Dec. 8, 1959 J. P. CAUDILL 2,916,091

DRILLED WELL CLEANING DEVICE

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Fig. 2

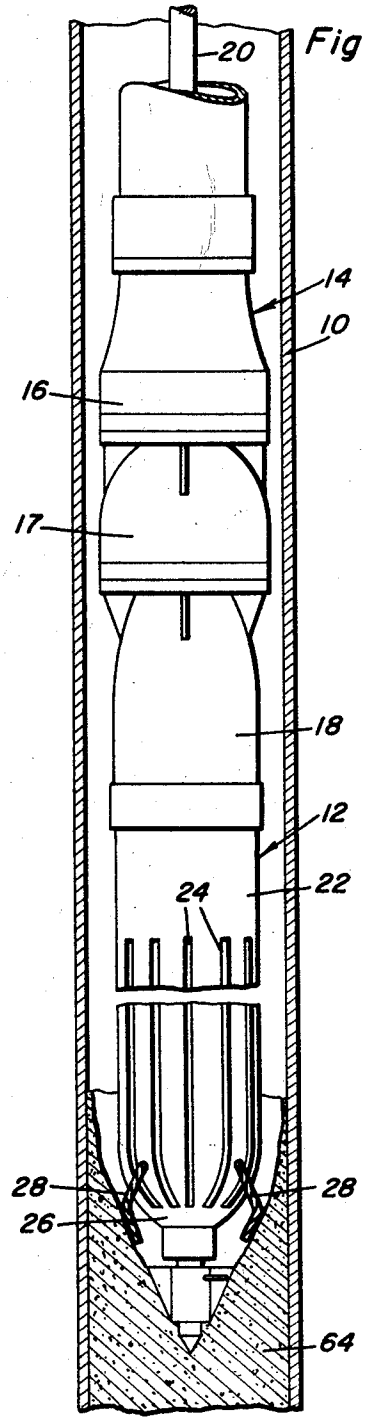
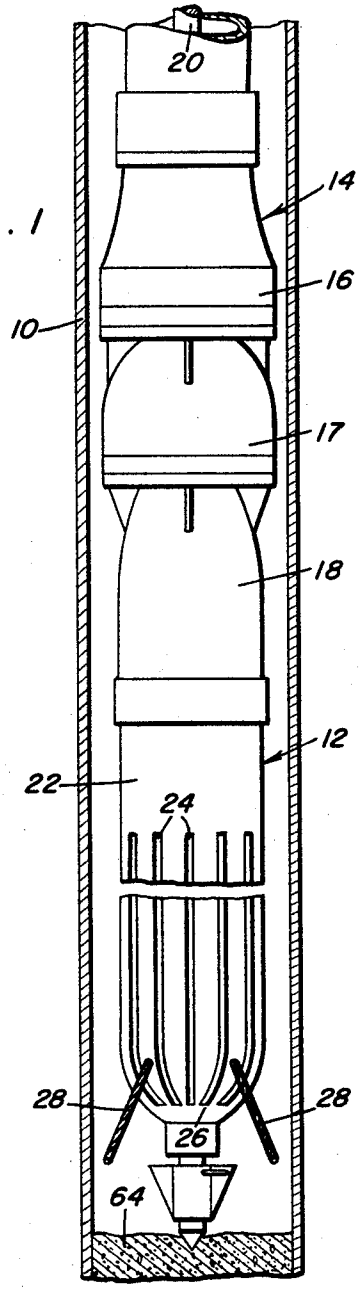


