Alcala
(Printed Name)

Lisa A. Alcala
(Signature)

Trademark Trial and Appeal Board
U.S. Patent and Trademark Office
P.O. Box 1451
Alexandria, Virginia 22313-1451

NOTICE OF APPEAL

Applicant hereby appeals to the Trademark Trial and Appeal Board from the decision of the Trademark Examining Attorney dated May 16, 2011, refusing registration.

Payment of in the amount of $100.00 is attached hereto in payment of the appeal fee. It is believed that no additional fee is due. If this is incorrect, the Commissioner is hereby authorized to charge any fees which may be required by this paper to Deposit Account No. 07-0153.

Respectfully submitted,

GARDERE WYNNE SEWELL LLP

Date: 11-16-11

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368614-3299 TRADEMARK

IN THE UNITED STATED PATENT AND TRADEMARK OFFICE
BEFORE THE TRADEMARK TRIAL AND APPEAL BOARD

In re Application of: Varel International Ind., L.P.

Serial Number: 76/700730

Filing Date: December 8, 2009

Mark: VULCAN

Examining Attorney: Amy L. Kertgate
Law Office: 113
(571) 272-1943

Trademark Trial and Appeal Board
U.S. Patent and Trademark Office
P.O. Box 1451
Alexandria, Virginia 22313-1451

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I hereby certify that this document is being deposited with Federal Express in an envelope addressed to Trademark Trial and Appeal Board, U.S. Patent and Trademark Office, P.O. Box 1451, Alexandria, Virginia 22313-1451 on 11-16-11.

Lisa Alcala
(Name of Person Mailing Document)

Lisa A. Alcala
(Signature)

Dear Sir:

REQUEST FOR RECONSIDERATION AND STAY OF APPEAL PENDING RECONSIDERATION

Applicant respectfully requests that the Examiner reconsider the Response to Final Office Action ("Response") and that the appeal filed with the Trademark Trial and Appeal Board be suspended until such time as the Examining Attorney has had the opportunity to consider and act on the previously filed Response.

It is believed that no additional fee is due. If this is incorrect, the Commissioner is hereby authorized to charge any fees which may be required by this paper to Deposit Account No. 070153.

Respectfully submitted,

Date: 11-16-11

By: Kay S
Kay Lyn Schwartz

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November 16, 2011

Commissioner for Trademarks
P.O. Box 1451
Alexandria, Virginia 22313-1451

Re:	In re Application of:	Varel International Ind., L.P.
	Mark:	VULCAN
	Serial No.:	76/700730
	Our File:	368614-3299

Dear Sir:

Enclosed for filing with the Patent and Trademark Office, please find the following:

1. Response to Final Office Action dated May 16, 2011 including Exhibits A-D;
2. Copy of Notice of Appeal and Request for Reconsideration filed with TTAB; and
3. Postcard.

It is believed that no additional fee is due. If this is incorrect, the Commissioner is hereby authorized to charge any fees that may be required by this paper to Deposit Account 07-0153.

Respectfully submitted,

Gardere Wynne Sewell LLP

Kay Lyn Schwartz

KLS/la
Enclosures
DALLAS 2280167v.1

Certificate of Mailing

Date of Deposit: 11-16-11

I hereby certify that this paper or fee is being deposited with the United States Postal Service First Class Mail service under 37 CFR 1.10 on the date indicated above and is addressed to Commissioner for Trademarks, P.O. Box 1451, Alexandria, VA 22313-1451.

Lisa Alcala
(Printed Name)

(Signature)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Varel International Ind., L.P.
Serial Number:	76/700730
International Class:	07
Filed:	December 8, 2009
Examining Attorney:	Amy L. Kertgate Trademark Examining Attorney Law Office 113 (571) 272-1943
Mark:	VULCAN

Commissioner for Trademarks
P.O. Box 1451
Alexandria, Virginia 22313-1451

RESPONSE TO OFFICE ACTION

The above-identified application has been carefully reviewed in light of the Official Action, made final, mailed May 17, 2011. It is believed that each of the objections raised by the Examining Attorney is satisfied by this response.

Section 2(d) Refusal – Likelihood of Confusion

The Examining Attorney has made the Section 2(d) rejection final, refusing registration of the above-identified mark on the basis that Applicant's mark, when used with the identified goods, is likely to be confused with U.S. Reg. No. 3,815,974 citing Trademark Act § 2(d), 15 U.S.C. § 1052(d); TMEP § 1207. This rejection is respectfully traversed and reconsideration and withdrawal of the Examining Attorney's rejection are requested in light of the following arguments and authorities.

<u>The marks are not identical</u>

Applicant's mark is not identical to the cited Registrant's mark. Applicant's mark is "VULCAN." In contrast, the cited Registrant's mark (noted below), is a highly stylized mark containing an initial letter "V" (which contains associated stylization suggesting movement), the letters "UL", which are then followed by the letters "CAN". The letters "CAN" are demarked/emphasized from the rest of the mark with a line element/stylization above the letters, as shown below:

The emphasis of "CAN" is highly relevant to consideration of the mark as a whole, such that when spoken, the mark may be pronounced, "Vul" "CAN" with more emphasis on the "CAN" part of the mark, the same way someone might say they are able to accomplishing something when encountering resistance (e.g., I <u>CAN</u> do it if you let me). The commercial impression created by the mark clearly encompasses the latter part of the mark (the "CAN" element) which is set apart from the mark with the over-arching line element, suggesting that "VUL" <u>CAN</u>...do it, "VUL" <u>CAN</u> get the job done, etc.

Contrary to the Examining Attorneys' assertion, the marks are not identical visually, in sound, meaning, or commercial impression. Applicant respectfully submits that the marks at issue create different commercial impressions, and the first prong of the test for likelihood of confusion is not met. The marks are not legally similar.

