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FLUID SCREEN

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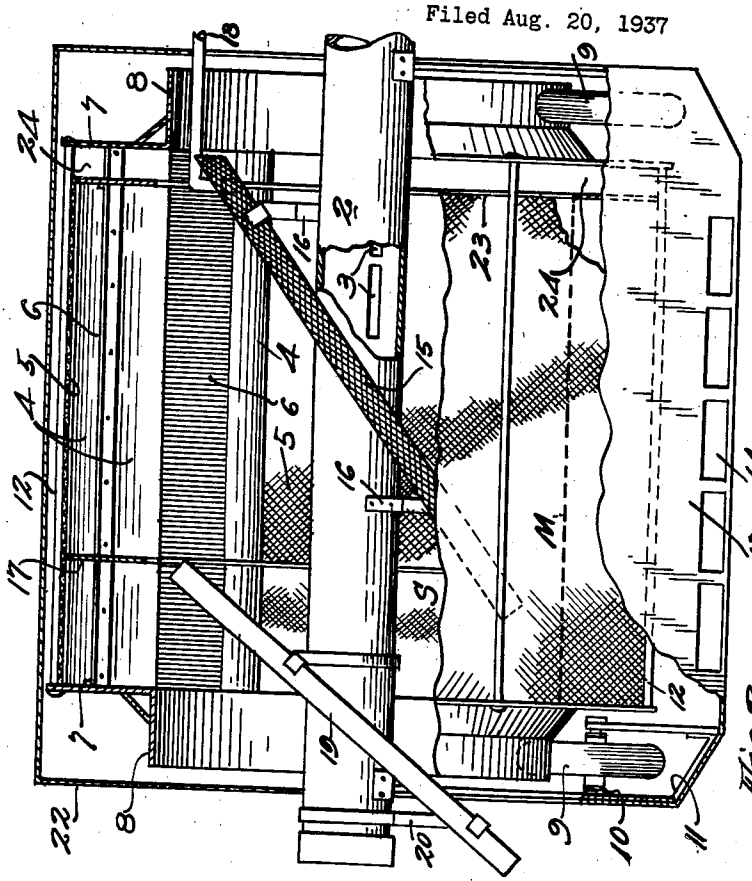


Fig. 2.

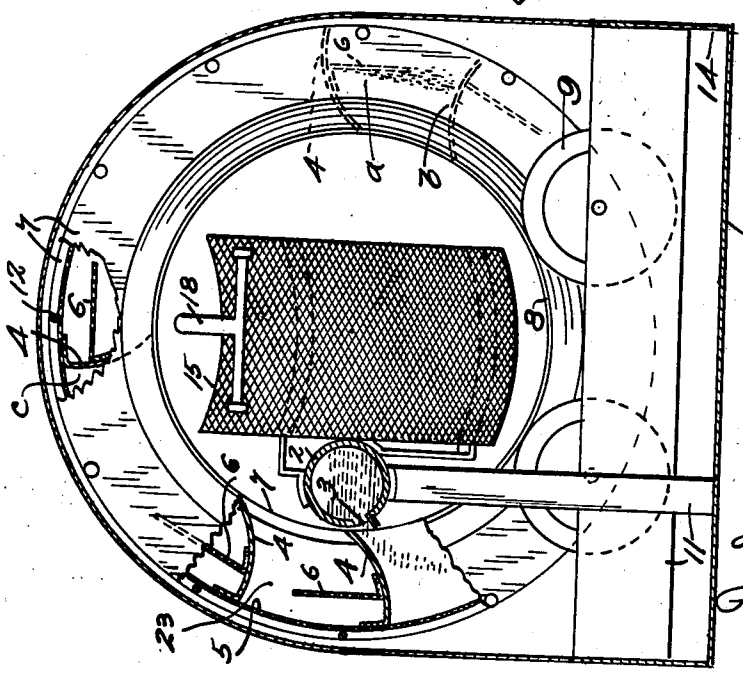


Fig. 1.