Fig. 1



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Fig. 3

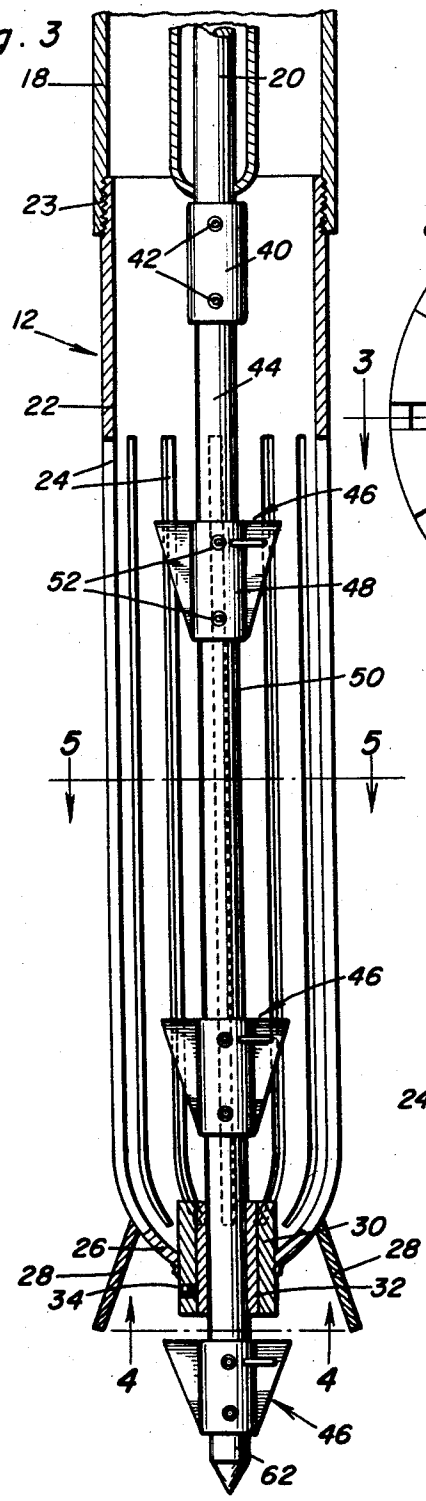


Fig. 4

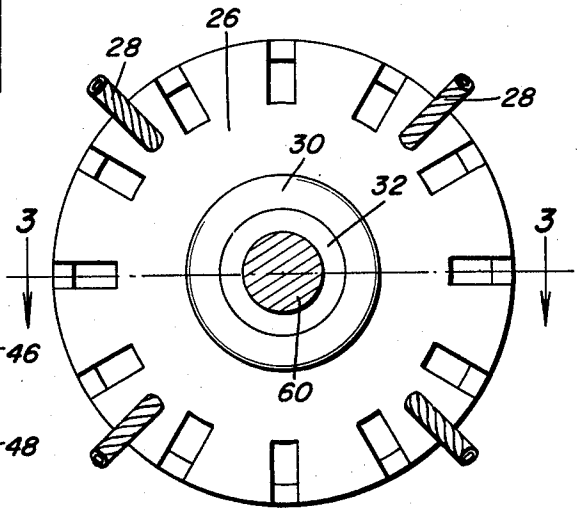
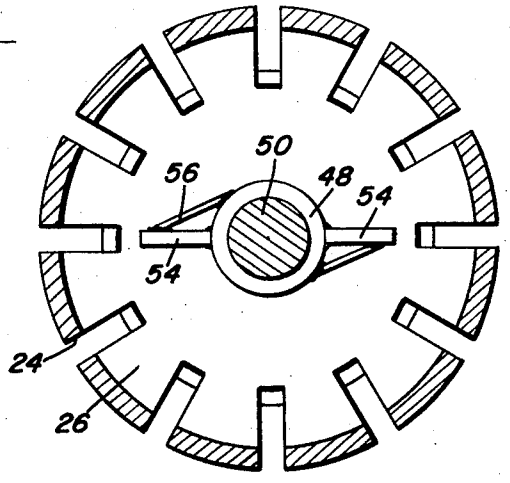


Fig. 5



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DRILLED WELL CLEANING DEVICE