The goods are not the same, or related

As the marks are not identical, the Examining Attorney must show that there is more than just a "viable relationship" between the goods. *See In re Shell Oil Co.*, 992 F.2d 1204, 26 USPQ2d 1687 (Fed. Cir. 1993); In re Opus One Inc., 60 USPQ2d 1812 (TTAB 2001); and *In re Concordia International Forwarding Corp.*, 222 USPQ 355 (TTAB 1983). As has been made of record, the respective goods of the Applicant and cited Registrant are totally different. And furthermore, the respective different goods are not related and would be marketed differently to very sophisticated consumers purchasing different products for different applications. The case law is clear that if the goods in question are not related or marketed in such a way that they would be encountered by the same persons in situations that would create the incorrect assumption that they originate from the same source, then, even if the marks are identical (which these are not), confusion is not likely. *See, e.g., Quartz Radiation Corp. v. Comm/Scope Co.*, 1 USPQ2d 1668, 1669 (TTAB 1986) (holding QR for coaxial cable and QR for various apparatus used in connection with photocopying, drafting, and blueprint machines not likely to cause confusion because of the differences between the parties' respective goods in terms of their nature and purpose, how they are promoted, and who they are purchased by); *Shen Mfg.Co. v. Ritz Hotel Ltd.*, 393 F.3d 1238, 1244-45, 73 USPQ2d 1350, 1356 (Fed. Cir. 2004) (reversing TTAB's holding that contemporaneous use of RITZ for cooking and wine selection classes and RITZ for kitchen textiles is likely to cause confusion, because the relatedness of the respective goods and services was not supported by substantial evidence); *Local Trademarks, Inc. v. Handy*

Boys Inc., 16 USPQ2d 1156, 1158 (TTAB 1990) (finding liquid drain opener and advertising services in the plumbing field to be such different goods and services that confusion as to their source is unlikely even if they are offered under the same marks).

<u>The goods are completely different</u>

The cited Registrant's mark is for a specialized <u>core</u> drilling <u>bit</u>. Applicant's goods, in contrast, are not bits, but rather <u>cutters</u> which are installed on a different type of bit, a rotary drag bit used for a completely different type of application. Applicant's PDC "cutter" is not a bit, but rather is a highly specialized product, incorporated as a <u>component</u> in the end product of a <u>rotary drag bit</u>. Applicant's goods are entirely different from the Registrant's goods.

<u>The goods are not "related"</u>

The Examining Attorney provides various printouts and alleges that they demonstrate that the Applicant's and Registrant's goods are "related "(i.e., alleging that PDC cutters can be used in the mining and geotechnical fields, and core drill bits are used in the oil and gas industry). Applicant's submits that a close examination of the evidence submitted by the Examining Attorney shows this is not the case.

Take for example, the first printout (attached hereto as **Exhibit A**) which appears to be an excerpt from a news article. Reading the article in context, the article does not relate to "core drill bits" (as was what was entered as a search term), but rather, drill bits that are at the essence or "core" of the company's technology (i.e., "The disposition of these assets will allow [Company]...to increase its focus on the delivery of our core drill bit technologies."). Similarly, the printout attached hereto as **Exhibit B** appears to be random paragraphs coupled together, some of which reference the term "core drilling" (in the context of describing this particular drilling technique), and other paragraphs reference the term "PDC Cutter"). Applicant respectfully submits that the fact that two terms appear in an article together does not make those products "related" for purposes of a likelihood of confusion determination.

Many of the articles produced by the Examining Attorney actually show the complete contrast between Applicant's goods and the cited Registrant's goods. Take for example, the material attached hereto as **Exhibit C**. This appears to be an article referencing various "drill types". As noted in Exhibit C, "there are two basic types of drills: drills which produce rock chips, and drills which produce core samples." Diamond core drilling utilizes an annular diamond-impregnated drill bit attached to the end of hollow drill rods to cut a cylindrical core of solid rock. Core drilling is "much slower than reverse circulation (RC) drilling due the hardness of the ground being drilled". "Diamond rigs need to drill slowly to lengthen the life of drill bits and rods, which are very expensive." "Core samples are retried via the use of a "lifter tube" a hollow tube lowered inside the rod. As the core is drilled, the core barrel slides over the core as it is cut" (which is then later removed from the hole, and the core sample is then removed from the core barrel).

In contrast, rotary drilling is used to "wear away at the cutting face" because "there is no need to return intact samples to the surface for assay (as in core drilling, noted above) as the objective is to reach a formation containing oil or natural gas." *See* **Exhibit C**.

<u>The channels of trade/consumers are different, and the consumers are highly sophisticated</u>

In addition to the differences in the relevant goods, the channels of trade and the consumers of the cited Registrant's goods and the Applicant's goods are different. The cited registrant's goods for the specific type of core drilling bit – designed for a specific purpose –

core drilling - would be sold to sophisticated consumers in the core drilling and geotechnical industries engaged in core drilling. Likelihood of confusion is not found where the purchasers of the goods and services at issue are sophisticated. *M&G Electronics Sales Corp. v. Sony Kabushiki Kaisha*, 250 F. Supp. 29, 104 (E.D. N.Y. 2003). Clearly, the consumers of the respective different goods of the respective different marks would not be confused in encountering the marks at issue.

As the Federal Circuit has recognized, circumstances suggesting care in purchasing tend to minimize any likelihood of confusion. *See, e.g., In re N.A.D., Inc.*, 754 F.2d 996, 999-1000, 224 USPQ 969, 971 (Fed. Cir. 1985) (concluding that, because only sophisticated purchasers exercising great care would purchase the relevant goods, there would be no likelihood of confusion merely because of the similarity between the marks NARCO and NARKOMED); *See also In re Homeland Vinyl Prods., Inc.*, 81 USPQ2d 1378, 1380, 1383 (TTAB 2006). Like Registrant's goods, Applicant's goods would be purchased by sophisticated industrial customers only after careful consideration.

Furthermore, the price point for the respective goods at issue range from ***$1000*** to ***$100,000 per article***. *See* **Exhibit D**. As courts have recognized, "the greater the value of an article the more careful the typical consumer can be expected to be." *See e.g. McGregor =-Doniger, Inc. v. Drizzle, Inc.*, 599 F.2d 1126, 1137 (2nd Cir. 1979). Applicant respectfully submits that the sophisticated industrial consumer engaged in drilling oil and gas wells, as compared to the different sophisticated consumer engaged in core drilling, would have different and specific needs in the types of equipment necessary for successfully drilling such specialized wells. Given the technical nature of the different applications, in addition to the expense involved in purchasing components to be used in such specialized operations, great care will be exercised by the professional buyer before purchasing any goods.

In summary, the realities of the marketplace are such that the relevant consumers purchasing the very specialized, different, goods sold by the Applicant and Registrant under the respective different marks would not in any way be confused.

