

Nov. 24, 1942.

G. C. MADDOX

2,303,085

DEVICE FOR REMOVING SAMPLES FROM A FLUID STREAM

Filed March 20, 1940

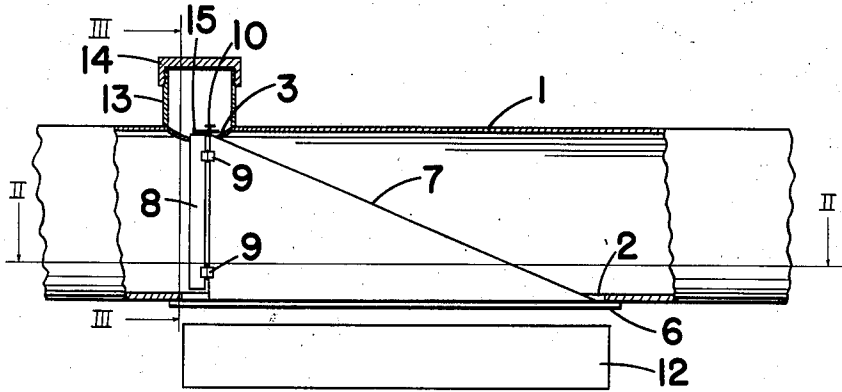


FIG. 1.

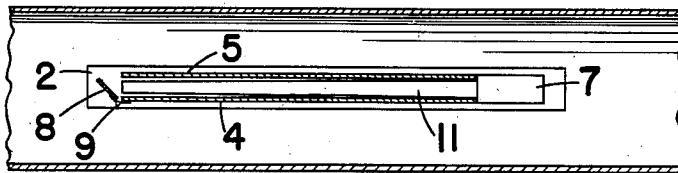


FIG. 2.

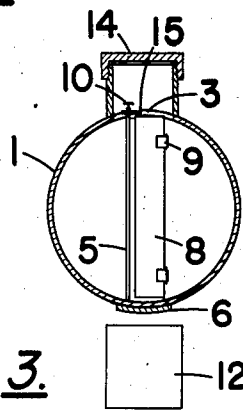


FIG. 3.

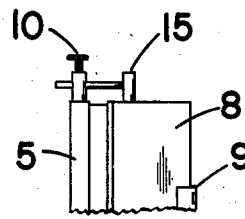


FIG. 4.

Gerald C. Maddox
INVENTOR.

BY *R. P. Young*
ATTORNEY.

UNITED STATES PATENT OFFICE

2,303,085

DEVICE FOR REMOVING SAMPLES FROM
FLUID STREAMSGerald C. Maddox, Ponca City, Okla., assignor to
Standard Oil Development Company, a corpo-
ration of Delaware

Application March 20, 1940, Serial No. 325,003

11 Claims. (Cl. 73—21)

The present invention relates to a device for removing a representative sample from a flowing stream carrying solid material in suspension.

In drilling bore holes in the earth by the rotary method it is conventional in the art to force a drilling fluid down into the well to aid in cooling the bit, sealing the walls of the bore hole, and removing cuttings from the bottom of the bore hole. Drilling fluid carrying the cuttings passes from the bore hole to a means for removing these cuttings, and then is again circulated into the well. From an examination of the cuttings paleontologists are able to determine the various geologic structures penetrated by the bore hole. It is therefore desirable that a representative sample be withdrawn from the flow line carrying the drilling returns to the cutting removing means.

Various means and methods have been used to obtain samples of the drilling returns, but these methods have not been satisfactory because they fail to secure the true percentages of the lighter and heavier rocks suspended in the drilling fluid. The previously known methods are not satisfactory because none of them obtains an exact vertical cross-section of the returns from the bore hole.

A common method of removing samples is to place a low baffle in the bottom of a trough carrying mud returns from the bore hole, and either diverting a part of the returns into a smaller trough where cuttings are allowed to settle out, or else simply allow the cuttings to accumulate behind the baffle and remove these accumulated cuttings.

Another method which may be used when a pipe is used to conduct the returns from the bore hole, involves the use of a sump placed in the line in which the cuttings are allowed to collect and which are removed by opening a valve in the bottom of the sump.

None of these methods is satisfactory in that the cuttings obtained are not representative of the cuttings removed from the hole, but contain too high a percentage of the heavier materials and larger cuttings.