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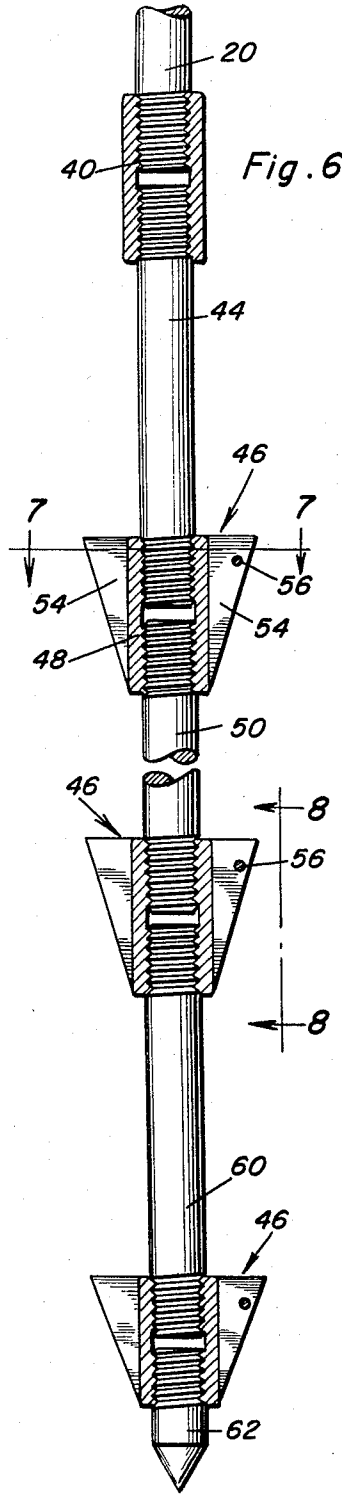
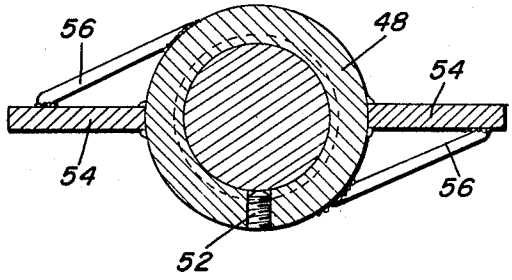


Fig. 6

Fig. 7



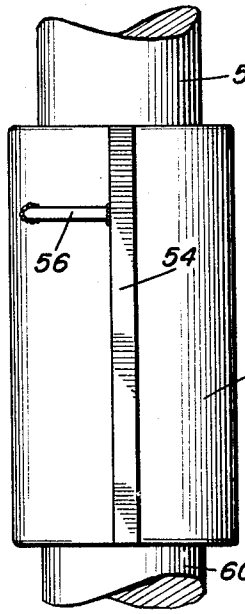


Fig. 8

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2,916,091

DRILLED WELL CLEANING DEVICE

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Application January 14, 1957, Serial No. 633,874

7 Claims. (Cl. 166—103)

This invention comprises a novel and useful drilled well cleaning device and more particularly relates to an apparatus and method for cleaning irrigation and other wells of the clay and other sediment often carried into the well bore from the producing formation by the water flowing to the well.

The purpose of this invention is to provide an apparatus and method for effectively cleaning out drilled wells which have become clogged and filled with silt, gravel, sand and clay whereby to restore such wells to their original depths and productive capacity.

A further object of the invention is to provide an apparatus in accordance with the foregoing object which will permit lowering of the pumping unit into the well as the unconsolidated materials accumulating therein are removed by this device.

A further object of this invention is to provide an apparatus and a method for effecting the cleansing of well bores from accumulated solid material which will not necessitate the removing of the pumping apparatus during such cleansing operation.

And a further more specific object of the invention is to provide an apparatus that conforms with the preceding objects which may be incorporated as a part of a conventional pump structure and may be handled therewith thereby facilitating operation of the device and reducing the cost of the same.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

Figure 1 is a view in vertical section through a portion of a well bore showing an embodiment of the apparatus in accordance with this invention being lowered into the well bore and in preparation for the removal of sediment from the bore;

Figure 2 is a view similar to Figure 1 but showing the manner in which the apparatus penetrates and removes sediment accumulating in a well bore;

Figure 3 is a vertical sectional view upon an enlarged scale showing the novel cleaning apparatus in accordance with this invention and its manner of attachment to a pumping unit for operation thereby and therewith, this view being taken substantially upon the plane indicated by section line 3—3 of Figure 4;

Figures 4 and 5 are horizontal sectional detail views taken upon an enlarged scale substantially upon the planes indicated by the section lines 4—4 and 5—5, respectively, of Figure 3;

Figure 6 is a view showing in elevation the driving shaft assembly of the invention, the manner in which the shaft sections are secured together being shown in vertical section;

Figure 7 is a horizontal sectional view taken substantially upon the plane indicated by section line 7—7 of Figure 6 and upon an enlarged scale and showing the construction of one of the impellers of the device; and

Figure 8 is a detailed view upon an enlarged scale in perspective view and taken substantially upon the plane indicated by the section line 8—8 of Figure 6.