CONCLUSION

It is incumbent upon the Examining Attorney to make the realistic appraisal of the likelihood of prospective purchasers being confused as to the source, origin or sponsorship of Applicant's goods vis-à-vis those goods of the cited registration. The Applicant's mark and the cited mark, as well as the goods offered by Applicant and goods offered by Registrant, are not the same. Any potential confusion caused by any minor overlap of Applicant's goods and the cited Registrant's goods is de minimus. These factors as well as the others discussed in detail above mitigate in favor of a finding that no likelihood of confusion exists and that the Applicant is entitled to registration of its mark.

For the foregoing reasons, Applicant asserts that no likelihood of confusion will result from its registration of the mark "VULCAN" as used in connection with the identified goods. Applicant respectfully requests reconsideration and withdrawal of the Examining Attorney's rejection under § 2(d) of the Lanham Act.

The present response is intended to fully address each of the issues raised by the Examining Attorney. Applicant's attorney requests that the Examining Attorney contact the undersigned if further clarification is needed or if a telephone conference would be useful in resolving the issues pending in this matter. For the foregoing reasons, it appears that Applicant has complied with the outstanding requirements of the Examining Attorney and the present application is in condition for publication and such action is respectfully requested at the earliest possible date.

It is believed that no additional fee is due. If this is incorrect, the Commissioner is hereby authorized to charge any additional fees, which may be required by this paper to Deposit Account 070153.

Respectfully submitted,

GARDERE WYNNE SEWELL LLP

Date: November 16, 2011

By: Kay Lyn Schwartz

3000 Thanksgiving Tower
1601 Elm Street
Dallas, Texas 75201
(214)999-4702

EXHIBIT A

OKC-based Quantum Drilling buys Halliburton unit The Journal Record (Oklahoma City, OK) August 11, 2005 Thursday

The Journal Record (Oklahoma City, OK)

August 11, 2005 Thursday

SECTION: NEWS

LENGTH: 174 words

HEADLINE: OKC-based Quantum Drilling buys Halliburton unit

BYLINE: Journal Record Staff

BODY:

... vice president of business development for Quantum. "With the shock absorbers acquired from Security DBS Drill Bits, our customers will benefit by prolonging the life of their drill bits and other down-hole drilling equipment."

Halliburton's Energy Services Groups offers products and services to upstream oil and gas customers.

"The disposition of these assets will allow Security DBS Drill Bits the opportunity to increase its focus on the delivery of our core drill bit technologies," said Jim Platt, product manager, with Security DBS Drill Bits.

Quantum has its headquarters in Oklahoma City and regional offices and service centers in Casper, Wyo., and Midland, Texas.

EXHIBIT B

Diamond-bit technology pushes hydraulic, rotation limits Oil & Gas Journal December 23, 1985

Oil & Gas Journal

December 23, 1985

SECTION: TECHNOLOGY; Drilling/production; Pg. 55

Note: This table may be divided, and additional information on a particular entry may appear on more than one screen.

LENGTH: 3473 words

HEADLINE: Diamond-bit technology pushes hydraulic, rotation limits

BYLINE: H. C. Vennin, Cristal Profor, Tarbes, France

BODY:

... hold bottom is then largely a function of fluid rock properties and hydraulics.

The rock-destruction process varies with the type of formation. When drilling formations of low compressive strength, the widely spaced teeth accomplish a considerable gouging and scraping action encouraged by the offset of the cones. In hard formations, the rock destruction is accomplished by a maximum of chipping and crushing action.

Surface set diamond bits. The principle of **core drilling** comes to us from remote antiquity. Modern diamond coring with holes up to a mile long is known to have been applied during the 19th century. For example, it was used in 1864 for drilling blast holes in the Mount Cenis tunnel between France and Italy. Diamond coring for the oil industry was introduced in the 1930s. In the next decade, attempts were made to develop solid diamond ...

... on the cutting elements to penetrate the rock.

Consequently, in order to obtain proper service life on bits, it is necessary to match the formation hardness by using smaller cutting elements on the bits. PDC bits must then be made with smaller cutters, in the same manner as roller bits are made with smaller teeth, and diamond bits with smaller diamonds.

To match this requirement, it is possible to use small **PDC cutters** in the form of angle-shaped, thermally stable compacts to be set and brazed with the bit matrix, giving sharp exposure at the diamond bit surface.

When drilling permeable rocks at greater depth, the rate of penetration is reduced not only by confiding pressure, but also by differential pressure when the mud column pressure exceeds the formation pressure. In this case, fluid filtrate may flow rapidly into the rock leaving filter cake behind.

When the fluid loss is high, the drill front becomes blocked with filter cake and cuttings which will reduce the bit penetration. This phenomenon also refers to the classic chip hold down theory. It is assumed that all three bit types, PDC, roller cone, and diamonds, are diversely affected by the bottom hole scavenging.

Recent articles n6 suggest that the **PDC cutter** is least affected because its cutters are large and well exposed, and therefore can more easily cut through the filter cake and crushed rock to clean the hole as it drills.

Manufacturing technologies. Two different technologies are used in the manufacture of PDC tools. The synthetic cutters can either be assembled on a steel body or on a tungsten-carbide-matrix body.

Steel body bits are preferred by companies having ...

Source: **News & Business > Combined Sources > US Publications**
Terms: "PDC cutters" (Edit Search | Suggest Terms for My Search)
Focus: "PDC cutters" and "core drilling" (Exit FOCUS™)
View: KWIC
Date/Time: Monday, May 16, 2011 - 9:28 AM EDT

EXHIBIT C

There are many types and designs of drilling rigs, with many drilling rigs capable of switching or combining different drilling technologies as needed. Drilling rigs can be described using any of the following attributes:

By power used [edit]

- Mechanical — the rig uses torque converters, clutches, and transmissions powered by its own engines, often diesel
- Electric — the major items of machinery are driven by electric motors, usually with power generated on-site using internal combustion engines
- Hydraulic — the rig primarily uses hydraulic power
- Pneumatic — the rig is primarily powered by pressurized air
- Steam — the rig uses steam-powered engines and pumps (obsolete after middle of 20th Century)

By pipe used [edit]

- Cable — a cable is used to raise and drop the drill bit
- Conventional — uses metal or plastic drill pipe of varying types
- Coil tubing — uses a giant coil of tube and a downhole drilling motor

By height [edit]

(All rigs drill with only a single pipe. Rigs are differentiated by how many connected pipe they are able to "stand" in the derrick when needing to temporarily remove the drill pipe from the hole. Typically this is done when changing a drill bit or when "logging" the well.)