Attempts have also been made to use various types of screens for removing cuttings from the drilling fluid. These were not successful because screens in the desired fine mesh plug up with mud, while coarse screens lose too much fine material, and both the fine and coarse screens require too much attention. In recent years when shakers have been used to condition the drilling mud, attempts have been made to catch samples

off the shaker. This method, however, is not satisfactory in that some of the fine cuttings are lost and also, since it is not customary to run the shaker continuously, a continuous run of cuttings is not obtained.

It is an object of the present invention to provide a device for taking a representative sample of drilling fluid containing cuttings of different sizes and densities.

It is a further object of the present invention to provide a device for taking a representative sample from a fluid stream containing solid particles of several sizes and densities which may be adjusted in capacity without causing any substantial change in the flow of fluid through the conduit in which the device is located.

It is another object of the present invention to provide a device for taking samples of fluid containing solid particles of several sizes and densities which will take representative vertical cross-sections of material flowing through a conduit without altering materially the flow of material in the conduit.

Other objects and advantages of the present invention may be seen from the following description taken in conjunction with the accompanying drawing in which

Fig. 1 is a side view of one embodiment of the present invention in position in a conduit with parts of the conduit broken away to show the construction of the device;

Fig. 2 is a sectional view taken along the line II—II of Fig. 1;

Fig. 3 is another view of the device taken along the line III—III of Fig. 1; and

Fig. 4 is an enlarged view of a portion of the device taken from Fig. 3.

Referring to the drawing in detail and first to Fig. 1, a conduit 1 is provided at its bottom with a longitudinal slot 2 and in its upper part with a circular opening 3. Arranged within the conduit is the sample removing device of the present invention which it is preferred to call a section cutter. The sides of the section cutter are formed by two similar units made in the form of right triangles which are designated by numerals 4 and 5. These triangular side pieces are arranged in parallel with each other with their vertical edges facing against the upstream direction in the conduit and their bases parallel with the axis of the conduit and connected to base plate 6 in a fluid-tight manner. The plate 7 is attached to the edges of the side pieces to join the hypotenuses of the triangles in a fluid-tight manner.

The effective space between the edges of the side pieces pointing in the upstream direction is controlled by vertical member 8 hingedly connected to side piece 4 by means of hinges 9-9. A bracket 15 is pivotally attached to member 8 to allow the bracket arcuate movement, and a thumbscrew 10 is pivotally attached to side member 5 in like manner. The bracket and thumbscrew cooperate to allow member 8 to be adjusted to any desired position. Base member 6 is provided with a longitudinal slot 11 between the side walls 4 and 5, the slot widening as it approaches the junction of member 7 with the base member for reasons which will hereinafter appear. A suitable vessel 12 is placed below slot 11 to retain the sample removed from the conduit by the device of the present invention.

Circular opening 3 in the upper portion of the conduit is positioned so that it is directly above the member 8 controlling the inlet to the device and also the adjusting means for regulating the size of the opening. A cylindrical member 13 is attached to the conduit adjacent the edges of circular opening 3 to prevent loss of liquid from this opening. In addition, a cap 14 may be used to close the upper end of circular member 13.

In operation, conduit 1 is placed in a substantially horizontal position, and mud returns containing cuttings from the well are allowed to flow through the conduit before the contaminated drilling mud is passed to a mud conditioning means, such as a settling pit or shaker. The vertical part of the section cutter is pointed in the upstream direction in the conduit. The amount of the sample removed by the device may be altered by altering the size of the opening at the mouth of the device by the adjustable flap. Since it is desirable that a sample be taken continuously, the size of the opening is generally adjusted so that the sample collecting device will fill in a proper time interval after which it is emptied by an operator and allowed to again collect a sample. If the sample retaining vessel fills too rapidly, the adjustable flap is set to reduce the size of the opening. When, on the other hand, it does not collect a sufficient amount of sample, the opening is widened.

The triangular shape of the section cutter and the increasing width of the bottom slot in the direction of the current flow tend to give the material entering the section cutter about the same speed as it maintains through the flow line. Since there is substantially no retardation nor increase in the speed of the current in front of the cutter, a true vertical cross-section of the drilling returns from the bore hole is obtained.

In drilling deep bore holes, it is common at the present time to use an eight inch pipe as the conduit for the returns from the well. It has been found that in an eight inch flow line suitable dimensions for the modification of the present invention are a height of seven inches, a width of one inch between the side walls and a base 19 inches long with a slot in the base varying from $\frac{1}{2}$ inch at its narrow end to 1 inch at its wide end. When a device of the above dimensions is used under ordinary drilling conditions, the adjustable flap is set for a $\frac{3}{4}$ inch opening of the mouth of the device, but this opening is determined in actual practice by the amount of cuttings collected in the sample box.

