

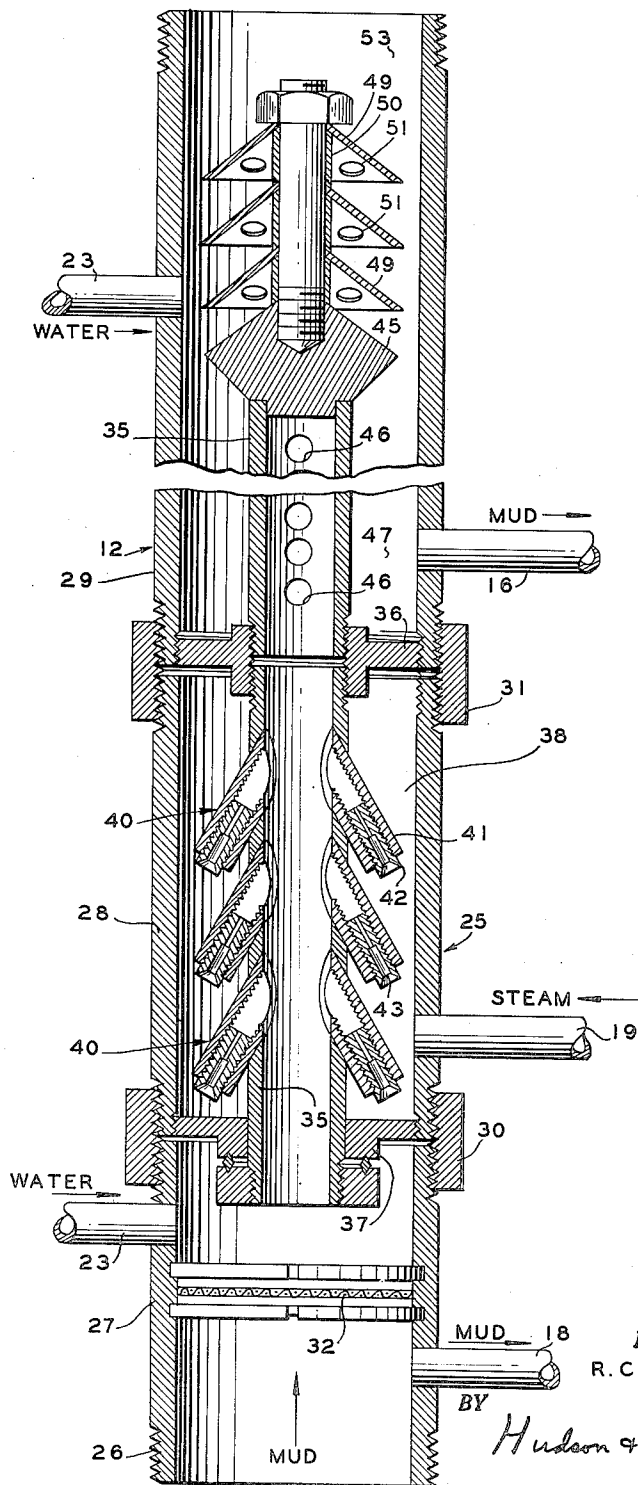
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GAS EXTRACTION APPARATUS

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GAS EXTRACTION APPARATUS

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This invention relates to apparatus for continuously extracting hydrocarbon gases from drilling muds.

In drilling wells, the hydrocarbon content of the drilling mud extracted from the well gives valuable information regarding the strata traversed by the drill bit. For example, a high hydrocarbon content may indicate that the drill bit is penetrating or is adjacent an oil-bearing sand formation.

It is an object of this invention to provide a steam extractor unit which is capable of converting practically all of the hydrocarbon compounds in a drilling mud into the gaseous phase and separating these gases from the mud.

It is another object of the invention to provide apparatus which is reliable in operation, of rugged construction, and which yields improved results over long periods of time.

Various other objects, advantages and features of the invention will become apparent from the following detailed description taken in conjunction with the accompanying drawings, in which the figure is a vertical sectional view of a steam extraction unit.

Referring now to the drawing in detail, I have shown apparatus for continuously removing hydrocarbons present in a drilling mud. In this apparatus, drilling mud is admitted to the bottom of a steam extractor unit 12 wherein the hydrocarbons contained in the mud are converted into the gaseous phase. Steam is supplied to the extractor unit through a line 19 and water input valves 21 and 22 admit water to the extractor unit in order to clean out the mud from the interior portions thereof, whenever this is desirable.

Unit 12 includes a generally cylindrical casing 25 having a screw-threaded end portion 26 which is adapted to receive the screw-threaded end of the mud inlet line. It will be noted that the casing 25 is divided into an inlet section 27, a jet section 28, and a baffle section 29, these sections being connected together by collars 30 and 31 so that the casing is essentially a one-piece unit.