- Single — can pull only single drill pipes. The presence or absence of vertical pipe racking "fingers" varies from rig to rig.
- Double — can hold a stand of pipe in the derrick consisting of two connected drill pipes, called a "double stand".
- Triple — can hold a stand of pipe in the derrick consisting of three connected drill pipes, called a "triple stand".

By method of rotation or drilling method [edit]

- No-rotation includes direct push rigs and most service rigs
- Rotary table — rotation is achieved by turning a square or hexagonal pipe (the "Kelly") at drill floor level.
- Top drive — rotation and circulation is done at the top of the drill string, on a motor that moves in a track along the derrick.
- Sonic — uses primarily vibratory energy to advance the drill string
- Hammer — uses rotation and percussive force (see Down-the-hole drill)

By position of derrick [edit]

- Conventional — derrick is vertical
- Slant — derrick is slanted at a 45 degree angle to facilitate horizontal drilling

Drill types [edit]

There are a variety of drill mechanisms which can be used to sink a borehole into the ground. Each has its advantages and disadvantages, in terms of the depth to which it can drill, the type of sample returned, the costs involved and penetration rates achieved. There are two basic types of drills: drills which produce rock chips, and drills which produce core samples.

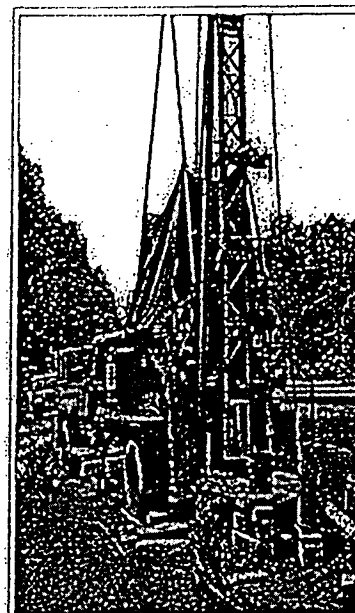
Auger drilling [edit]

Auger drilling is done with a helical screw which is driven into the ground with rotation; the earth is lifted up the borehole by the blade of the screw. Hollow stem auger drilling is used softer ground such as swamps where th hole will not stay open by itself for environmental drilling, screw. Hollow stem auger drilling is used softer ground such as swamps where th hole will not stay open by itself for environmental drilling, geotechnical drilling, soil engineering and geochemistry reconnaissance work in exploration for mineral deposits. Solid flight augers/bucket augers are used inharder ground construction drilling. In some cases, mine shafts are dug with auger drills. Small augers can be mounted on the back of a utility truck, with large augers used for sinking piles for bridge foundations.

Auger drilling is restricted to generally soft unconsolidated material or weak weathered rock. It is cheap and fast.

Percussion rotary air blast drilling (RAB) [edit]

RAB drilling is used most frequently in the mineral exploration industry. (This tool is also known as a Down-the-hole drill.) The drill uses a pneumatic reciprocating piston-driven "hammer" to energetically drive a heavy drill bit into the rock. The drill bit is hollow, solid steel and has ~20 mm thick tungsten rods protruding from the steel matrix as "buttons". The tungsten buttons are the cutting face of the bit.



Cable tool water well drilling rig in Kimball, West Virginia. These slow rigs have mostly been replaced by rotary drilling rigs in the U.S.

The cuttings are blown up the outside of the rods and collected at surface. Air or a combination of air and foam lift the cuttings.

RAB drilling is used primarily for mineral exploration, water bore drilling and blast-hole drilling in mines, as well as for other applications such as engineering, etc. RAB produces lower quality samples because the cuttings are blown up the outside of the rods and can be contaminated from contact with other rocks. RAB drilling at extreme depth, if it encounters water, may rapidly clog the outside of the hole with debris, precluding removal of drill cuttings from the hole. This can be counteracted, however, with the use of "stabilisers" also known as "reamers", which are large cylindrical pieces of steel attached to the drill string, and made to perfectly fit the size of the hole being drilled. These have sets of rollers on the side, usually with tungsten buttons, that constantly break down cuttings being pushed upwards.

The use of high-powered air compressors, which push 900-1150 cfm of air at 300-350 psi down the hole also ensures drilling of a deeper hole up to ~1250 m due to higher air pressure which pushes all rock cuttings and any water to the surface. This, of course, is all dependent on the density and weight of the rock being drilled, and on how worn the drill bit is.

Air core drilling [edit]

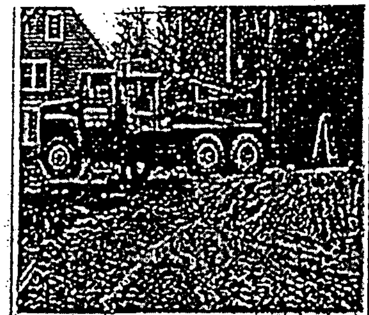
Air core drilling and related methods use hardened steel or tungsten blades to bore a hole into unconsolidated ground. The drill bit has three blades arranged around the bit head, which cut the unconsolidated ground. The rods are hollow and contain an inner tube which sits inside the hollow outer rod barrel. The drill cuttings are removed by injection of compressed air into the hole via the annular area between the innertube and the drill rod. The cuttings are then blown back to surface up the inner tube where they pass through the sample separating system and are collected if needed. Drilling continues with the addition of rods to the top of the drill string. Air core drilling can occasionally produce small chunks of cored rock.

This method of drilling is used to drill the weathered regolith, as the drill rig and steel or tungsten blades cannot penetrate fresh rock. Where possible, air core drilling is preferred over RAB drilling as it provides a more representative sample. Air core drilling can achieve depths approaching 300 meters in good conditions. As the cuttings are removed inside the rods and are less prone to contamination compared to conventional drilling where the cuttings pass to the surface via outside return between the outside of the drill rod and the walls of the hole. This method is more costly and slower than RAB.

