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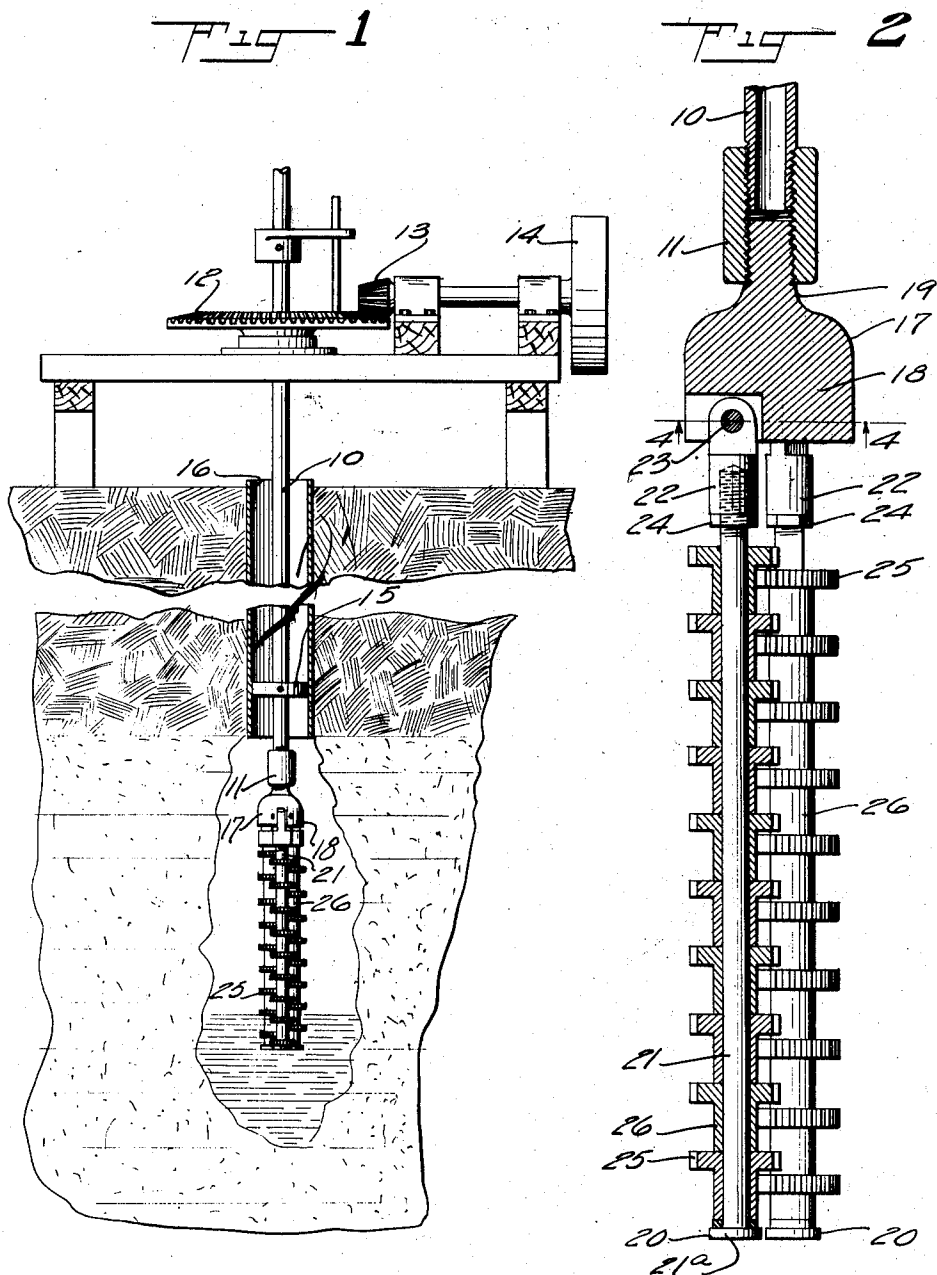
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W. H. DE FONTAINE