The finer particles of mud from the inlet pass through a screen 32 which is disposed in the inlet section 27. The coarser particles of mud cannot pass through the screen 32 and are discharged through the outlet line 18.

A conduit 35 receives the mud from the inlet section 27 and this conduit is supported within the casing 25 by a pair of annular members 36 and 37, the peripheral portions of which are screw-threaded to the casing 25 and the interior

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portions of which are screw-threaded or otherwise suitably attached to the conduit 35. These annular members together with the inner surface of casing section 28 and the outer surface of conduit 35 define a sealed chamber 38 to which steam may be admitted through the line 19. The conduit 35 also carries a series of jets 40 which inject steam from the chamber 38 to the interior of conduit 35. Each of the jets 40 includes an interiorly threaded tubular member 41 which is secured within a suitable opening in conduit 35 and these tubes are angularly disposed with respect to the conduit 35 so that the steam admitted therethrough into the interior of conduit 35 flows co-currently with the mud flowing from the inlet section 27, but at an acute angle with respect to the direction of flow of the mud. A plug 42 is screw-threaded into the outer end of each tube 41 and each plug has a small central bore or nozzle 43 so that the steam is formed into a jet as it flows therethrough. The steam injected through the jets 40 causes the mud to be thoroughly agitated. This serves to partially separate the entrained hydrocarbon gases from the mud and the heat of the steam vaporizes practically all of the solid hydrocarbon compounds contained in the mud.

The upper end of conduit 35 is closed by a plug 45 and a series of perforations 46 are formed in the conduit adjacent the plug 45. As a result, the mud, steam and hydrocarbon particles are forced to pass through the perforations 46 into a chamber 47 defined by the interior walls of the baffle section 29, the outer surface of conduit 35, and the annular member 36. The steam and hydrocarbon particles rise in the chamber 47 together with a considerable amount of the mud particles and these particles are directed against a series of baffles 49 which are spaced at intervals along a tube 50 carried by the plug 45. Each baffle has several holes 51 at the central portion thereof, the steam and hydrocarbon particles passing through the holes 51 in the successive baffles 49 and rising toward the top of the casing 25. A certain amount of the heavier mud particles strike against each of the baffles 49 and drop therefrom into the lower part of the chamber 47 with the result that the ascending steam and hydrocarbon gas column contains fewer and fewer mud particles as the top of the baffle structure is approached. Of course, a large number of the mud particles settle immediately to the bottom of the chamber as they are discharged from the perforations 46 and are not carried up to the baffle structure. The mud particles settling to the bottom

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of the chamber are removed through outlet 16. A sufficient number of baffles is utilized so that the steam and hydrocarbon gases issuing from the openings in the top baffle 49 are practically free from mud particles and these gases pass through the opening 53 at the top of casing 25.

With the described apparatus, substantially all the hydrocarbons are extracted from the mud which flows through the unit 12. This substantially complete extraction is effected by two actions occurring within the unit. The high pressure steam entering through the jets 40 causes the mud to be forcibly ejected through the perforations 46 after which it strikes the baffles 49 thereby providing a high degree of mechanical agitation which is very effective in freeing gaseous hydrocarbons from the mud. In addition, the heat provided by the steam vaporizes the solid hydrocarbons and water contained in the mud while the perforated baffles prevent any of the mud from being mixed with the combined hydrocarbon and water vapor issuing from the unit 12 through opening 53.

From the foregoing description, it will be apparent that I have provided apparatus for obtaining the objects of my invention. The extractor unit 12 effectively removes hydrocarbon gases from the drilling mud for purposes of analysis. The apparatus of my invention may be used either to continuously determine the percentage of hydrocarbons present in the drilling mud or to take samples at predetermined intervals.

While the invention has been described in connection with a present, preferred embodiment thereof, it is to be understood that this description is illustrative only and is not intended to limit the invention.

I claim:

1. A unit for extracting hydrocarbon gases from drilling muds which comprises, in combination, a casing having inlet means at one end thereof for receiving drilling mud, said inlet means including a screen for preventing passage of particles therethrough which are of greater than a predetermined size, outlet means for oversize particles adjacent the inlet side of said screen, a conduit extending longitudinally of said casing for receiving the screened particles of mud, a series of jets for injecting steam into the mud as it flows through said conduit to vaporize a portion of the hydrocarbons therein, a chamber communicating with said conduit, a series of longitudinally spaced perforated baffles in said chamber for separating the hydrocarbon gases from the drilling mud, outlet means for the drilling mud at the end of said chamber adjacent said conduit, means for injecting a stream of water adjacent said baffle structure to wash the mud from said chamber, and outlet means for hydrocarbon gases at the other end of said chamber.