Cable tool drilling [edit]

Cable tool rigs are a traditional way of drilling water wells. The majority of large diameter water supply wells, especially deep wells completed in bedrock aquifers, were completed using this

supply wells, especially deep wells completed in bedrock aquifers, were completed using this drilling method. Although this drilling method has largely been supplanted in recent years by other, faster drilling techniques, it is still the most practicable drilling method for large diameter, deep bedrock wells, and in widespread use for small rural water supply wells. The impact of the drill bit fractures the rock and in many shale rock situations increases the water flow into a well over rotary.



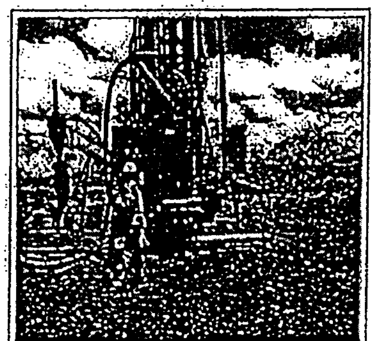
SpeedStar cable tool drilling rig, Ballston Spa, New York

Also known as ballistic well drilling and sometimes called "spudders", these rigs raise and drop a drill string with a heavy carbide tipped drilling bit that chisels through the rock by finely pulverizing the subsurface materials. The drill string is composed of the upper drill rods, a set of "jars" (inter-locking "sliders" that help transmit additional energy to the drill bit and assist in removing the bit if it is stuck) and the drill bit. During the drilling process, the drill string is periodically removed from the borehole and a bailer is lowered to collect the drill cuttings (rock fragments, soil, etc.). The bailer is a bucket-like tool with a trapdoor in the base. If the borehole is dry, water is added so that the drill cuttings will flow into the bailer. When lifted, the trapdoor closes and the cuttings are then raised and removed. Since the drill string must be raised and lowered to advance the boring, the casing (larger diameter outer piping) is typically used to hold back upper soil materials and stabilize the borehole.

Cable tool rigs are simpler and cheaper than similarly sized rotary rigs, although loud and very slow to operate. The world record cable tool well was drilled in New York to a depth of almost 12,000 feet. The common Bucyrus Erie 22 can drill down to about 1,100 feet. Since cable tool drilling does not use air to eject the drilling chips like a rotary, instead using a cable strung bailer, technically there is no limitation on depth.

Cable tool rigs now are nearly obsolete in the United States. They are mostly used in Africa or Third-World countries. Being slow, cable tool rig drilling means increased wages for drillers. In the United States drilling wages would average around US$200 per day per man, while in Africa it is only US$6 per day per man, so a slow drilling machine can still be used in undeveloped countries with depressed wages. A cable tool rig can drill 25 feet to 60 feet of hard rock a day. A newer rotary drillcat top head rig equipped with down-the-hole (DTH) hammer can drill 500 feet or more per day, depending on size and formation hardness.

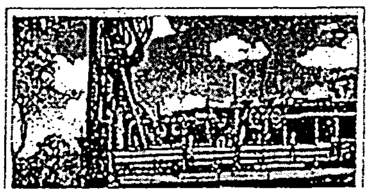
Reverse circulation (RC) drilling [edit]



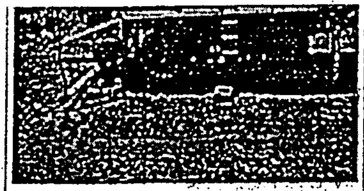
Reverse Circulation (RC) rig, outside Newman, Western Australia

RC drilling is similar to air core drilling, in that the drill cuttings are returned to surface inside the rods. The drilling mechanism is a pneumatic reciprocating piston known as a "hammer" driving a tungsten-steel drill bit. RC drilling utilises much larger rigs and machinery and depths of up to 500 metres are routinely achieved. RC drilling ideally produces dry rock chips, as large air compressors dry the rock out ahead of the advancing drill bit. RC drilling is slower and costlier but achieves better penetration than RAB or air core drilling; it is cheaper than diamond coring and is thus preferred for most mineral exploration work.

Reverse circulation is achieved by blowing air down the rods, the differential pressure creating air lift of the water and cuttings up the "inner tube", which is inside each rod. It reaches the "bell" at the top of the hole, then moves through a sample hose which is attached to the top of the "cyclone". The drill cuttings travel around the inside of the cyclone until they fall through an opening at the bottom and are collected in a sample bag.



The most commonly used RC drill bits are 5-8 inches (13–20 cm) in diameter and have round metal 'buttons' that protrude from the bit, which are required to drill through shale and abrasive rock. As the buttons wear down, drilling becomes slower and the rod string can potentially become bogged in the hole. This is a problem as trying to recover the rods may take hours and in some cases weeks. The rods and drill bits themselves are very expensive, often resulting in in some cases weeks. The rods and drill bits themselves are very expensive, often resulting in great cost to drilling companies when equipment is lost down the bore hole. Most companies will regularly re-grind the buttons on their drill bits in order to prevent this, and to speed up progress. Usually, when something is lost (breaks off) in the hole, it is not the drill string, but rather from the bit, hammer, or stabiliser to the bottom of the drill string (bit). This is usually caused by a blunt bit getting stuck in fresh rock, over-stressed metal, or a fresh drill bit getting stuck in a part of the hole that is too small, owing to having used a bit that has worn to smaller than the desired hole diameter.

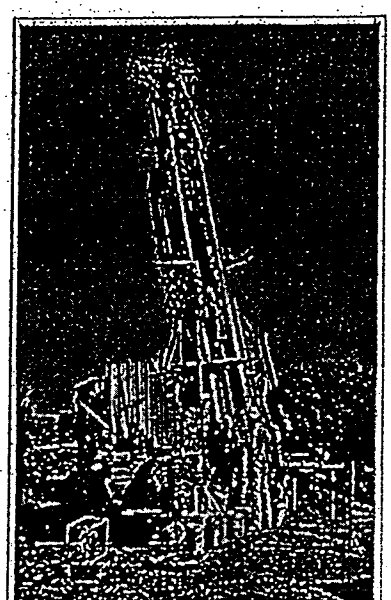


Track mounted Reverse Circulation rig (side view).