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FLUID SCREEN

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15 Claims. (Cl. 210—199)

This invention is a fluid screen and especially a screen for the practical and effective separation of coarse particles from running fluid, more particularly for the treatment of deep well, circulating mud.

Much difficulty is encountered in operation of various types of mud screen under the usual conditions presented in mud circulating drilling practice in drilling deep wells, and many of the current forms of screens are troublesome and hazardous in operation.

Most of the screens now on the market are of a vibrating type and usually a separate power plant, that is, a motor is employed for the screen alone. In this particular branch of drilling the handling of the muddy fluid presents incidental difficulties making operation and attention of the outfit quite objectionable, as well as costly in power consumption.

In various types of mud screens the shale and sand soon clog the screen and reduce its capacity and there is also a substantial loss of the valuable mud; a product purchased especially for well drilling. Considerable idle periods are required for screen cleaning to maintain a fair efficiency.

Therefore, an object of the present invention is to substantially eliminate many of the objections above outlined, in this art.

Another object is to provide a screening apparatus in which there is a principal or main screening rotor in which there is provided an intermediate or protective, initial screening means whereby to catch oversize or coarse particles so that they do not pass to the main screen and the latter is kept free of clogging media and is made to operate more efficiently and with a high volume capacity.

A further object is to provide a self-propelling, rotary screen deriving its energy from the unbalanced load of the material being treated, and thereby to eliminate a separate source of power, and its operating cost.

Additionally, an object is to provide a substantial, compact and readily transported and installed screening unit, and one of simple construction, and of such principle of operation as not to require services of an expert in operation and up-keep; an object being to provide a mud screen of freedom from intricate and numerous moving parts, and to reduce requirement of lubrication to the minimum.

The invention consists in certain advancements in this art as set forth in the ensuing disclosure and having, with the above, additional objects and advantages as hereinafter developed, and whose construction, combination and details of means, and the manner of operation, and the method of mud treatment, will be made manifest in the description of the annexed illustrative embodiment of apparatus; it being understood that modifications, variations and adaptations may be resorted to within the scope, principle and spirit of the invention as it is more directly claimed hereinbelow.

Figure 1 is a vertical, transverse section showing parts of the machine in end elevation.

Figure 2 is an axial section showing parts in side elevation.

The fluid to be screened is suitably supplied to a horizontal feed pipe **2** along one side of which there is provided an alined row of elongated discharge ports **3** from which the fluid pours, in suitable volume, onto each of an annular series of angularly spaced, elongate shelves which are of such cross-sectional shape as to form buckets **4**. These buckets are fastened in symmetrical arrangement along the inner face of a horizontal, cylindrical, main screen or rotor **5** of any suitable structural character and of any desired dimensions.

A distinctive feature of the invention is the provision of a preliminary or first-stage screening means whereby to screen out coarse material such as drill cuttings and sand brought up in the mud from a well hole by drilling operations of the class in which a drilling mud is constantly circulated.

It is desired to keep to a minimum the loss of this valuable mud during the necessary screening treatment, and further to maintain the mud at a given desired degree of fluidity for the best performance of its function in the drilling of the hole.

This initial separation is here accomplished by the provision of a suitable screening panel **6** of which one is fixed to the upper face of the bottom of each bucket **4** in an inwardly spaced relation from the adjacent portion of the main screen **5**.

The pipe **2** is arranged in the open ended rotor or screen **5** eccentric to the axis thereof and lies close to the inner edges of end flanges **7** of the screen, and close to the inner longitudinal edges of the several buckets **4** as they move downwardly in a circular orbit about the axis of the rotary screen **5**, to receive the muddy fluid discharging from the side ports **3** of the stationary pipe **2**.

This provides for successively filling each bucket **4** with the heavy fluid and this at once starts to drain through the upstanding panel **6**

of each bucket. The panel 6 forms a separating barrier which keeps back coarse particles as determined by the screen openings in the panels 6 and allows the liquid and fine clay to pass out to the main screen 5.