CENTRIFUGAL REAMER FOR OIL WELLS AND THE LIKE

Filed Oct. 2, 1922

2 Sheets-Sheet 1



Inventor

Wade Hampton de Fontaine

By His Attorney

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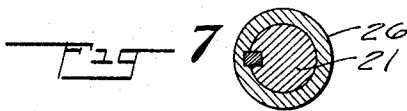
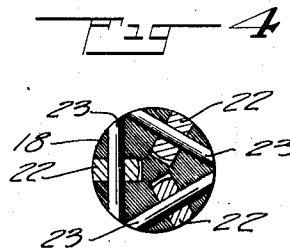
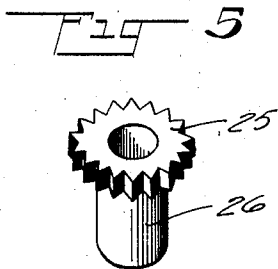
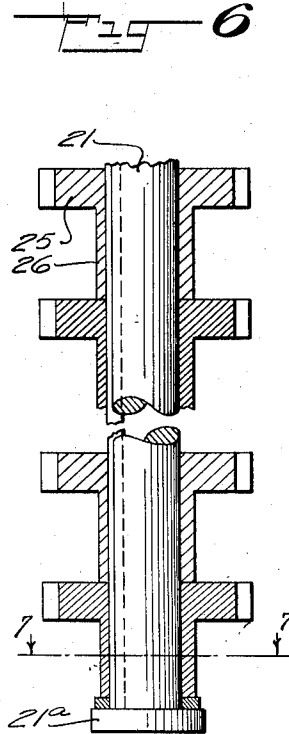
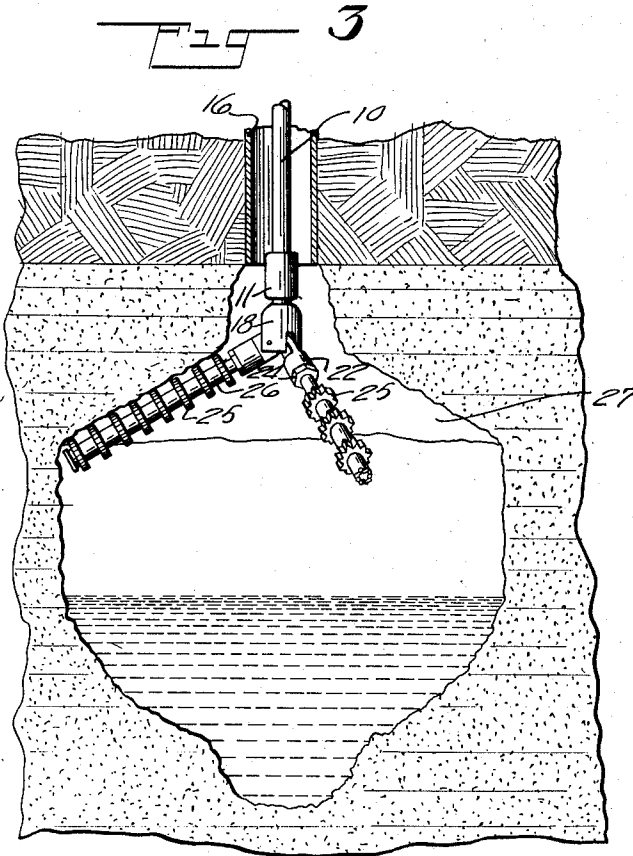
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## UNITED STATES PATENT OFFICE.

WADE HAMPTON DE FONTAINE, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO GAUNTLETT & COMPANY, INC., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

## CENTRIFUGAL REAMER FOR OIL WELLS AND THE LIKE.

Application filed October 2, 1922. Serial No. 591,759.

*To all whom it may concern:*

Be it known that I, WADE HAMPTON DE FONTAINE, a citizen of the United States, and a resident of the borough of Manhattan, city, county, and State of New York, have invented a new and useful Improvement in Centrifugal Reamers for Oil Wells and the like, of which the following is a specification.

