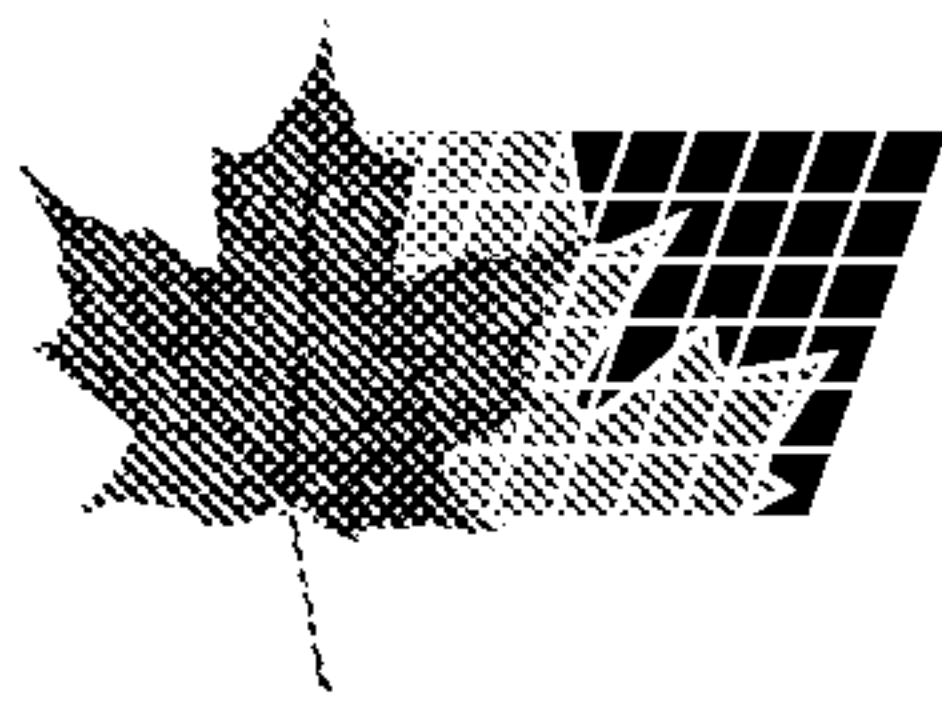




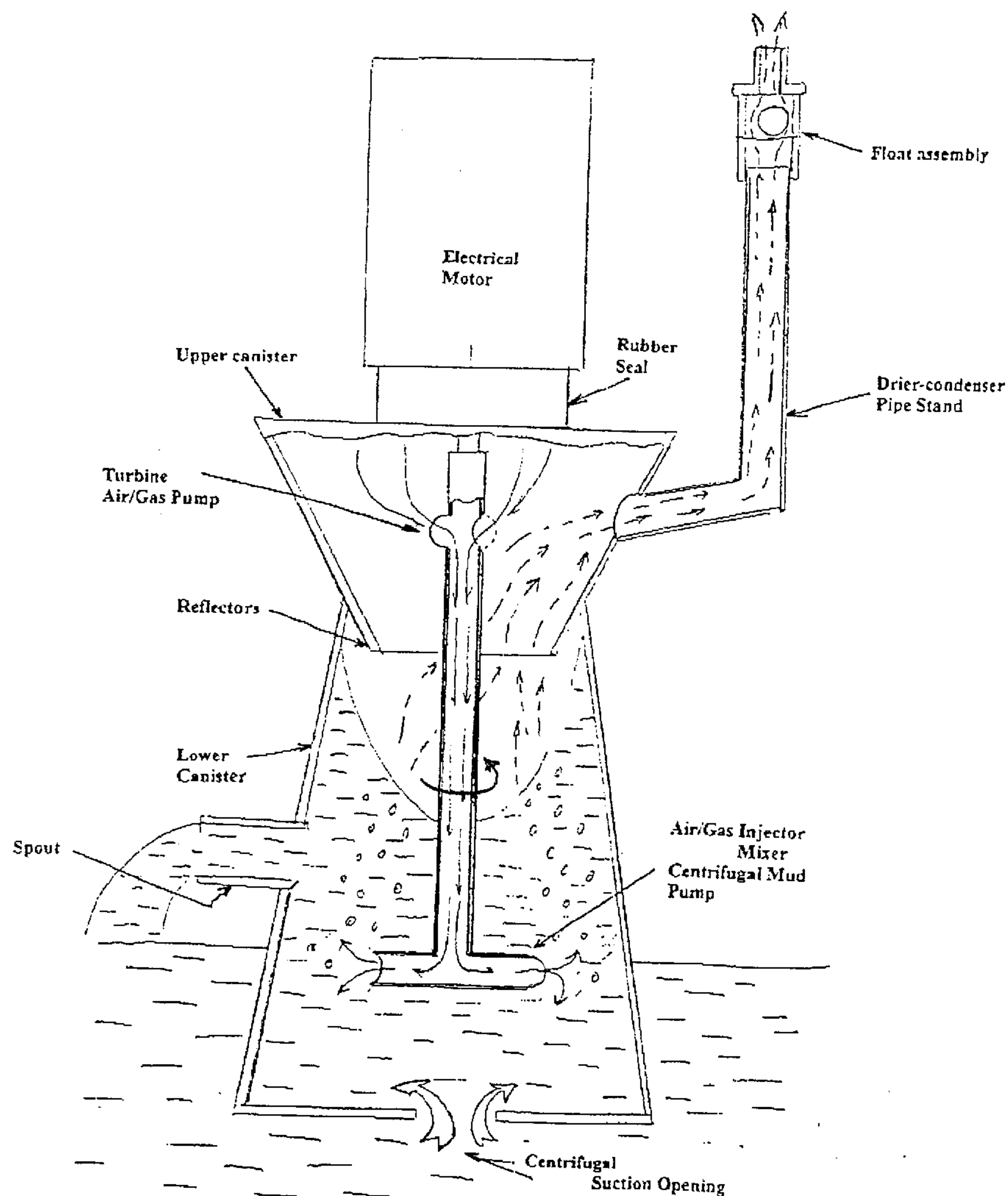
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(54) **PIEGE A GAZ POUR BOUE DE FORAGE**