The screen has, at its end flanges 7, outwardly extending, circular rims 8 and these are turnably mounted on respective pairs of supporting wheels 9 on shafts 10 journaled in suitable bearings in the machine frame 11.

The end flanges 7 are cross-connected by tie rods 12 which also serve as back supports for the cylindrical screen 5.

As the buckets are loaded when passing the ports 3 of the feeder pipe 2 the weight of the liquid causes the screen to turn counter-clockwise and the screening panels 6 descend and take a horizontal position below the axis of the cylinder. During this period of downward travel the coarse particles lodge on the inner faces of the panels 6 whilst the initially screened liquid drains through the panels and then through the wall forming screen 5, whence the double screened liquid enters a mud box 13 having, at one side, outlet holes 14 for flow of the mud to a mud sump for re-circulation by a hog pump to the given well.

As the buckets 4 pass in an inverted position up on the right side (Fig. 1) the panels 6 are also inverted (at *a*) and the collected screenings gravitate off and fall onto the upwardly presented back of the next subjacent bucket (at *b*). The inverted buckets move successively upward to the top of their circular orbit and as they get above the axis of the rotary screen 5 the collection of screenings falls (at position *c*) onto the subjacently arranged, downwardly inclined trough or chute 15 which is preferably of suitable screen material and is held stationary, by brackets 16, in the chamber of the rotor or screen 5.

The screenings precipitated onto the chute-screen 15 will roll down to its lower end and fall into a second screening compartment S, formed between one end flange 7 and a flat ring partition 17 fixed to and transversely across the cylindrical screen 5. A pipe 18 supplies wash water to the upper end of the fixed chute 15 to wash the screening of adhering mud and accelerate their descent on the chute.

The screenings are carried by the buckets 4 in compartment S to the top of the rotor or screen 5 and are dropped onto a final discharge chute 19 disposed in the open left end of the screen and rigidly supported by brackets 20 attached to the pipe 2, as, also, are the brackets for the chute 15, as a convenient stationary element of the structure.

A suitable housing 22 encloses the operating screen. Ends of the mud box 13 are shown as bevelled off upwardly for the purpose of facilitating the skidding of the unit as a whole from well to well in a given field.

An overflow partition 23 and the partition 17 are of less depth than the end flanges 7—7, and therefore, when mud accumulates to the level M, Fig. 2, in the lower portion of the cylindrical screen 5, the excess mud overflows into a discharge space 24 between the partition 23 and the adjacent, right end flange 7 at which the cylinder ends; the overflowing mud passing into the mud box to be discharged therefrom without its loss from circulation.

It is understood that excess power generated by the mud-driven, bucket-wheel or rotary cylindrical screen 5 may well be utilized as for the driving of a small pump to feed water to the wash pipe 18.

Also, by ascertaining the average volume of mud load in the buckets 4 and the number of revolutions per unit of time an accurate record may be kept, as by an automatic counter, motivated by the rotating screen 5, of the amount of mud being handled.

What is claimed is:

1. A fluid screening apparatus including a horizontal-axis, rotatively supported, circumferentially endless screen having buckets fixed on its interior surface and facing upwardly along the downwardly moving side of the screen, and fluid supply means arranged in the screen chamber in a position to deliver a load of the fluid to each bucket at a downwardly moving portion of its orbit, and each bucket having a screen wall arranged in a position inwardly of the outer screen to prescreen the fluid as it passes to the outer screen.

2. A fluid screening apparatus including a continuous wall, horizontal axis screen with load receiving means fixed on its inner face, and means extending into the screen for supplying a motivating fluid to the said means for actuating the screen while the said fluid is being screened through the screen; and the load means including screen panels arranged to intercept the fluid from the supply before it passes to the screen.

3. A fluid screening apparatus having a rotary screen provided with means whereby the screen is automatically rotated by the weight of the material to be screened, means to supply the material continuously to the screen, and buckets, having screen walls, fixed in the screen to intercept the material before it reaches the rotary screen.