My invention relates to centrifugal reamers for mechanical enlargement of the cavities at the bottoms of wells, and is adapted more particularly for use in oil wells to enable greatly increased flow of oil to be obtained. This result is secured by enlarging the opening at the bottom of the well, removing the compacted mass produced by "shooting" the well or by the accumulation of paraffin, asphalt and the like, which clog the walls and prevent flow of oil to the pump.

The object of my invention consists in the improvement of devices of the type referred to in numerous respects, so as to provide a practical working apparatus which is simple, compact and sturdy, and is adapted to secure satisfactory results over extended periods of use. Among the features of the improvement embodied in my invention are the provision of a reamer head which is adapted for ready attachment and detachment of reamer arms therefrom, whereby the reamer arms may be replaced at will; the provision of cutters arranged in staggered relation on the various arms whereby the effective diameter of the arms and the sturdiness and compactness of the device are greatly increased; and the arrangement of three reamer arms at substantially 120 degrees apart, which serves to secure good balance during operation and at the same time enables the device to be made compact and rugged, and the individual arms to be of substantially maximum size and strength, so that the effect of centrifugal force is obtained to the best advantage for the production of rapid cutting. With a device in accordance with my invention all unnecessary and superfluous parts are dispensed with, and the relatively small space available for introduction of the reamer is made use of to the fullest extent so that an efficient de-

vice can be introduced into the opening at the bottom of the well through the casing. Other objects of my invention will appear in connection with the following description.

The drawings forming a part of the specification illustrate an embodiment of the invention, which is shown for illustration only, and not for limitation of the invention.

Fig. 1 is a vertical sectional view showing one form of reamer embodying my invention as introduced into the oil well below the oil well casing, and attached to the pump tubing. Fig. 2 is a similar view of the reamer on an enlarged scale. Fig. 3 is a view similar to Fig. 1 and showing the reamer arms outwardly extended by centrifugal force, as in operation. Fig. 4 is a transverse section on the line 4-4, Fig. 2. Fig. 5 is a perspective view of one of the cutters and its collar, or spacing device. Fig. 6 is a longitudinal section of one of the reamer arms having the cutters keyed thereon, and Fig. 7 is a transverse sectional view on the line 7-7, Fig. 6.

In making use of my improved apparatus in oil wells, the reamer is preferably attached to the pump tubing 10, as by means of a coupling 11. Any suitable provision is made for imparting rotation to the pump tubing 10, and the reamer carried thereby, as, for example, gears 12 and 13, and pulley 14, which may be operated from any convenient source of power. The pump tubing is, of course, arranged so that it can be pulled out of the well from time to time and the sand and other cuttings removed, as by a sand pump. The pump tubing 10 is preferably provided with a collar 15 adapted to centralize same in the lower end of the casing 16 and to steady the pump tubing 10 during rotation.

The reamer of the present invention is designated generally by the reference numeral 17 and comprises a head 18 which is preferably reduced at the upper end as shown at 19 and threaded on the outside to receive the coupling 11, though various other modes of attaching the head 18 to the pump tubing 10 may be resorted to.

The reamer arms are designated generally by reference numeral 20 and are pivotally attached to the reamer head 18. In the

form shown the arms 20 comprise the rods 21, which are screw threaded into stub arms 22 pivoted at 23 in the reamer head 18, and locked in place by lock nuts 24. The rods 21 may be provided at their outer ends with heads 21<sup>a</sup>, which serve as stops against outward movement of the cutters 25. With this arrangement the rods 21 can be readily removed and replaced in the head 18 whenever desired, so that the outer portions of the reamer arms, which are the parts most subject to wear, can be replaced when needed, there being practically no wear on the reamer head or the stub arms pivoted directly thereto. It is, of course, to be understood that the reamer arms 20 may be of one piece construction and pivoted directly in the reamer head, if desired.