(54) **GAS TRAP FOR DRILLING MUD**



(57) A gas trap is provided for liberating subterranean gases entrained in drilling muds. The trap comprises a pair of opposing truncated right circular vessels and having a concentric bottom mud inlet, a side mud outlet and a gas outlet at the top. A hollow shaft stirrer depends vertically and concentrically within the trap and has radial tubes extending from its lower end for forming a continuous bore within the shaft. The radial tube ends are bevelled on the trailing edge. Ports are formed at the top of the hollows shaft. The trap is partially immersed in mud forming a mud level in the trap and a freeboard area above containing air. When rotated, the hollow shaft spins the mud forming a turbulent low pressure area at the bevels, drawing air down the shaft from the upper ports and injecting air into the mud, all of which aids in liberating gases from the mud.



1 **"GAS TRAP FOR DRILLING MUD"**

2

3 **ABSTRACT OF THE INVENTION**

4 A gas trap is provided for liberating subterranean gases entrained in
5 drilling muds. The trap comprises a pair of opposing truncated right circular vessels
6 and having a concentric bottom mud inlet, a side mud outlet and a gas outlet at the
7 top. A hollow shaft stirrer depends vertically and concentrically within the trap and has
8 radial tubes extending from its lower end for forming a continuous bore within the
9 shaft. The radial tube ends are bevelled on the trailing edge. Ports are formed at the
10 top of the hollow shaft. The trap is partially immersed in mud forming a mud level in
11 the trap and a freeboard area above containing air. When rotated, the hollow shaft
12 spins the mud forming a turbulent low pressure area at the bevels, drawing air down
13 the shaft from the upper ports and injecting air into the mud, all of which aids in
14 liberating gases from the mud.

15

1 **"GAS TRAP FOR DRILLING MUD"**

2

3 **FIELD OF THE INVENTION**

4 The invention relates to apparatus and process for the extraction and

5 collection of gases which are entrained with mud used in drilling.

6

7 **BACKGROUND OF THE INVENTION**

8 During the drilling of a subterranean well, mud is circulated downhole to

9 carry away drill cuttings. Should gas be encountered while drilling, it becomes

10 incorporated with the mud and is conveyed to the surface. The mud is circulated in

11 a loop: pumped from the mud tank; downhole to the bit; up to the surface; and back

12 to the mud tank. The gas can contain the information necessary to establish whether

13 the well has traversed a formation of interest; specifically whether hydrocarbons have

14 been encountered.

15 In order to analyse the gas, it is known to insert apparatus or gas trap

16 into the mud tank for extracting the gas. This apparatus agitates the mud so that the

17 gas is released for collection.

18 More particularly, the known gas trap comprises a cylindrical vessel

19 inserted into the mud in the tank. The vessel has a transverse bottom plate formed

20 with a bottom concentric hole. The vessel is partially submerged in the mud. Mud

21 flows upwards into the bottom hole, establishing a mud level within the vessel.

