July 25, 1933

R. A. HILL

1,919,653

HYDRAULIC SAND EXTRACTOR

Filed Nov. 27, 1931

Fig. 1.

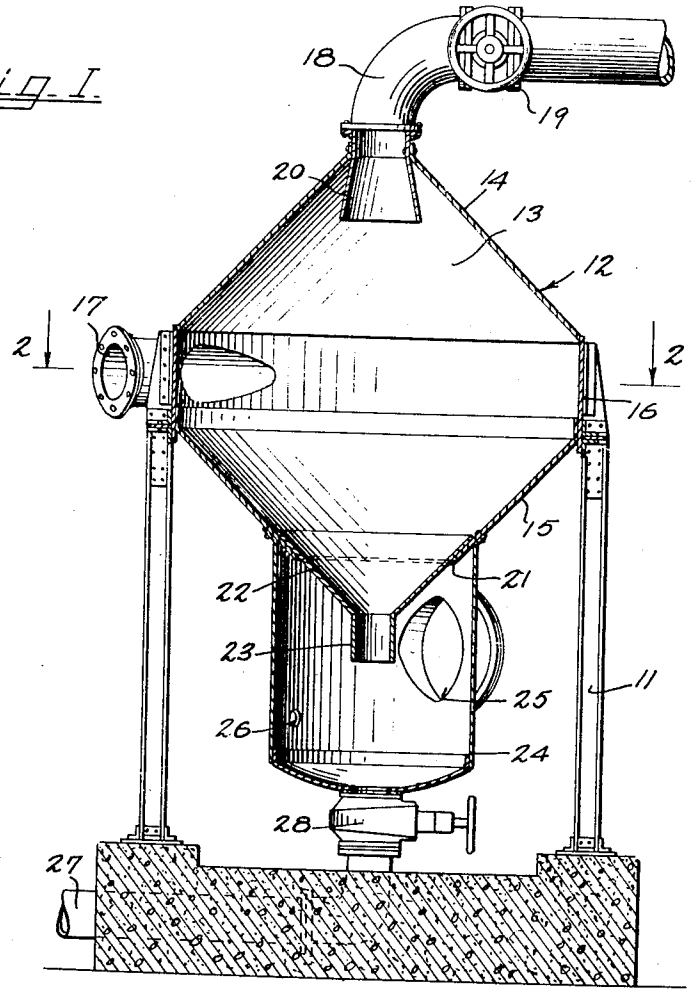
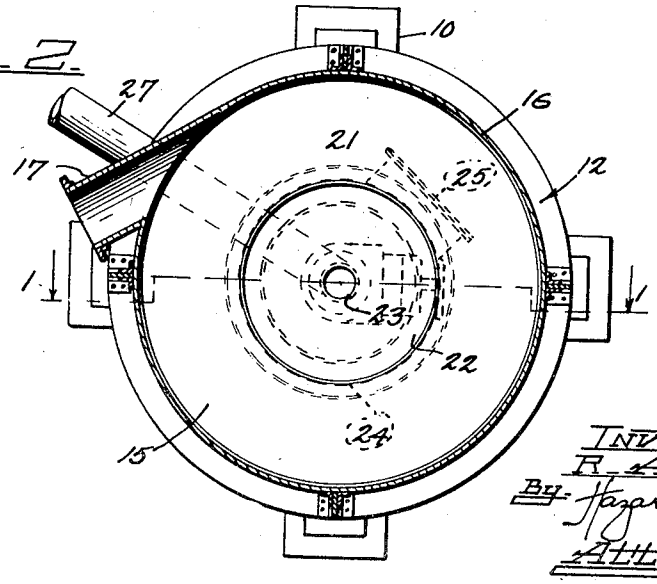


Fig. 2.



INVENTOR.
R. A. HILL.
By Hazard and Miller
ATTORNEYS.

Patented July 25, 1933

1,919,653

UNITED STATES PATENT OFFICE

RAYMOND A. HILL, OF LOS ANGELES, CALIFORNIA

HYDRAULIC SAND EXTRACTOR

Application filed November 27, 1931. Serial No. 577,588.

This invention relates to a hydraulic sand extractor and to devices of this character which are designed to separate solids from fluids, such as sand from water. It very frequently occurs that water and other fluids are contaminated with fine particles of foreign matter such as sand. It is highly desirable to be able to extract this sand from the fluid in a continuous manner before discharging the water into a water system. It frequently occurs, however, that the foreign matter or sand is in such a finely divided state that it is difficult to accomplish a quick and continuous separation.

An object of the present invention is to provide a device of relatively simple construction having virtually no moving parts which enables large quantities of fluid, such as water, to be continuously and quickly handled and to have all of the solids, such as sand, even though very finely divided, substantially completely removed therefrom. The present construction is so designed as to be capable of operation under high pressures or low pressures as desired. The separation takes place continuously without a material loss in energy or pressure head and the separation is virtually complete.

With the foregoing and other objects in view, which will be made manifest in the following detailed description, and specifically pointed out in the appended claim, reference is had to the accompanying drawing for an illustrative embodiment of the invention, wherein:

Fig. 1 is a vertical section through the improved hydraulic sand extractor.

Fig. 2 is a horizontal section taken substantially upon the line 2—2 upon Figure 1.