The reamer arms 20 are provided with cutters so arranged thereon as to permit folding of the arms with the cutters thereon into the most compact space possible. In the form shown this result is secured by arranging the cutters, which are designated generally by reference numeral 25, in staggered relation so that when the arms 20 hang straight down, as shown in Figs. 1 and 2, cutters 25 are arranged at different heights on the respective arms and pass by one another and permit the necessary close folding of the device to enable it to pass through the casing. A preferable mode of obtaining this relation of the cutters 25, which may be referred to for convenience as "staggered", consists in providing the individual cutters 25 with a collar 26. While the collar need not be integral with the cutter, the collars are here shown as integral with the cutters and this is a convenient and simple method of manufacture and is of assistance in the ready assembly of the parts. It will be seen that the three cutter arms, when in dependent vertical position to pass down through the casing, occupy practically all the space under the head and each cutter arm is of the maximum section, and that all wedges or other devices arranged between the cutters are dispensed with, and all the available space utilized to the greatest advantage to enable the use of heavy massive arms which are well adapted to swing outwardly under the influence of centrifugal force when rotated.

While it is generally preferable to have the cutters rotatable upon the rods 21 so that they may turn more or less in striking the face of the rock thereby presenting a fresh surface at all times, it is sometimes desirable to have, at least in the case of one of the arms, a substantially rigid relation between the cutters and the arm, and if desired, one or more of the arms may have the cutters keyed thereto, as shown in Figs. 6 and 7.

The use and operation of the device will

be readily understood from the foregoing. The reamer, being provided with the arm rods 21 and with cutters arranged thereon and secured in place in the stub arm 22, is attached to the pump tubing and lowered into place. Rotation being imparted thereto, the heavy, massive arms with their cutters are thrown out by the centrifugal force, as indicated in Fig. 3, resulting in the rapid cutting away of the sand and rock to a material distance on every side of the axis of the well. The material thus cut away being removed from time to time, an enlarged cavity 27 is secured at the bottom of the well, which has been cut clear back to fresh rock and entirely freed from accumulations of paraffin, asphalt and the like, so that greatly increased flow of oil is obtained. If the flow of oil should be decreased at any time after the reaming out of the well bottom in the manner described, it is only necessary to repeat the operation, preferably with slightly elongated reamer arms, whereupon a new and fresh surface is exposed. Subsequent enlargements are, of course, performed at very little expense, as little more than a scraping operation is required.

I claim:

1. A device of the class described, comprising a head and three reamer arms which are pivotally mounted in substantially equidistant radial slots in the lower end of the head and carry each a plurality of cutter wheels, the arms being of heavy construction and the cutter wheels of maximum diameter permitting the arms normally to depend vertically downward below the head with the outer peripheries of the wheels substantially flush with the periphery of the head.

2. A device of the class described, comprising a head, three stub arms which are pivotally mounted in substantially equidistant radial slots in the lower end of the head, and three reamer arms which are detachably secured each to the free end of a stub arm and carry each a plurality of cutter wheels of maximum diameter permitting the arms to hang vertically downward below the head with the outer peripheries of the wheels substantially flush with the periphery of the head and which are swung outwardly to operative position solely by the action of centrifugal force.

3. In a reamer, a head, a plurality of arms pivoted thereon and cutters on said arms, said cutters being so arranged as to pass between one another when the arms are in folded position.

4. In a reamer for oil wells, a head, means for securing said head to a well tubing, three slots cut in the bottom surface of said head at an angle of substantially 120 degrees to one another, three reamer arms

pivoted in said slots, and cutter wheels on said arms, the cutter wheels on the respective arms being arranged in substantially staggered relation so as to permit close folding of the arms together.

5. A device of the class described, comprising a head, a plurality of centrifugally-

actuated reamer arms pivotally mounted in the outer end of the head and cutters non-rotatably mounted on one of said arms and 10 rotatably mounted on the other arms.

In testimony whereof, I have signed my name hereto.

WADE HAMPTON DE FONTAINE.