While I have disclosed a specific embodiment of the present invention, it is obvious that various modifications may be made without departing from the scope of the invention. Generally, how-

ever, it is desirable that side pieces be selected which have a substantially vertical edge to be presented to the upstream side of the fluid to be sampled, and that an opening at the bottom increasing in size with the direction of the flowing stream be provided to help maintain a current speed within the device comparable to the speed through the flow line.

Having fully described and illustrated the present invention what I desire to claim is:

1. A device adapted for removing samples from the return mud line in a rotary drilling rig comprising a substantially horizontal fluid conduit provided with a floor opening two similar vertical side pieces, arranged within said conduit, corresponding edges of each of said pieces being attached to the floor of said conduit in a fluid-tight manner to include said floor opening between them, and substantially vertical edges of said pieces being faced in the upstream direction in said conduit, a member attached to one of said vertical edges arranged to control the width of the fluid opening between said vertical edges, and means for connecting together in a fluid-tight manner the edges of said side pieces other than the above mentioned vertical edges and those attached to the floor of the conduit.

2. A device in accordance with claim 1 in which the opening in the floor of the conduit increases in width in the downstream direction.

3. A device in accordance with claim 1 in which the vertical edges of the side pieces are of substantially the same length as the largest vertical dimension of the conduit and in which the opening in the floor of the conduit increases in width in the downstream direction.

4. A device suitable for taking samples from the return mud line in a rotary drilling rig comprising a fluid conduit provided with a bottom opening, two similar triangular side pieces, said side pieces being arranged parallel with each other in said fluid conduit with corresponding sides attached to the bottom of said conduit to include said opening between them and substantially vertical edges pointing in the upstream direction, a member provided with an adjustable bracket hingedly attached to one of said sides, whereby the fluid opening between the two side pieces may be regulated, and means connecting together in a fluid-tight manner those edges of the side pieces not attached to said bottom of the conduit and not forming the opening controlled by the hinged member.

5. A device in accordance with claim 4 in which said conduit is substantially horizontal, said vertical edges have substantially the same dimensions as the largest vertical dimensions of said conduit and in which the opening in the bottom of the conduit increases in width in the downstream direction.

6. A device suitable for taking samples from the return mud line in a rotary drilling rig comprising a fluid conduit having a bottom opening, two similar side pieces in the shape of right angle triangles, said side pieces being arranged parallel with each other, in the conduit with their bases attached to the bottom of said conduit to include said opening between them, and their altitude sides pointed in the upstream direction, a member closing the opening between the hypotenuses of the side pieces, and a member hingedly attached to the altitude side of one of said side pieces and provided with a bracket whereby the fluid opening between the altitude sides of said side pieces may be adjusted.

7. A device adapted for removing samples from a stream comprising a horizontal cylindrical conduit, two right-angle, triangularly shaped sides arranged vertically in said conduit, with one pair of the right-angle edges disposed on the bottom of the conduit and the other pair of right-angle edges pointing upstream, one of said latter edges being provided with a hinged flap arranged to close the opening between the two upright edges, said conduit having an opening in the floor thereof between said side pieces.

8. A device for removing fluid samples from a stream comprising a conduit arranged so that a stream flowing therethrough has a substantial horizontal component of flow, said conduit being provided with an opening, walls arranged in said conduit to define a passage discharging through said opening, an elongated inlet for said passage including the upper and lower limits of a cross section of said stream, and means arranged in said conduit for altering the size of the opening without substantially changing the proportion of sample received between said upper and lower limit of said stream.

9. A device for receiving fluid samples from a stream comprising a conduit provided with an opening and arranged with its axis extending in

a horizontal direction, walls arranged in said conduit to define a passage discharging through said opening, an elongated inlet for said passage facing in the upstream direction, and including the upper and lower limit of a cross section of said stream, and means arranged in said conduit for altering the size of the opening without substantially changing the proportion of sample received between said upper and lower limits of the stream.

10. A device for removing fluid samples from a stream comprising a conduit arranged to conduct the fluid in a substantially horizontal direction and provided with an opening, walls arranged in said conduit to define a passage discharging through said opening, an elongated inlet for said passage facing in the upstream direction with its axis extending between substantially the upper and lower limit of said stream, and means arranged for altering the width of opening of said inlet without changing its other dimensions.

11. A device in accordance with claim 10 in which the inlet opening is of uniform width and is so maintained.

GERALD C. MADDOX.