Although RC drilling is air-powered, water is also used, to reduce dust, keep the drill bit cool, and assist in pushing cutting back upwards, but also when "collaring" a new hole. A mud called "Liqui-Pol" is mixed with water and pumped into the rod string, down the hole. This helps to bring up the sample to the surface by making the sand stick together. Occasionally, "Super-Foam" (a.k.a. "Quik-Foam") is also used, to bring all the very fine cuttings to the surface, and to clean the hole. When the drill reaches hard rock, a "collar" is put down the hole around the rods, which is normally PVC piping. Occasionally the collar may be made from metal casing. Collaring a hole is needed to stop the walls from caving in and bogging the rod string at the top of the hole. Collars may be up to 60 metres deep, depending on the ground, although if drilling through hard rock a collar may not be necessary.

Reverse circulation rig setups usually consist of a support vehicle, an auxiliary vehicle, as well as the rig itself. The support vehicle, normally a truck, holds diesel and water tanks for resupplying the rig. It also holds other supplies needed for maintenance on the rig. The auxiliary is a vehicle, carrying an auxiliary engine and a booster engine. These engines are connected to the rig by high pressure air hoses. Although RC rigs have their own booster and compressor to generate air pressure, extra power is needed which usually isn't supplied by the rig due to lack of space for these large engines. Instead, the engines are mounted on the auxiliary vehicle. Compressors on an RC rig have an output of around 1000 cfm at 500 psi (500 $L \cdot s^{-1}$ at 3.4 MPa). Alternatively, stand-alone air compressors which have an output of 900-1150cfm at 300-350 psi each are used in sets of 2, 3, or 4, which are all routed to the rig through a multi-valve manifold.

Diamond core drilling [edit]



Multi-combination drilling rig (capable of both diamond and reverse circulation drilling). Rig is currently set up for diamond drilling.

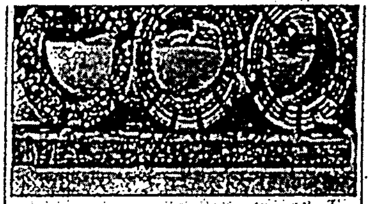
Diamond core drilling (exploration diamond drilling) utilizes an annular diamond-impregnated drill bit attached to the end of hollow drill rods to cut a cylindrical core of solid rock. The diamonds used are fine to microfine industrial grade diamonds. They are set within a matrix of varying hardness, from brass to high-grade steel. Matrix hardness, diamond size and dosing can be varied according to the rock which must be cut. Holes within the bit allow water to be delivered to the cutting face. This provides three essential functions — lubrication, cooling, and removal of drill cuttings from the hole.

Diamond drilling is much slower than reverse circulation (RC) drilling due to the hardness of the ground being drilled. Drilling of 1200 to 1800 metres is common and at these depths, ground is mainly hard rock. Diamond rigs need to drill slowly to lengthen the life of drill bits and rods, which are very expensive.

Core samples are retrieved via the use of a "lifter tube", a hollow tube lowered inside the rod string by a winch cable until it stops inside the core barrel. As the core is drilled, the core barrel slides over the core as it is cut. An "overshot" attached to the end of the winch cable is lowered inside the rod string and locks on to the "backend", located on the top end of the core barrel. The winch is retracted, pulling the core barrel to the surface. The core does not drop out of the inside of the core barrel when lifted because either a split ring core lifter or basket retainer allow the core to move into, but not back out of the tube.

Once the core barrel is removed from the hole, the core sample is then removed from the core barrel

core sample is then removed from the core barrel and catalogued. The Driller's offsider screws the rod apart using tube clamps, then each part of the rod is taken and the core is shaken out into core trays. The core is washed, measured and broken into smaller pieces using a hammer or sawn through to make it fit into the sample trays. Once catalogued, the core trays are retrieved by geologists who then analyse the core and determine if the drill site is a good location to expand future mining operations.


Diamond core drill bits

Diamond rigs can also be part of a multi-combination rig. Multi-combination rigs are a dual setup rig capable of operating in either a reverse circulation (RC) and diamond drilling role (though not at the same time). This is a common scenario where exploration drilling is being performed in a very isolated location. The rig is first set up to drill as an RC rig and once the desired metres are drilled, the rig is set up for diamond drilling. This way the deeper metres of the hole can be drilled without moving the rig and waiting for a diamond rig to set up on the pad.

Direct push rigs [edit]

Direct push technology includes several types of drilling rigs and drilling equipment which advances a drill string by pushing or hammering without rotating the drill string. While this does not meet the proper definition of drilling, it does achieve the same result — a borehole. Direct push rigs include both cone penetration testing (CPT) rigs and direct push sampling rigs such as a PowerProbe or Geoprobe. Direct push rigs typically are limited to drilling in unconsolidated soil materials and very soft rock.

CPT rigs advance specialized testing equipment (such as electronic cones), and soil samplers using large hydraulic rams. Most CPT rigs are heavily ballasted (20 metric tons is typical) as a counter force against the pushing force of the hydraulic rams which are often rated up to 20 kN. Alternatively, small, light CPT rigs and offshore CPT rigs will use anchors such as screwed-in ground anchors to create the reactive force. In ideal conditions, CPT rigs can achieve production rates of up to 250–300 meters per day.

Direct push drilling rigs use hydraulic cylinders and a hydraulic hammer in advancing a hollow core sampler to gather soil and groundwater samples. The speed and depth of penetration is largely dependent on the soil type, the size of the sampler, and the weight and power the rig. Direct push techniques are generally limited to shallow soil sample recovery in unconsolidated soil materials. The advantage of direct push technology is that in the right soil type it can produce a large number of high quality samples quickly and cheaply, generally from 50 to 75 meters per day. Rather than hammering, direct push can also be combined with sonic (vibratory) methods to increase drill efficiency.

Hydraulic rotary drilling [edit]

Oil well drilling utilises tri-cone roller, carbide embedded, fixed-cutter diamond, or diamond-impregnated drill bits to wear away at the cutting face. This is preferred because there is no need to return intact samples to surface for assay as the objective is to reach a formation containing oil or natural gas. Sizable machinery is used, enabling depths of several kilometres to be penetrated. Rotating hollow drill pipes carry down bentonite and barite infused drilling muds to lubricate, cool, and clean the drilling bit, control downhole pressures, stabilize the wall of the borehole and remove drill cuttings. The mud travels back to the surface around the outside of the drill pipe, called the annulus. Examining rock chips extracted from the mud is known as mud logging. Another form of well logging is electronic and is frequently employed to evaluate the existence of possible oil and gas deposits in the borehole. This can take place while the well is being drilled, using Measurement While Drilling tools, or after drilling, by lowering measurement tools into the newly drilled hole.