Referring now specifically to the accompanying drawings, attention is directed first to Figures 1 and 2 wherein the numeral 10 indicates a casing of a well bore. It is understood, however, that the apparatus may be employed in uncased well bores, and in any event is adapted to clean out the sediment and other material from a producing formation which accumulates in the bottom of a well bore, either in the bottom of an uncased well bore or below the bottom end of the casing disposed in the upper portion of a well bore.

Indicated generally by the numeral 12 is the apparatus for cleaning sediment from the bottom of a well bore, in accordance with this invention and which is adapted to be attached as an accessory to or as a component of the lower portion of a pumping unit of conventional design and indicated generally by the numeral 14. The latter, in accordance with conventional practice, consists of a succession of vertically spaced bowls 16 and 18 in which are provided the usual pumping impellers not shown, and which are driven by a rotatable impeller drive shaft 20 which extends to the surface of the ground for operation by any suitable means. Use is made of the lowermost of the bowls 18 and of the impeller shaft 20 for supporting and operating the present invention.

The cleaning device of the apparatus disclosed herein consists of a cylindrical casing or housing 22 which at its upper end is externally threaded as at 23 for reception in the internally threaded lower end of the lowermost bowl 18 for support thereby, as shown in Figure 3. Along the major portion of its length, the casing 22 is provided with longitudinally extending slots 24 which terminate just above the inwardly curving lower portion or lower end 26 of the casing. Secured to and projecting downwardly from the lower portion of the casing 22 and between the slots 24 thereof are a suitable number of fenders or legs 28.

Extending through a circular opening in the lower portion 28 is a sleeve or bushing 30 in which is received a journal or bearing sleeve 32, removably secured as by a setscrew 34.

Referring now especially to Figure 3 it will be seen that the lower end of the driveshaft 20 of the pump unit 14 of the lowermost bowl 18 thereof is provided with a coupling sleeve 40 having setscrews 42 by which the coupling is attached to the lower end of the drive shaft 20, and in turn is secured to the upper end of an upper section 44 of an extension driveshaft. In addition to the setscrew, or as a substitute therefor, as shown in Figure 6, the coupling 40 is internally threaded for engagement with the externally threaded extremities of the driveshaft 20 and of the uppermost section of the shaft extension 44. At the lower end of the section 44, there is provided an impeller unit indicated generally by the numeral 46. The latter serves the dual functions of coupling together adjacent sections of the driveshaft extension and of providing an agitating means for stirring up the water and sediment in the well bore in order to permit and facilitate their withdrawal from the well bore by the pumping unit 14.

The member 46 consists of a centrally disposed internally threaded sleeve or bushing 48 constituting a coupling member and which receives the externally threaded portion of the upper extension section 44 and the next adjacent extension section 50. Suitable setscrews 52 serve to further lock the sleeve of the unit 46 to the sections of the driveshaft extension.

Referring now particularly to Figures 7 and 8 it will be seen that a pair of triangular shaped vanes or blades **54** are secured to and project radially from the sleeve **48**. These blades may be of any desired contour, and reinforcement or braces **56** are welded or otherwise secured to the vanes or blades and to the sleeve **48**.

Within the slotted casing **22** which constitutes thus a strainer cage for the impellers, there may be provided in any desired number of these impeller units **46**. Conveniently, two such units have been found to be satisfactory and the lower unit is disposed preferably closely adjacent the bottom of the casing or cage, while the upper unit is disposed adjacent the uppermost end of the slots **24** therein.

Journalled in the previously mentioned bearing **32** is a lower section **60** having its upper end screw-threadedly engaged in the lowermost of the impeller units **46** within the casing **22**, and at its lower end which lies beneath the casing **22**, there is secured a lowermost impeller unit **46**. The latter in turn carries a pointed shaft **62**.

It will now be apparent that each of the impeller units **46** may be of identical construction, each serving the joint functions of securing together the associated sections of the driving shaft extensions and for agitating the water and solid material.

From the foregoing, it is believed that the operation of the apparatus and the method of operation performed thereby will now be readily understood.

The cleaner attachment **12** is secured to the lowermost of the bowl units of the pump **14** and with the pump is then lowered into a well to be cleaned in any suitable manner. When the pump is started by rotation of the shaft **20**, the impellers of the various elements **46** will all be rotated simultaneously therewith. These impellers, as the device is lowered towards the bottom of a well bore and into proximity with the sediment **64** accumulating therein, will produce an agitation and rotation of the liquid in the well bore, causing the material **64** to be agitated and producing a suspension of the same in the liquid. Consequently, such agitating material can be sucked up through the strainer formed by the casing **22** into the interior thereof through the slots **24**, such agitation being continued by the elements **46** therein, and the liquid and material can then be drawn to the pump unit and discharged by the same from the well bore to the surface of the ground in a known manner.