2. A unit for extracting hydrocarbon gases from drilling muds which comprises, in combination, an elongated casing, a conduit supported inside said casing and extending longitudinally thereof, a pair of spaced annular members positioned in the interspace between said conduit and said casing, said members defining a sealed chamber with the adjacent walls of said casing and said conduit, inlet means for introducing steam into said sealed chamber, a series of jets spaced along said conduit for injecting steam from said chamber into drilling mud flowing through said conduit, a plug closing one end of

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said conduit, said conduit having perforations therein adjacent said plugged end for permitting the flow of drilling mud from said conduit into a second chamber formed between said conduit and said casing, a baffle structure carried by said plug and including a series of longitudinally spaced frusto conical plates, each plate having a plurality of openings in the central region thereof to permit hydrocarbon gases to pass therethrough but to obstruct the passage of drilling mud, outlet means for drilling mud in said second chamber, and outlet means for hydrocarbon gases at the end of said baffle structure remote from said plug.

3. A unit for extracting hydrocarbon gases from drilling muds which comprises, in combination, a casing having inlet means at one end thereof for receiving drilling mud, said inlet means including a screen for preventing passage of particles therethrough which are of greater than a predetermined size, outlet means for oversize particles adjacent the inlet side of said screen, a conduit supported inside said casing and extending longitudinally thereof, a pair of spaced annular members positioned in the interspace between said conduit and said casing, said members defining a sealed chamber with the adjacent walls of said casing and said conduit, inlet means for introducing steam into said sealed chamber, a series of jets spaced along said conduit for injecting steam from said chamber into drilling mud flowing through said conduit, a plug closing one end of said conduit, perforations formed adjacent said plugged end of said conduit for permitting the flow of drilling mud from said conduit into a second chamber formed between said conduit and said casing, a baffle structure carried by said plug and including a series of longitudinally spaced frusto conical plates, each plate having a plurality of openings in the central region thereof to permit hydrocarbon gases to pass therethrough while obstructing passage of said drilling mud, outlet means for drilling mud in said second chamber, and outlet means for hydrocarbon gases at the end of said baffle structure remote from said plug.

4. A unit for extracting hydrocarbon gases from drilling muds which comprises, in combination, a casing having inlet means at one end thereof for receiving drilling mud, said inlet means including a screen for preventing passage of particles therethrough which are of greater than a predetermined size, outlet means for oversize particles adjacent the inlet side of said screen, a conduit supported inside said casing and extending longitudinally thereof, a pair of spaced annular members positioned in the interspace between said conduit and said casing, said members defining a sealed chamber with the adjacent walls of said casing and said conduit, inlet for introducing steam into said sealed chamber, a series of jets spaced along said conduit for injecting steam from said chamber into drilling mud flowing through said conduit, a plug closing one end of said conduit, perforations formed adjacent said plugged end of the conduit for permitting the flow of drilling mud from said conduit into a second chamber formed between said conduit and said casing, a baffle structure carried by said plug and including a series of frusto conical plates spaced longitudinally within said casing, each plate having a plurality of openings in the central region thereof to permit hydrocarbon gases to pass through the baffle structure while obstructing passage of said drill-

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ing mud therethrough, outlet means for drilling mud in said second conduit, outlet means for hydrocarbon gases at the end of said baffle structure remote from said plug, inlet means for introducing water into the inlet portion of said conduit, and a water inlet means adjacent said baffle structure to wash the mud from said conduit, said screen, and said baffle structure.

5. A unit for extracting hydrocarbon gases from drilling muds which comprises, in combination, an elongated vertical casing, means for causing a stream of drilling mud to flow through said casing, a series of upwardly directed jets for injecting high pressure steam into said stream of drilling mud to vaporize a portion of the hydrocarbons therein, a series of baffles disposed within said casing above said jets for separating the hydrocarbon gases from the drilling mud, said baffles being constructed and arranged to impede the flow of mud through said casing and to permit the flow of vapors through said casing, and outlet means for said vaporized hydrocarbons.

6. An extractor unit comprising, in combina-

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tion, an elongated vertical casing, inlet means at the lower end of said casing, a conduit communicating with said inlet means and extending longitudinally of said casing, a series of upwardly directed jets for injecting a heated fluid into said conduit, an elongated chamber communicating with said conduit through a plurality of perforations in said conduit, a series of longitudinally spaced perforated baffles in said chamber, and outlet means at opposite respective ends of said chamber.

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