The rotary system of drilling was in general use in Texas in the early 1900s. It is a modification of one invented by Fauvelle in 1845, and used in the early years of the oil industry in some of the oil-producing countries in Europe. Originally pressurized water was used instead of mud, and was almost useless in hard rock before the diamond cutting bit.[2] The main breakthrough for rotary drilling came in 1901, when Anthony Francis Lucas combined the use of a steam driven rig and of mud instead of water in the Spindletop discovery well.[3]

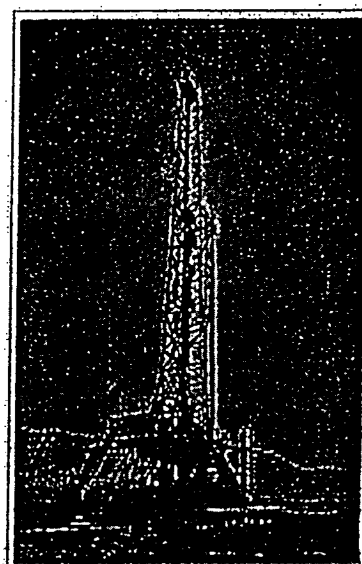
The drilling and production of oil and gas can pose a safety risk and a hazard to the environment from the ignition of the entrained gas causing dangerous fires and also from the risk of oil leakage polluting water, land and groundwater. For these reasons, redundant safety systems and highly trained personnel are required by law in all countries with significant production.

Sonic (vibratory) drilling [edit]

A sonic drill head works by sending high frequency resonant vibrations down the drill string to the drill bit, while the operator controls these frequencies to suit the specific conditions of the soil/rock geology. Vibrations may also be generated within the drill head. The frequency is generally between 50 and 120 hertz (cycles per second) and can be varied by the operator.

Resonance magnifies the amplitude of the drill bit, which fluidizes the soil particles at the bit face, allowing for fast and easy penetration through most geological formations. An internal spring system isolates these vibrational forces from the rest of the drill rig.

Limits of the technology [edit]


An oil rig.

Drill technology has advanced steadily since the 19th century. However, there are several basic limiting factors which will determine the depth to which a bore hole can be sunk.

All holes must maintain outer diameter; the diameter of the hole must remain wider than the diameter of the rods or the rods cannot turn in the hole and progress cannot continue. Friction caused by the drilling operation will tend to reduce the outside diameter of the drill bit. This applies to all drilling methods, except that in diamond core drilling the use of thinner rods and casing may permit the hole to continue. Casing is simply a hollow sheath which protects the hole against collapse during drilling, and is made of metal or PVC. Often diamond holes will start off at a large diameter and when outside diameter is lost, thinner rods put down inside casing to continue, until finally the hole becomes too narrow. Alternatively, the hole can be reamed; this is the usual practice in oil well drilling where the hole size is maintained down to the next casing point.

For percussion techniques, the main limitation is air pressure. Air must be delivered to the piston at sufficient pressure to activate the reciprocating action, and in turn drive the head into the rock with sufficient strength to fracture and pulverise it. With depth, volume is added to the in-rod string, requiring larger compressors to achieve operational pressures. Secondly, groundwater is ubiquitous, and increases in pressure with depth in the ground. The air inside the rod string must be pressurised enough to overcome this water pressure at the bit face. Then, the air must be able to carry the rock fragments to surface. This is why depths in excess of 500 m for reverse circulation drilling are rarely achieved, because the cost is prohibitive and approaches the threshold at which diamond core drilling is more economic.

Diamond drilling can routinely achieve depths in excess of 1200 m. In cases where money is no issue, extreme depths have been achieved, because there is no requirement to overcome water pressure. However, circulation must be maintained to return the drill cuttings to surface, and more importantly to maintain cooling and lubrication of the cutting surface.

Without sufficient lubrication and cooling, the matrix of the drill bit will soften. While diamond is the hardest substance known, at 10 on the Mohs hardness scale, it must remain firmly in the matrix to achieve cutting. Weight on bit, the force exerted on the cutting face of the bit by the drill rods in the hole above the bit, must also be monitored.

A unique drilling operation in deep ocean water was named Project Mohole.

Research of new drilling technologies [edit]

Limits of the conventional contact drilling technologies caused strengthen of the research of new non-contact effective drilling technologies. There were several attempts to achieve sufficient results of the research which would negate disadvantages of current contact technology. The best known are technologies based on the utilization of water jet, chemical plasma, hydrothermal spallation or laser. The research teams round the world have been developing these technologies for the long time.

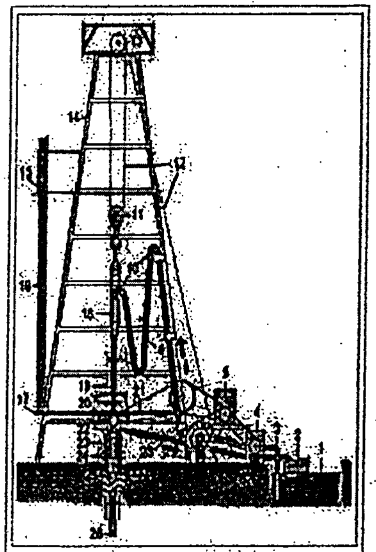
Nowadays, utilization of high energetic electrical plasma shows very promising in deep drilling applications. This approach has potential to replace conventional drilling technologies because of several advantages. It would be able to produce boreholes with large constant diameter without frequent replacement of the drill bits. It would decrease time and money consumption. This technology is in the research phase and need a strong support, but it can bring a large shift in drilling segment.

Causes of deviation [edit]

Most drill holes deviate slightly from their planned trajectory. This is because of the torque of the turning bit working against the cutting face, because of the flexibility of the steel rods and especially the screw joints, because of reaction to foliation and structure within the rock, and because of refraction as the bit moves into different rock layers of varying resistance. Additionally, inclined holes will tend to deviate upwards because the drill rods will lie against the bottom of the bore, causing the drill bit to be slightly inclined from true. It is because of deviation that drill holes must be surveyed if deviation will impact the usefulness of the information returned. Sometimes the surface location can be offset laterally to take advantage of the expected deviation tendency, so the bottom of the hole will end up near the desired location. Oil well drilling commonly uses a process of controlled deviation called directional drilling (e.g., when several wells are drilled from one surface location).