As the device is lowered into the well bore, the point **62** of the lowermost impeller unit will penetrate the top of the material **64** accumulating therein, facilitating engagement of the impeller with the material. Thus, the material is effectively broken up, introduced as a suspension to the support into the liquid medium and agitated and rotated therewith. The device thus actually drills itself into the collected material as will be apparent from Figure 2, thereby effectively removing the material below the lower end of the casing of the strainer, and material which could not be reached by merely dropping the lower end of the pump unit upon the top of the material.

The legs or fenders **28** of the strainer housing dislodge from the bottom of the well any loose rocks or protruding materials in the drilled hole. The process of lowering and pumping is continued until all loose materials have been removed from the hole and the well is cleansed.

It is to be expected that the bottom bearing **32**, the impellers and the shaft **62** will wear relatively rapidly, but the satisfactory results obtained thereby will more than compensate for the replacement cost of these parts.

It will thus be apparent that there has been provided an apparatus which constitutes an attachment for a conventional pump unit together with a method of operation which will enable a conventional pump to quickly, and efficiently remove sediment collected in a well bore which could not otherwise be removed by the conventional pump.

After the well has been completed by the use of this device, the attachment may be removed and the conventional pump returned to the well for further use.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A well cleaning device for use with a conventional pump unit comprising a cylindrical casing adapted at its upper end for attachment to the lower portion of a pump to have direct communication therewith and to form an extension thereof, openings in said casing whereby to constitute the latter as a strainer, an extension drive shaft journaled in said casing, means for coupling the extension drive shaft to the drive shaft of the pump to which the casing is attached, agitating impellers mounted upon said extension drive shaft for agitating the fluid medium and sediment in a well for forming a suspension of the solid matter collecting in a well bore and the fluid medium whereby they may be withdrawn from the well bore through said cylindrical casing and into said pump inlet by the pump, the lower end of the shaft extension projecting below the bottom end of the casing, an impeller secured upon said projecting shaft extension, and a point mounted upon said last mentioned impeller and projecting therebeneath, fenders dependingly carried by the lower end of said casing and extending outwardly of said point for supporting the casing and point in an upright position during penetration of said point into material collecting in the bottom of a well bore.

2. The combination of claim 1 wherein said extension shaft includes a plurality of axially aligned sections, connectors securing the adjacent ends of said sections to said pump shaft and to adjacent sections, agitating impellers carried by at least some of said connectors.

3. The combination of claim 1 wherein said strainer openings comprise vertically extending slots in the lower portion of said casing and extending throughout the major portion of the vertical extent of the latter.

4. A well cleaning device comprising a pump having a lower portion and having a drive shaft therein, a casing connected at its upper end to said lower portion and having direct communication therewith, strainer openings in said casing, an extension drive shaft journaled in said casing, means connecting said extension drive shaft to said pump drive shaft, the lower end of said extension drive shaft projecting below the bottom end of said casing, an impeller secured upon the projecting end of said lower end of said extension drive shaft and a point on said impeller projecting therebeneath, fenders dependingly carried by the lower end of said casing and extending outwardly beyond said point and supporting the casing and point in an upright position during penetration of said point into material collecting in the bottom of a well bore.

5. The combination of claim 4 including a plurality of agitating impellers secured to said extension shaft in said casing and disposed in spaced relation to each other for agitating the fluid medium and sediment in a well bore and forming and maintaining a suspension thereof whereby they may be withdrawn from the well bore through the pump and casing by the pump.

6. The combination of claim 5 wherein said extension shaft includes a plurality of axially alined sections, connectors securing the adjacent ends of adjacent sections, said agitating impellers being secured to said connectors.

7. The combination of claim 4 including a plurality of agitating impellers secured to said extension shaft in said casing and disposed in spaced relation to each other for agitating the fluid medium and sediment in a well

bore and forming and maintaining a suspension thereof whereby they may be withdrawn from the well bore through the pump and casing by the pump, said strainer openings comprising vertically extending slots in the lower portion of said casing and extending throughout the major portion of the vertical extent of the latter.

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