

UNITED STATES PATENT OFFICE

2,634,236

TREATMENT FOR THE CORRECTION OF
LOST CIRCULATION OF DRILLING
FLUIDSEdgar K. Simon and Milton H. Fischer, New York,
N. Y., assignors to Lorum Fibre Company, Inc.,
New York, N. Y., a corporation of New YorkNo Drawing. Application April 30, 1951,
Serial No. 223,832

6 Claims. (Cl. 252—8.5)

1

This invention relates to the drilling of wells and relates more particularly to a method for correcting lost circulation of drilling fluid in the drilling of wells.

In the rotary drilling of wells, such as those for petroleum oil or gas, a drilling fluid is continuously circulated from the surface of the ground to the bottom of the hole and back to the surface again for the purpose of lubricating the drill bit and pipe, carrying cuttings from the bottom of the hole to the surface of the ground, and imposing a hydrostatic pressure on the drilled formations to prevent escape of oil, gas, or water therefrom into the hole during the drilling operations. When drilling through shale or fractured or cavernous formations or other formations having high permeability, a condition known as lost circulation is frequently encountered, i. e., the drilling fluid flows into the formation with consequent loss of the drilling fluid and increase in the cost of drilling the well. Frequently, the condition is so aggravated that drilling cannot be continued and the well has to be abandoned. Various methods have been devised to correct lost circulation but each suffers from one or more drawbacks. For example, various types of fibrous materials have been added to the drilling fluid to correct lost circulation but these materials form a loosely adherent barrier along the walls of the well at the lost circulation zone which, while correcting the lost circulation momentarily, are easily removed by the normal mechanical action of the drill bit or pipe or by the normal erosive effect of the drilling fluid stream with recurrence of lost circulation.

It is an object of this invention to provide a method for correcting lost circulation of drilling fluid. It is another object of this invention to provide a barrier to the flow of drilling fluid into a lost circulation zone which barrier is not easily removable by the normal action of the drill bit or pipe or the normal erosive effect of the drilling fluid stream. Further objects of the invention will become apparent from the following description thereof.

In accordance with the invention, lost circulation of drilling fluid is corrected by admixing with the fluid ground or fiberized leather and pumping the resulting mixture through the well bore to contact the lost circulation zone. We have found that fiberized leather effectively corrects many cases of lost circulation of drilling fluid. The leather fibers penetrate into the permeable lost circulation zones of sufficient distance to form an effective barrier to the flow of drilling fluid into the zones without the build-up

2

of a thick cake at the walls of the bore hole thereby preventing sticking of the drill bit or pipe, and normal action of the drill bit or pipe or flow of the drilling fluid stream does not remove the barrier.

The leather may be any type of tanned animal skin and may be tanned by any suitable process such as vegetable tanning or chrome tanning. The leather must be ground, or fiberized, and the fibers may be of various sizes depending upon the size of the interstices or voids in the zone where lost circulation is to be corrected. The fibers should be hair-like in form and at least the finer fibers, when pressed together in the dry state, should tend to mat or form a felt-like material. The fiberized leather may be prepared by grinding leather against abrasive wheels, between millstones, or by any other method providing fibrous material.

The fiberized leather is added to the drilling fluid at the mud pit, at the inlet to the mud pumps, or at any other desired place. The finer fibers of the fiberized leather tend to lump together when added to the drilling fluid and therefore it is preferred to add the fiberized leather to the drilling fluid by sprinkling or scattering or otherwise in small individual quantities in order to obtain a relatively uniform dispersion. Suitably, the fiberized leather may be added to the drilling fluid from a hopper by means of a liquid jet. Where the fiberized leather is added to the drilling fluid, as for example, to the fluid in the mud pit, in large individual quantities and lumping occurs, agitation of the fluid and the fiberized leather is helpful in obtaining dispersion.

The fiberized leather is added to the drilling fluid in amounts required to effectively seal the lost circulation zone to the flow thereto of the drilling fluid. These amounts will vary depending upon the thickness, the permeability, and the porosity of the lost circulation zone. Ordinarily, the thickness, the permeability, and the porosity of the lost circulation zone cannot be determined and therefore no definite rule can be given with respect to the amount to be employed. Preferably, the fiberized leather should be added to the drilling fluid in amounts such that the concentration of fiberized leather will be between about two and twenty pounds per barrel of drilling fluid. The fiberized leather is added to the drilling fluid at the time lost circulation is encountered, or is added just prior to the time lost circulation will be encountered as determined by knowledge of the stratigraphy of the well. However, if desired, the fiberized leather may be main-

tained in the drilling fluid throughout drilling although such procedure is not required unless lost circulation is continuously being encountered.