22 A beater or agitator, formed like an upside down "T" or tee-bar, is

23 rotated concentrically within the vessel, typically driven by a 1725 rpm motor. The

1 mud spins and is thrown parabolically up the vessel's side walls. A side port in the
2 vessel permits mud to overflow and escape the vessel when it rises up the wall.
3 Accordingly, a flow is established, drawing fresh mud up from the bottom hole. The
4 agitation causes contained gas to be liberated from the incoming mud. The liberated
5 gas is drawn from the top of the vessel and is analysed, such as by a gas detector.

6 As the agitator is merely a beater, the gas release is less than
7 satisfactory.

8

9

SUMMARY OF THE INVENTION

10 According to the present invention, an improved gas-liberation vessel or
11 gas trap is provided which improves the release of gases from the mud. Generally,
12 an improved stirrer in the trap rotates within the mud, causing localized reduced
13 pressure in the mud and further injecting freeboard gases, including air and gas, into
14 the mud, the freeboard gases being recycled from the freeboard volume above the
15 mud. As a result, the mud gas is diluted and a correction can be applied if
16 concentrations are to be calculated. Additionally, the configuration of the vessel
17 forming the trap further aids in the release of mud gas and avoids accidental
18 entrainment of mud in the gas outlet port.

19 More specifically, in one embodiment of the present invention, the novel
20 gas trap comprises upper and lower conical vessels joined together at their narrow
21 truncated ends. The truncated end of the upper canister projects somewhat into the
22 truncated end lower canister, forming a mud deflecting lip. The bottom of the trap has

1 a mud-inlet hole. A mud-outlet spout is formed along the side wall. A gas outlet port
2 is located at the top of the trap. A rotary stirrer extends vertically and concentrically
3 into the trap. The stirrer comprises a hollow shaft terminated the lower end with
4 diametrically opposing radial tubes so that the stirrer forms a "T" configuration. The
5 radial tubes have beveled open ends on the trailing edge of the tubes and the shaft
6 has gas inlet ports at its upper end, above the mud. In operation, the stirrer spins and
7 lifts the mud inertially and parabolically up the conical side wall of the vessel. At high
8 mud levels (the trap is located low in the mud), the mud rides high the side walls, lower
9 lip preventing entry of the mud into the freeboard volume. A turbulent low pressure
10 area is formed in the trailing bevelled open ends, aiding in the release of gas from the
11 mud and drawing gas down the hollow stirrer for injection into the mud. Radial scoops
12 mounted to the shaft's upper ports aid in collecting air and gas. The combination of
13 inducing low pressure into the mud and introduction of recycled gases provides
14 superior liberation of gas form the mud.

15 In a broad aspect of the invention, a gas trap is provided comprising a
16 vessel having a transverse circular cross-section with a concentric bottom mud inlet,
17 a side mud outlet and a gas outlet at the top. A hollow shaft stirrer depends vertically
18 and concentrically within the trap and has radial tubes extending from its lower end for
19 forming a continuous bore within the shaft. The radial tube ends are bevelled on the
20 trailing edge. Ports are formed at the top of the hollows shaft. The trap is partially
21 immersed in mud forming a mud level in the trap and a freeboard area above
22 containing air. When rotated, the hollow shaft spins the mud forming a turbulent low

1 pressure area at the bevels, liberating gas from the mud and drawing air down the
2 shaft from the upper ports and injecting air into the mud.

3

4 BRIEF DESCRIPTION OF THE DRAWINGS

5 Figure 1 illustrates a side view of the gas trap of one embodiment of the
6 present invention, illustrating a cross section of the upper and lower canisters with
7 minimum insertion into mud;

8 Figure 2 is illustrates a gas trap according to Fig. 1 wherein the trap is
9 inserted deeply into mud and additionally a cross-sectional view of the stirrer is
10 illustrated;

11 Figure 3 is a side cross-sectional view of the hollow "T" shaft according
12 to Figs. 1 and 2;

13 Figure 4 is a cross-sectional view along A—A according to Fig. 3 which
14 illustrates radial scoops; and

15 Figure 5 is a cross-sectional view along B—B according to Fig. 3 which
16 illustrated the bevelled tube ends.

17

18 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

19 As shown in Fig. 1, an improved gas-liberation vessel or gas trap
20 comprises a vessel having circular walls, more particularly, upper and lower canisters,
21 each of which is a truncated right circular cone. The lower canister is a conical vessel
22 having side walls narrowing upwardly and a closed bottom. The lower canister's top

1 end is truncated and open. A centrally located mud inlet hole is formed in the closed
2 bottom and a side spout located intermediate along the side walls of the lower
3 canister.

