Coming now to a detailed description of one embodiment of the invention which is illustrative and serves to show a mode of action employed in the invention, reference is had to Fig. 1. In this figure, 10 designates a casing of generally cylindrical form which may conveniently be made from brass or steel tubing. This casing is closed at top and bottom by disks 11 and 12 respectively. Disk 12 is perforated by a generally central hole 13, which serves as an inlet for mud. In the interior of the casing, and generally concentric within it, is positioned an impeller-agitator shaft 14, which is connected to and driven by a motor 15 which may be conveniently an electric motor. Reference character 16 indicates a power lead for this motor. The impeller shaft 14 carries an impeller-agitator portion 17, which may be, as shown in the figure, a single rod symmetrically disposed with respect to the shaft 14 and at right angles thereto. Alternatively, a plurality of rods may be used as is illustrated in Figs. 4 and 5.

Referring again to Fig. 1, the side of the casing 10 thereof is perforated, near the center thereof, by a threaded opening in which is secured an outlet spout 18, which may conveniently be an ordinary street elbow. The top disk 11 bears a gas outlet 19, which is conveniently a short piece of pipe welded to the disk. A fitting 20 and a hose 21 are shown attached thereto for conduction of the gas to any desired detection means.

In use, the device illustrated in Fig. 1 is partially immersed in the drilling mud to be sampled. This is most conveniently accomplished by placing the device in a portion of the mud ditch, when possible near a weir which maintains a more or less constant level of mud. Such an arrangement is shown diagrammatically in Fig. 3, wherein 30 are the sides of the mud ditch or flume, 31 is the mud flowing through, 32 is a submerged weir, and 33 is a clamp which serves to attach the device 10 to the side of the ditch at a suitable height. It will be observed that the device is positioned so that the outlet of the outlet spout 18 is slightly above the normal level of mud in the ditch.

In operation, the shaft 14 is rotated at a suitable speed, which may be, for example, 1725 R. P. M., by means of the electric motor 15. Before the motor is started, it will be observed that with the device positioned as shown in Fig. 3, the mud will have sought its own level within the casing 10, by reason of the opening in the bottom and the side opening. Rotation of the shaft with its associated impeller-agitator rod or rods brings about a number of effects in cooperation. In the first place, a strong vortex action is created which lowers very considerably the level of the mud in the central-most portion of the casing 10, and causes a corresponding rise in the level close to the wall. This in turn results in a gentle pumping action, whereby mud is drawn up through the central portion of the casing 10 and discharged through the side opening. This pump action is facilitated and indeed is maintained remarkably constant by virtue of the fact that the mud is kept beaten down in gel strength by the action of the impeller-agitator rod or rods. Simultaneously air is beaten into the mud and out again as a result of the vortex action in combination with the rod. This causes the air in the upper portion of the casing 10 to be maintained in equilibrium with the gas content of the mud. A slight suction applied at the gas sampling tube or pipe 19 serves to withdraw air continuously and at the constant rate from the upper portion of the casing 10, so that it can be subjected to any desired test. The well-known hot-wire detector is suitable for this purpose and has been quite generally described in the literature. Maintaining the side outlet 18 above the level of the mud in the ditch allows freedom of access of air to the inside of the cylinder.
Excellent results have been obtained in actual field trials of devices corresponding to this invention and more particularly to the device illustrated by Fig. 1 and explained hereinabove. For the first time in the art, both large and small gas shows have been uniformly presented to the detecting means regardless of mud characteristics and mud flow.

It will be seen that the invention accomplishes its objects, especially in the provision of a device to perform the desired results. It will be understood that I do not limit myself to the particular mechanical embodiments shown, but that modifications and changes may be made in the device and in the implemenation and operation thereof, all within the scope of the herein-described invention and the appended claims.

Having described the invention, what I claim is:

1. In a device for extracting gas from well drilling mud, at times containing minute quantities thereof, while the mud is in circulation during drilling, the combination of a top, a bottom and a side wall of generally cylindrical form defining a substantially closed, single compartment, hollow chamber constructed to be immersed with its axis vertical to a fraction of its depth in said mud, said bottom having a central opening therethrough of a diameter less than that of the side wall, an opening in said side wall of limited area positioned to be above the immersion level, a gas outlet passage communicating with the upper portion of said chamber, a vertical shaft positioned centrally in at least the lower portion of said chamber, an impeller-agitator consisting of at least one horizontally disposed rod affixed to said shaft near and above said bottom and being of a length not less than the diameter of said central opening, and means to rotate said shaft at sufficiently high speed to produce a vortex action in the body of liquid in said chamber to circulate liquid from said central opening out through said side wall opening.

2. A device for extracting gas from well drilling mud circulating during drilling operations, in combination, a cylindrical container having a side wall and top and bottom closure plates defining a single compartment, means to support said container with its axis vertical and immersed to a minor fraction of its depth in said mud, said side wall having an opening therein above the level of immersion, said bottom plate having a central aperture therein, a gas outlet tube extending through a wall of said compartment and terminating therein above the level of said opening, an impeller-agitator having at least one better element disposed close to and above the said bottom plate, symmetrical in respect to the center of said aperture, longer than the diameter of the aperture and having its ends equally spaced from the plane of the plate, and means to rotate said impeller-agitator about the axis of said container at a speed sufficient to produce a vortex in the body of mud in the compartment capable of lifting it for discharge through said side wall opening.

References Cited in the file of this patent

UNITED STATES PATENTS

835,126 Wilson Nov. 6, 1906
2,294,827 Booth Sept. 1, 1942
2,341,169 Wilson et al. Feb. 8, 1944
2,514,690 Bliss et al. July 11, 1950
2,704,638 Gordon Mar. 22, 1955