The following examples will be illustrative of the effect of fiberized leather admixed with drilling fluid for preventing flow of drilling fluid through permeable media.

EXAMPLE I

A drilling fluid was prepared by admixing water and bentonite in the proportion of 94.5 pounds of water to 5.5 pounds of bentonite and the fluid was aged for 24 hours at 240° F. One thousand cubic centimeters of the aged fluid was placed in a static drilling fluid tester consisting of an upright cylindrical chamber provided at the top with a cap having a pressure connection and at the bottom with a closure plate supporting a bed of gravel within the chamber, the closure plate having an orifice at the center thereof leading to a pipe connected to a valve positioned outside the chamber. The gravel bed constituted the permeable medium and its permeability was 7,600 darcies. A pressure of 100 pounds per square inch gage was imposed within the chamber and the valve was opened. The entire amount of drilling fluid passed through the gravel bed and left the chamber through the valve.

EXAMPLE II

Various amounts of fiberized leather were added to one thousand cubic centimeter samples of the aged drilling fluid described above. Each sample was placed in the tester, a fresh gravel bed being employed for each sample, and the procedure described in Example I repeated. With each sample, an initial surge of drilling fluid through the gravel bed occurred, after which the gravel bed became completely plugged with respect to the passage therethrough of further drilling fluid, only the slow passage of filtrate water characteristic of normal filtering action through a filter cake being observed. To test the completeness of plugging following the initial surge, a pressure of 500 pounds per square inch gage was imposed on the drilling fluid remaining within the chamber and in case there was no flow of drilling fluid through the gravel bed, only the flow of filtrate water continuing. The table gives the amount of fiberized leather in each sample, the volume of drilling fluid passing through the gravel bed during the initial surge, and the depth of penetration of the fiberized leather into the gravel bed.

Table I

Sample Number.....	1	3	3	4
Amount of Fiberized Leather, Pounds Per Barrel of Drilling Fluid.....	7.5	5.0	3.0	2.0
Surge Loss, Cubic Centimeters.....	145	200	455	515
Depth of Penetration of Fiberized Leather, Inches.....	1	1	1	1

Having thus described our invention, it will be understood that such description has been given by way of illustration and example and not by way of limitation, reference for the latter purpose being had to the appended claims.

We claim:

1. A process for correcting lost circulation of drilling fluid during drilling of a petroleum well bore comprising admixing fiberized leather with said drilling fluid and pumping the resulting mixture through said well bore to contact the lost circulation zone within said well bore.

2. A process for correcting lost circulation of drilling fluid during drilling of a petroleum well bore comprising admixing with said drilling fluid fiberized leather in an amount between about two and twenty pounds per barrel of drilling fluid and pumping the resulting mixture through said well bore to contact the lost circulation zone within said well bore.

3. A process for correcting lost circulation of drilling fluid during drilling of a petroleum well bore comprising admixing with said drilling fluid fiberized leather in an amount between about two and twenty pounds per barrel of drilling fluid, dispersing said fiberized leather in said drilling fluid, and pumping the resulting mixture through said well bore to contact the lost circulation zone within said well bore.

4. A process for correcting lost circulation of drilling fluid during drilling of a well bore in the earth comprising admixing fiberized leather with a liquid and passing the resulting mixture into said bore to contact the lost circulation zone within said well bore.

5. A process for correcting lost circulation of drilling fluid during drilling of a well bore in the earth comprising admixing fiberized leather with a liquid and pumping the resulting mixture into said well bore to contact the lost circulation zone within said well bore.

6. A process for correcting lost circulation of drilling fluid during drilling of a well bore in the earth comprising admixing fiberized leather with a liquid and circulating the resulting mixture through said well bore to contact the lost circulation zone within said well bore.

EDGAR K. SIMON.
MILTON H. FISCHER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,297,660	Mazee	Sept. 29, 1942

OTHER REFERENCES

Rogers, "Composition and Properties of Oil Well Drilling Fluids," pgs. 449 and 450, First Ed., 1948. (Copy in Div. 64.)

Certificate of Correction

Patent No. 2,634,236

April 7, 1953

EDGAR K. SIMON ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 3, Table I, the heading should appear as shown below instead of as in the patent

Sample Number.....	1	2	3	4
--------------------	---	---	---	---

column 4, line 34, for "said bore" read *said well bore*;

and that the said Letters Patent should be read as corrected above, so that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 16th day of June, A. D. 1953.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.