Referring to the accompanying drawing, wherein similar reference characters designate similar parts throughout, the improved extractor has been illustrated as having been mounted on a suitable concrete base 10 on which there are suitable supporting standards 11. Any suitable support for the device may be employed. The body of the extractor consists of a shell, generally designated at 12, providing a chamber 13 which is circular in horizontal cross section. The chamber is preferably formed with a conical top 14 and a conical bottom 15, the top and bottom thus presenting concave interior surfaces. The top and bottom are shown as having been spaced from each other and having been connected by a cylindrical portion 16, although it is possible to eliminate this cylindrical portion and connect the top and bottom directly to each other. An inlet is provided for the chamber 13, this inlet being indicated by a section of pipe 17 which is mounted upon the cylindrical portion 16. This inlet is so arranged as to discharge a fluid, such as water, into the chamber in a substantially tangential direction, although any direction other than on a radius of the chamber 13 will suffice. The purpose of this arrangement of the inlet is to cause the incoming fluid to circulate at a high velocity within the chamber, producing a swirling of the fluid about a substantially vertical axis. The outlet from the chamber 13 is indicated by a pipe 18 having a valve 19 and having a portion indicated at 20 which projects downwardly through the top 14 a short distance. The purpose of this construction will be hereinafter explained. The bottom 15 has a relatively large central aperture 21 formed therein which is normally closed by a funnel shaped member 22. The funnel shaped member which completes the bottom is preferably detached therefrom so that it merely rests on the bottom 15 within aperture 21. Its discharge end 23 discharges into a collecting chamber or tank 24, the top of which is fastened to the bottom 15 around aperture 21. The collecting chamber or tank is preferably provided with a manhole 25 normally closed by a manhole cover. The outlet indicated at 26, which is normally closed, is for testing the amount of solids or sand which has collected within the collecting chamber 24. In the bottom of the collecting chamber there is an outlet leading into an outlet pipe 27 which is normally closed by a valve 28. Pipe 27 and valve 28 constitute a blow off for emptying the collecting chamber from time to time.

The operation of the hydraulic sand ex-

tractor is as follows. The water carrying the sand enters the chamber 13 in a direction approximately tangent to the chamber. This sets up a high circular velocity of the water within the chamber with the result that the small particles of sand are thrown by centrifugal action against the cylindrical walls. The frictional resistance of these particles against the walls slows down the particles so that the force of gravity becomes effective upon them to cause them to work downwardly and centrally on the conical bottom 15. They gradually pass into the funnel shaped member 22, through the spout 23, into the collecting chamber 24. As the particles pass downwardly toward the center of the conical bottom and toward the center of the funnel shaped member 22, it will be noted that the radius of the chamber decreases with the result that the circular velocity likewise decreases on approaching the spout 23. The water at the center of the swirl which is virtually free of the particles which have been thrown out against the cylindrical walls is continually removed from the chamber through the outlet 18. Experience has developed that some small particles have a tendency to climb up on the conical top 14. These particles are prevented from entering the outlet 18 with the outgoing water by the portion 20 which projects into the chamber. This portion acts as a baffle for these particles with the result that they circulate about the walls of the conical top 14 and eventually drop down through the circulating water onto the conical bottom 15. From time to time the collecting chamber 24 becomes partially filled with sand and in order to empty the device valve 28 is opened temporarily, allowing the water to flow out through pipe 27, carrying out the sand which has collected. The pipe and valve thus constitute a blow off. During this blow off operation valve 19 may be closed or it is possible to leave it open where uninterrupted delivery of water is desired. The purpose of having the funnel shaped member 22 separate from the bottom 15 is to enable ready access to the interior of chamber 13. In other words the manhole cover can be removed from the manhole 25 and the funnel shaped member pushed up into chamber 13, thus enabling a repair man to repair the interior of chamber 13, such as tightening rivets or the like. During normal operation of the construction the funnel shaped member 22 merely rests on bottom 15. From actual experience I find that the above construction is very efficient in operation. On one installation in which the diameter of chamber 13 was eight feet and the incoming velocity of water was about six feet per second through a fourteen inch inlet, I found that the sand was virtually completely separated or extracted from the water. Sixty percent of the sand particles collected in the chamber 24 were capable of passing through a 100 mesh screen and there was a substantial percentage of particles present capable of passing through a 200 mesh screen, indicating the ability of the device to extract from the water very minute particles of sand.

It will be appreciated from the above described construction that the hydraulic sand extractor is of very simple construction and has virtually no moving parts to become worn or to get out of order. The construction is silent in operation and the extraction of sand is continuous, enabling a continuous flow through the outlet 18 which may be under a high pressure. In other words use of the hydraulic sand extractor does not involve a loss of pressure head which is highly advantageous under some circumstances.

Various changes may be made in the details of construction without departing from the spirit or scope of the invention as defined by the appended claim.

I claim:

A hydraulic sand extractor comprising means providing a chamber having a concave top and bottom, means for discharging water containing solids, such as sand, in a substantially tangential direction between the top and bottom of the chamber so as to cause the water to swirl in the chamber, means providing a water outlet in the top of the chamber at about the center thereof, and means providing a collecting tank beneath the bottom of said chamber and communicating therewith into which sand may pass from said chamber and collect, the portion of the bottom of said chamber defining it from the collecting tank being detached from the remainder of the bottom to permit access to the interior of said chamber, said collecting tank having a manhole therein.

RAYMOND A. HILL.