4 The upper canister is also a conical vessel having side walls which
5 narrow downwardly. The top of the upper canister is closed and the bottom end is
6 truncated and open. A gas outlet port is formed adjacent the top of the upper canister
7 for directing gas to gas detectors (not shown). Installation of an optional ball-float
8 assembly prevents accidental mud access and damage to the gas detectors.

9 The truncated open end of the upper canister is smaller than the
10 truncated open end of the lower canister so that it is partially insertable into the open
11 end of the lower canister, forming a lower lip. Accordingly, the lip restricts centripetally
12 thrown mud from entering into the upper canister trap and deflects it downwardly in the
13 extreme case. The upper and lower canisters are joined at their connective interface.

14 The lower canister is located partially immersed into drilling mud. Mud
15 enters the mud inlet hole and forms a mud level within the lower canister. Above the
16 mud level is a freeboard area which collects gases.

17 Gas is urged out through the gas outlet port using pumps and the like,
18 creating a slight suction in the freeboard area. Gases in the freeboard area result from
19 gases being liberated from the mud and from atmospheric air being drawn in through
20 the mud outlet spout.

21 A rotary shaft passes downwardly through the top of the upper canister
22 driven by a top-mounted motor. The shaft is rotatably connected to a rotary stirrer

1 which extends downwardly into the lower canister.

2 The stirrer comprises a hollow vertical shaft terminated with hollow
3 radially extending tubes for forming a "T" configuration. As shown in Figs. 1-3 and
4 Fig. 4, a pair of opposing ports are formed in the hollow shaft adjacent its upper end,
5 above the mud level. The ends of the radial tubes are open and bevelled in a vertical
6 plane. A continuous bore is formed between the upper ports and the ends of the radial
7 tubes.

8 Turning to Figs. 3 and 5, the bevel is formed on the trailing edge of the
9 radial tubes as set by the normal direction of rotation, shown as counter-clockwise
10 (CCW) in Fig. 2. Simply, the bevel provides an elliptical opening which avoids forced
11 entry of mud during stirrer rotation and further results in the formation of a low-
12 pressure in the wake of the rotation.

13 Best shown in Fig. 2, in operation, the mud is lifted inertially and
14 parabolically up the conical wall of the vessel, the lower lip preventing entry of the mud
15 into the upper canister and accidental fouling of the gas outlet. The stirrer is rotated,
16 causing the a low pressure area at the bevels liberating gas from the mud and
17 inducing a flow of gas from the upper ports to the bevelled openings for injection of
18 gases including air and recycled mud gases into the mud. The flow of gas through the
19 shaft is aided by the addition of radial scoops extending from top of the shaft mounted
20 behind each of the upper ports.

21 The liberated gas and injected gases rise to the freeboard area for
22 removal at the gas outlet port.

1 Generally, the result of the agitation of the mud with this unique stirrer
2 is the formation of a turbulent decompression at the ends of the "T" shaft, increasing
3 aeration of the mud significantly and producing a significant improvement in the
4 liberation of gases from the mud. Further, the unique design permits a much larger
5 range of operation, continuing to process mud whether the trap is shallowly immersed
6 or deeply immersed.

7

1 THE EMBODIMENTS OF THE INVENTION FOR WHICH AN
2 EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS
3 FOLLOWS:
4

5 1. A gas trap for liberating mud gas from a flow of drilling mud
6 comprises:

7 (a) a vessel having a mud inlet and a mud outlet through which the
8 mud is flowing, a mud level forming a freeboard volume and a gas collection port
9 in the freeboard volume;

10 (b) means for agitating the flowing mud; and

11 (c) means for introducing stripping gas into the flowing mud so that
12 liberated mud gas and stripping gas is collected at the collection port.
13

14 2. The trap of claim 1 wherein the vessel's mud inlet is adapted to
15 be at least partially immersed in the drilling mud.
16

17 3. The trap of claim 1 wherein:

18 (a) the vessel comprises circular side walls; and

19 (b) the agitating means comprise a rotary stirrer immersed in the
20 mud.
21

22 4. The trap of claim 3 wherein the stirrer is hollow and further
23 comprises:

24 (a) gas outlet ports formed below the mud level;

25 (b) gas inlet ports formed in the freeboard; and

1 (c) a gas flow passage formed therethrough between the inlet and
2 outlet ports.

3

4 5. The trap of claim 6 wherein the outlet ports are bevelled on their
5 trailing edge for inducing low pressure in the mud and inducing a flow of freeboard
6 gases from the stirrer's inlet to the outlet ports.

7

8 6. The trap of claim 7 wherein the vessel comprises a truncated
9 cone having upwardly narrowing side walls.

10

11 7. The trap of claim 8 wherein the vessel further comprises a
12 second upper truncated cone having downwardly narrowing side walls and a lower
13 lip, the lower lip being fitted downwardly into the first truncated cone as a mud
14 deflector.