4. A fluid screening machine including a continuous source of supply and a rotary screen having angularly spaced buckets fixed internally thereto for receiving the material to be screened and for delivering the material to the screen and for causing automatic rotation of the screen by weight of the load in the respective buckets; said buckets having means arranged therein to intercept and pre-screen the incoming material.

5. A screening apparatus including a rotatively mounted device comprising a chamber having an endless screening wall, bucket means relatively spaced in fixed relation on the inner face of the wall to receive loads of the media to be screened, means for supplying the buckets with the media, and screening panels fixed in inwardly spaced relation as to said wall and forming sides, of the bucket, between the supply means and said wall whereby to pre-screen the media moving from the bucket means to the screen wall.

6. A screening apparatus including a rotatively mounted, cylindrical screen, a series of buckets fixed to the inner surface of the screen, means extending internally of the screen to discharge fluid to the buckets at a side of the screen; said buckets having partition-forming first-stage screening means arranged in inwardly spaced relation to said screen whereby to screen the fluid before it passes to the screen during rotation of the latter.

7. A screening apparatus as set forth in claim 6, and having a transfer chute disposed in the screen and onto which the oversize material is discharged as the buckets pass in their orbit above the axis of the screen when it is rotating.

8. A screening apparatus having a cylindrical main screen, means rotatively supporting the

screen on a horizontal axis, bucket means fixed to the interior of the screen and which are successively inverted when the screen is rotating, means for supplying the upright buckets with a load of the material to be screened, and side-forming screen panels fixed to respective buckets in spaced relation to the screen for pre-screening the material in the bucket means as it passes from the supply means to the main screen during descent of the buckets in their orbit as the screen rotates.

9. An apparatus as set forth in claim 8, and including an inclined trough-screen arranged in the cylindrical screen and to which the screening caught by the panels are passed for discharge.

10. An apparatus as set forth in claim 8, and the buckets being individually fixed in the main screen in a position eccentric to the axis of rotation and passing in upright position under the supply means; whereby the loaded buckets are effective to automatically rotate the buckets, and the screen.

11. An apparatus as set forth in claim 8, and in which the cylindrical screen and its buckets are divided into co-axial compartments, and transfer and discharge chutes fixedly supported in the chamber of the rotary screen and onto which the oversize screenings are precipitated from the superjacent bucket means.

12. A screening apparatus including a horizontally supported, screening rotor having spaced end flange rings which are rigidly connected together, intermediate, compartment-forming, ring partitions coaxially spaced between the end rings, and a screen cylinder extending from one end flange ring and enclosing the said spaced partitions and terminating in spaced relation to the other end ring to form an overflow passage for material accumulating to a depth predetermined by the depth of the partitions a material supply means extending into the cylinder in a position laterally of its axis, and an initial screening means arranged between the cylinder and the supply means and including basket-like receivers angularly spaced in the cylinder for prescreening over-size media from the liquid flowing to the cylinder.

13. A liquid screening apparatus having a rotatively supported screening cylinder, a series of angularly spaced, longitudinal, symmetrical buckets fixed in the cylinder along and contiguous to the inner face of the screen and being open at the top from end to end to receive, and discharge for their full length toward the screen, a load of liquid, and means extending into the cylinder and constructed and arranged to continuously pour a wall of liquid substantially the length of and into the upright buckets during cylinder rotation, said means including a longitudinal conduit having outflow along its side disposed contiguous to and of the length of the buckets; whereby to uniformly load each upright bucket at one time, in succession, from end to end.

14. A liquid screening apparatus having a rotative, screening shell, a series of angularly spaced, longitudinal, symmetrical buckets fixed in the shell along and contiguous to its inner screening face and the buckets being open from end to end to receive, and discharge for their full length toward the screen, a load of liquid, and a longitudinal, closed end pipe having, along its side toward the upright buckets, outlets for substantially the length of the buckets whereby to facilitate rapid and full loading of each bucket as it moves into proximity with the discharge side of the pipe.

15. Apparatus as in claim 13, and said cylinder presenting uncovered screen area between the spaced buckets and which areas pass under said outflow so that the liquid falls directly thereto as the buckets move past the supply means.

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