Rig equipment [edit]

Drilling rigs typically include at least some of the following items: See Drilling rig (petroleum) for a more detailed description.



Simple diagram of a drilling rig and its basic operation

- Blowout preventers: (BOPs)

The equipment associated with a rig is to some extent dependent on the type of rig but (#23 & #24) are devices installed at the wellhead to prevent fluids and gases from unintentionally escaping from the borehole. #23 is the annular (often referred to as the "Hydril", which is one manufacturer) and #24 is the pipe rams and blind rams. In the place of #24 Variable bore rams or VBR's can be used, they offer the same pressure and sealing capacity found in standard pipe rams, while offering the versatility of sealing on various sizes of drill pipe, production tubing and casing without changing standard pipe rams. Normally VBR's are used when utilizing a tapered drill string (when different size drill pipe is used in the complete drill string).

- Centrifuge: an industrial version of the device that separates fine silt and sand from the drilling fluid.
- Solids control: solids control equipments for preparing drilling mud for the drilling rig.
- Chain tongs: wrench with a section of chain, that wraps around whatever is being tightened or loosened. Similar to a pipe wrench.
- Degasser: a device that separates air and/or gas from the drilling fluid.
- Desander / desilter: contains a set of hydrocyclones that separate sand and silt from the drilling fluid.
- Drawworks: (#7) is the mechanical section that contains the spool, whose main function is to reel in/out the drill line to raise/lower the traveling block (#11).
- Drill bit: (#26) device attached to the end of the drill string that breaks apart the rock being drilled. It contains jets through which the drilling fluid exits.
- Drill pipe: (#16) joints of hollow tubing used to connect the surface equipment to the bottom hole assembly (BHA) and acts as a conduit for the drilling fluid. In the diagram, these are "stands" of drill pipe which are 2 or 3 joints of drill pipe connected together and "stood" in the derrick vertically, usually to save time while tripping pipe.
- Elevators: a gripping device that is used to latch to the drill pipe or casing to facilitate the lowering or lifting (of pipe or casing) into or

out of the borehole.

- Mud motor: a hydraulically powered device positioned just above the drill bit used to spin the bit independently from the rest of the drill string.
- Mud pump: (#4) reciprocal type of pump used to circulate drilling fluid through the system.
- Mud tanks: (#1) often called mud pits, provides a reserve store of drilling fluid until it is required down the wellbore.
- Rotary table: (#20) rotates the drill string along with the attached tools and bit.
- Shale shaker: (#2) separates drill cuttings from the drilling fluid before it is pumped back down the borehole.

See also [edit]

Mining portal

- Boring
- Flame jet drill
- Mineral exploration
- Oil platform
- Oil well
- Pumpjack
- Subsea

References [edit]

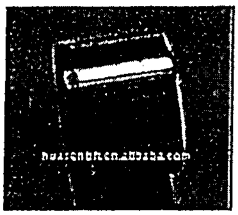
1. ^ Baars, D.L.; Watney, W.L.; Steeples, D.W.; and Brostuen, E.A (1989). [HTTP://www.kgs.ku.edu/Publications/Oil/primer12.html *Petroleum: a primer for Kansas*] (Educational Series, no. 7 ed.). Kansas Geological Survey. pp. 40. Retrieved 18 April 2011. "After the cementing of the casing has been completed, the drilling rig, equipment, and materials are removed from the drill site. A smaller rig, known as a workover rig or completion rig, is moved over the well bore. The smaller rig is used for the remaining completion operations."
2. ^ This article incorporates text from a publication now in the public domain: Chisholm, Hugh, ed (1911). "Petroleum". *Encyclopædia Britannica* (Eleventh ed.). Cambridge University Press.
3. ^ Roughnecks, Rock Bits And Rigs: The Evolution Of Oil Well Drilling Technology In Alberta, 1883-1970 By Sandy Gow, Bonar Alexander Gow Published by University of Calgary Press, 2005 ISBN 1-55238-067-X

External links [edit]

- OSHA guide for drilling rigs
- Soil boring with Rotary drilling
- Borehole drilling rig gallery

Categories: Drilling technology | Petroleum engineering | Petroleum geology | Oilfield terminology

EXHIBIT D



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Type: PDC cutter
Machine Type: Drilling Tool
Certification: ISO
Material: diamond
Processing Type: Forging
Use: Coal Mining
size: 89mm

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1PDC cutters for oil well drilling
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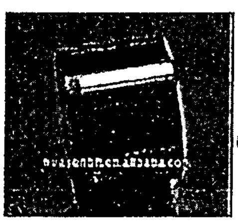

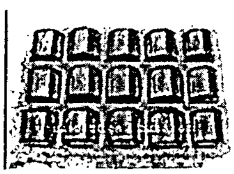

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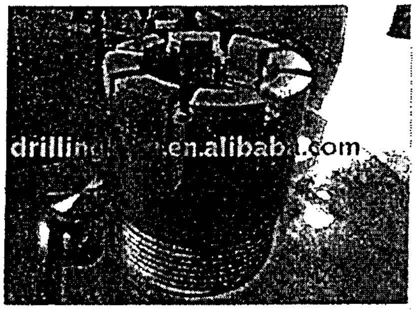
Impregnated diamond core drill bits



See larger image: Impregnated diamond core drill bits

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WG series: EWG, AWG, BWG, NWG, HWG
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Attorney(s):	Kay Lyn Schwartz/la	**Check Amount:**	$ n/a
Client/Matter#:	368614-3299	**U.S. Serial No./Reg. No.:**	76/700730
Applicant:	Varel International Ind., L.P.	**U.S. Filing/Reg. Date:**	Dec. 8, 2009
Title:	VULCAN		
Today's Date:	11-16-11	**Due Date:**	11-16-11

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Applicant: Varel International Ind., L.P.
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Attorney(s):	Kay Lyn Schwartz/la	**Check Amount: $** n/a	
Client/Matter#:	368614-3299	**U.S. Serial No./Reg. No.:** 76/700730	
Applicant:	**Varel International Ind., L.P.**	**U.S. Filing/Reg. Date:** Dec. 8, 2009	
Title:	VULCAN		
Today's Date:	11-16-11	**Due Date:** 11-16-11	

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November 16, 2011

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