15

16 8. A process for the liberation of mud gas from a flow of drilling mud
17 comprises the steps of:

18 (a) flowing mud through a vessel which has a mud level forming a
19 freeboard volume thereabove;

20 (b) agitating the flowing mud;

21 (c) introducing a stripping gas into the agitated and flowing mud;

22 and

23 (d) collecting gas which includes mud gas liberated by the stripping
24 gas.

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9. The process of claim 10 further comprising the steps of agitating the mud by rotating a stirrer in the mud.

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10. The process of claim 11 further comprising the step of introducing the stripping gas through the stirrer.

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11. The process of claim 12 further comprising the steps of:

(a) inducing a low pressure area in the mud using the stirrer; and

(b) introducing the stripping gas into the low pressure area.

12. The process of claim 10 further comprising the steps of metering

the collected gas for determining dilution of the mud gas.

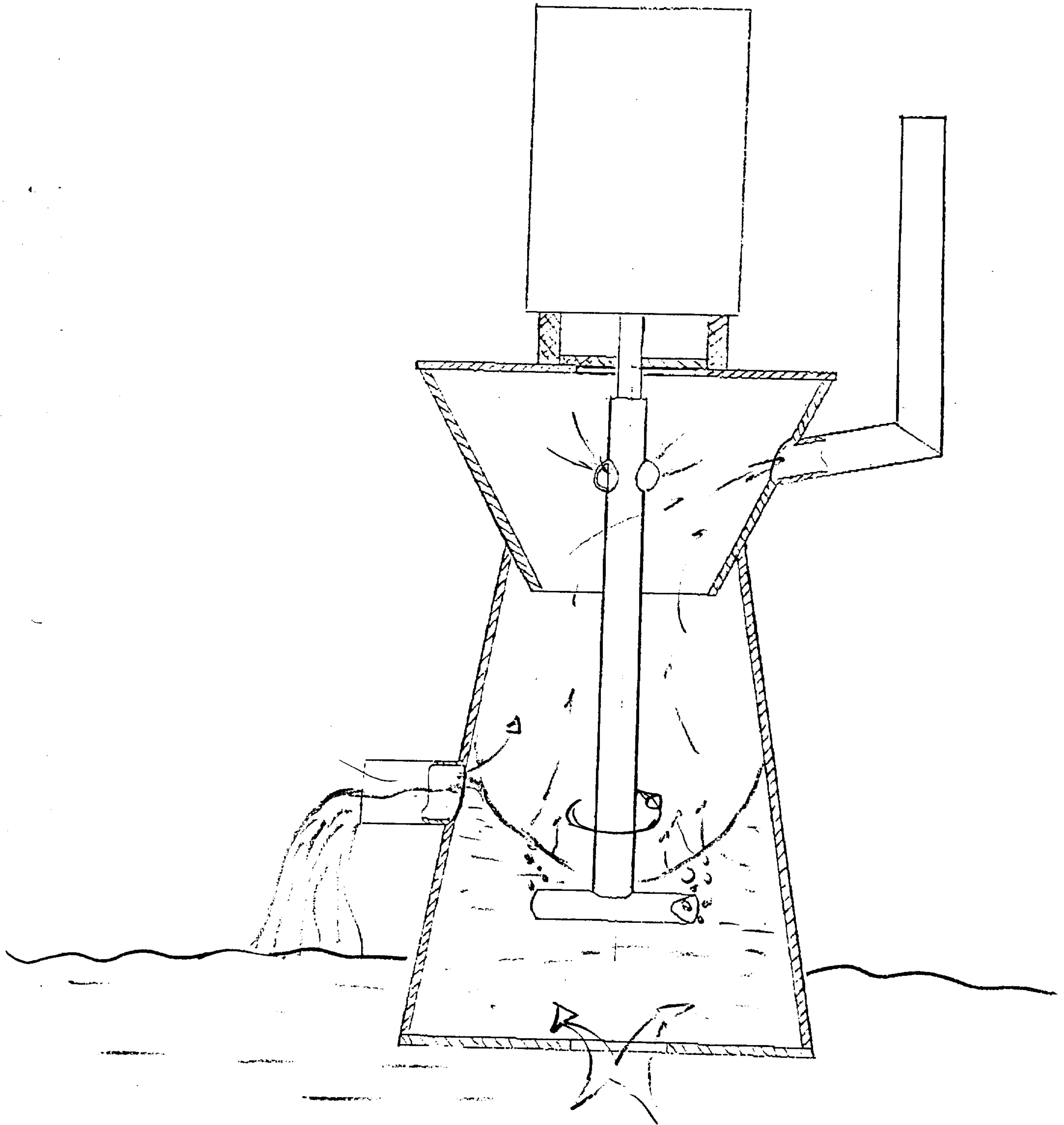


Fig. 1

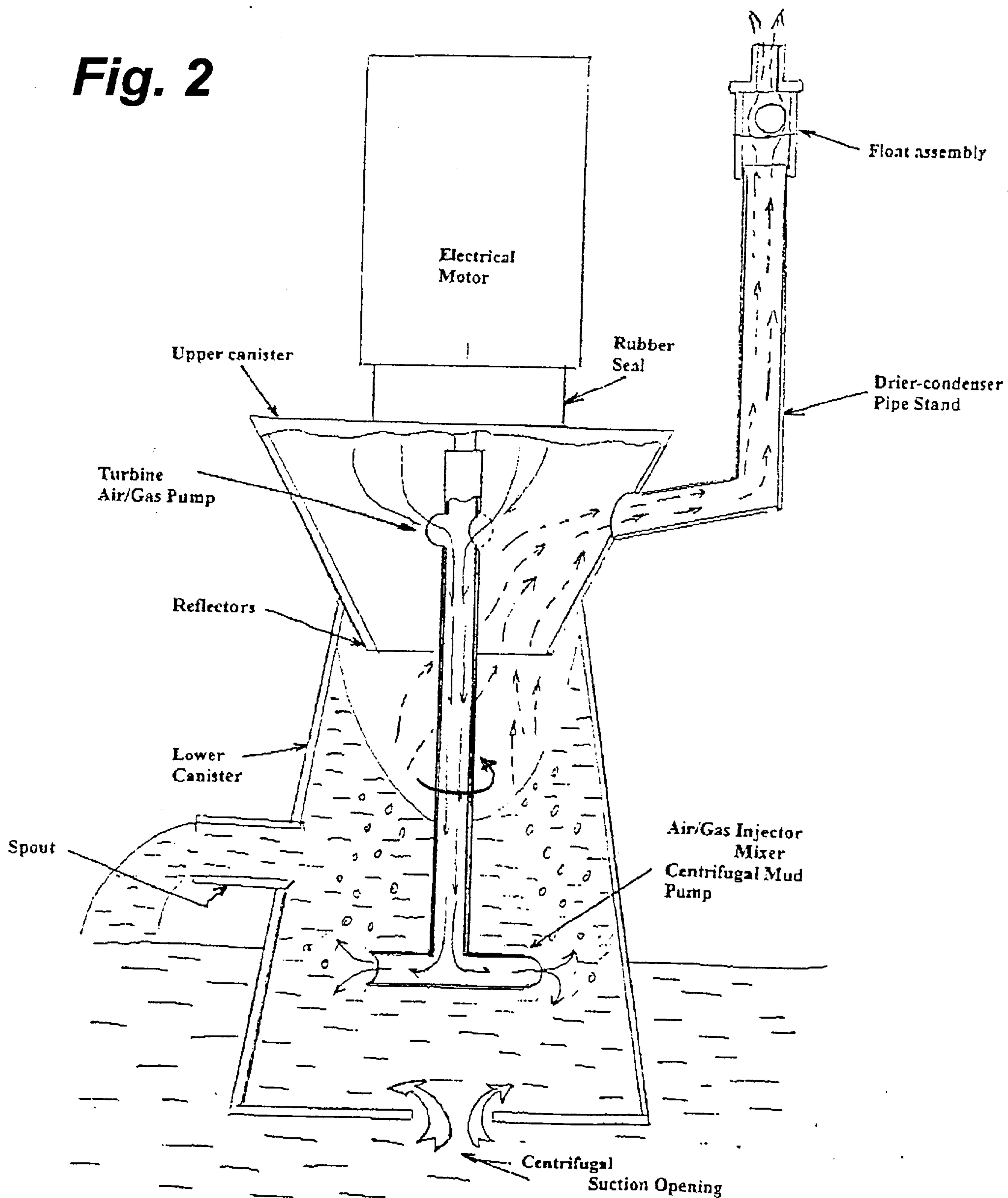
Fig. 2

Fig. 3

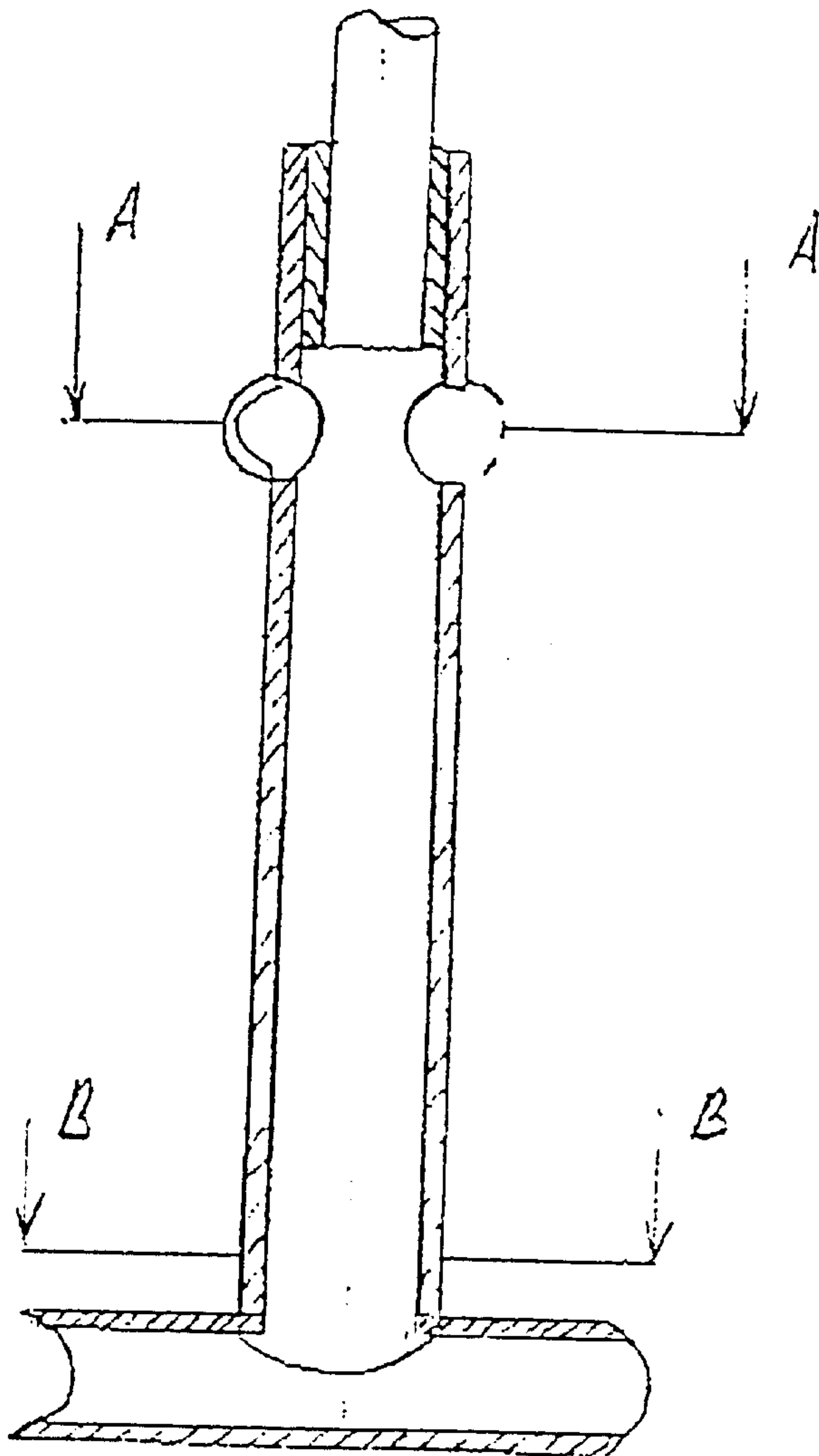
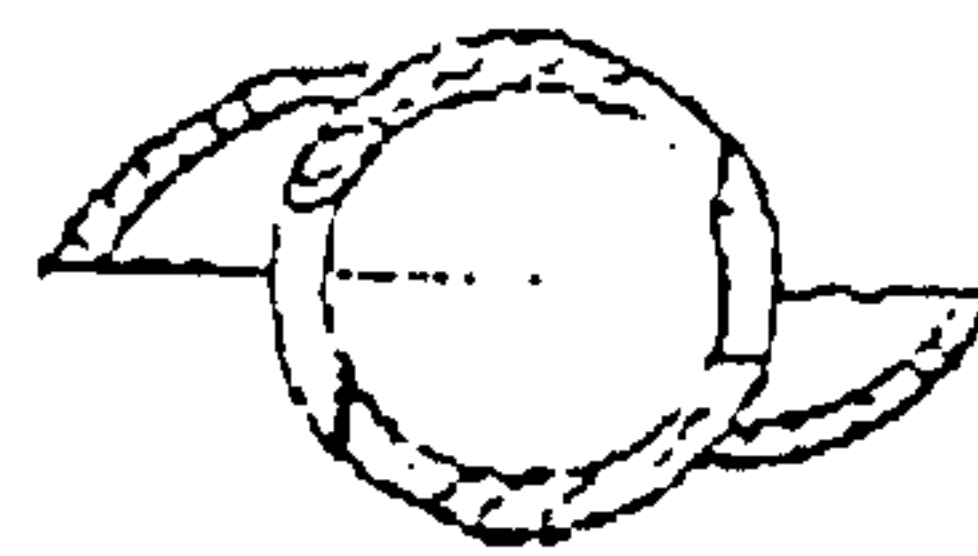
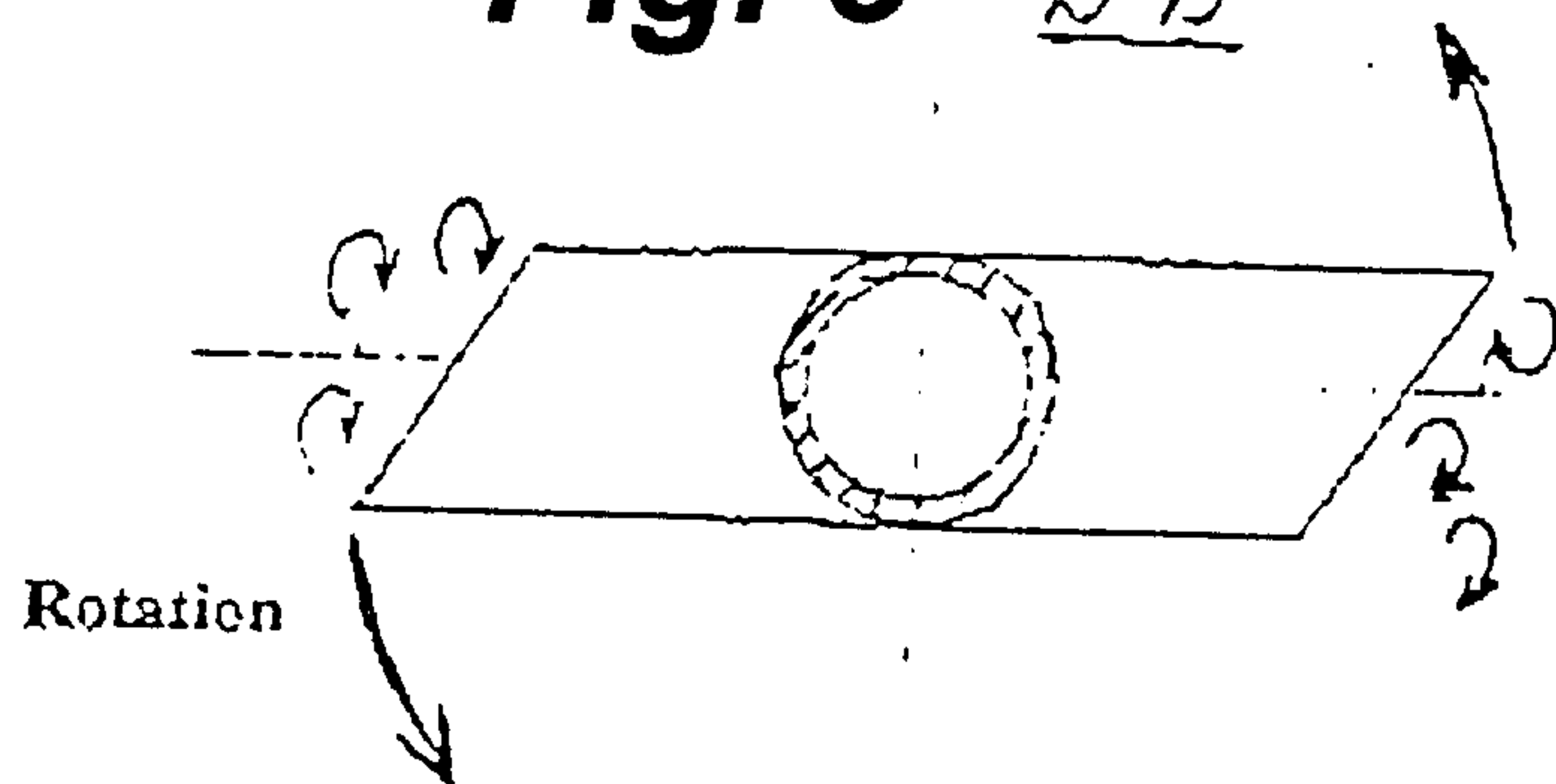


Fig. 4



A-A

Fig. 5 B-B



Turbulent decomposition creates a suction effect
Increasing the aeration of mud significantly

