June 23, 1942. M. H. WOLFF 2,287,157

HYDRAULIC DRILLING JAR

Filed June 9, 1941

Fig. 1

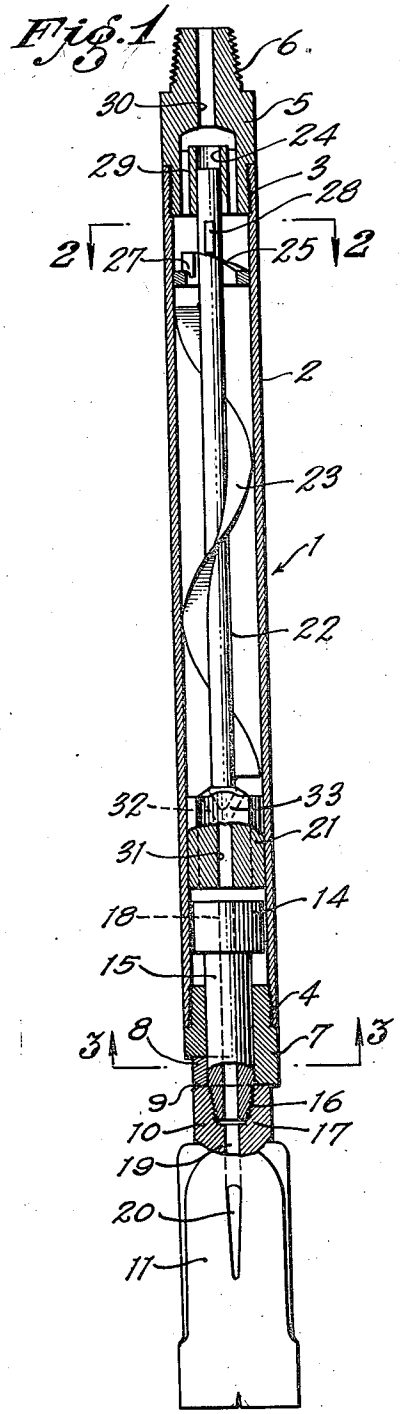


Fig. 2

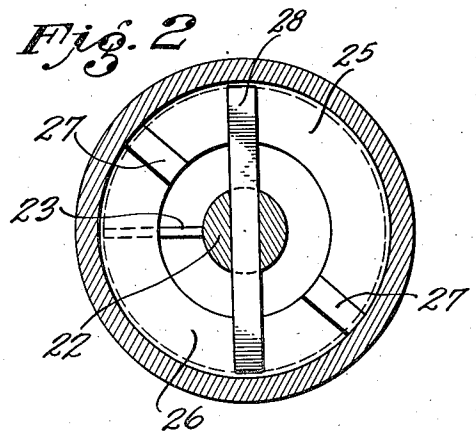


Fig. 3

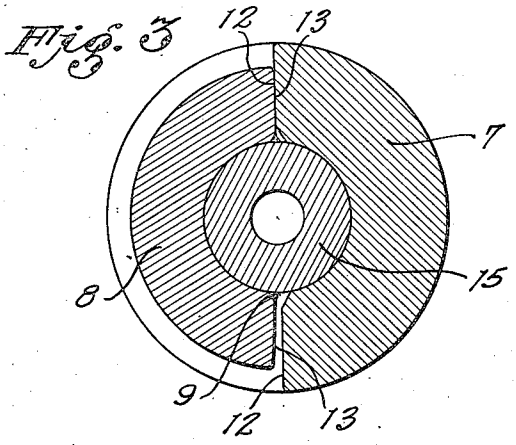
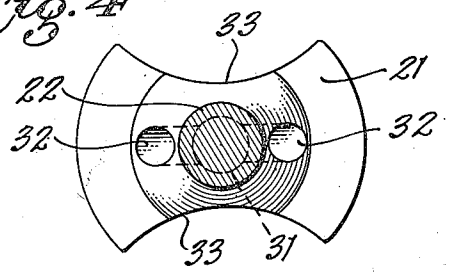


Fig. 4



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HYDRAULIC DRILLING JAR

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6 Claims. (Cl. 255—27)

This invention relates to hydraulic drilling jars of the type wherein is incorporated a bit for cutting or chipping formation and a jarring device, hydraulically operated, to maintain constant blows upon the head of the bit, to the end that freezing of the bit during a drilling operation is prevented.

The invention also contemplates in a device, a construction wherein jarring action may be stopped and drilling proceeded with, or both jarring and drilling stopped, fluid being allowed to circulate to the bottom of the drill to prevent freezing thereof in a well hole.

The inventor is aware that certain prior inventors have developed hydraulic drilling jars. However, this invention is thought to be novel in that the jarring means is under the direct control of the operator of the tool from the surface of the well hole. The operator may stop all jarring action against the bit, allow the entire tool to float while circulating mud, or actually drill without jarring action.

The invention incorporates novel constructions which are so related as to assure against breakage under normal working conditions.

An object of the invention is the provision of a hydraulic rotary jar wherein jarring action is not dependent upon rotation of the drill pipe.

Another object is the provision in a device of the character stated of means whereby hammering or jarring action may be effectively controlled as to impact.

Another object is the provision in a device of the character stated which permits proper mud balancing in that free rotation of the drill pipe is permitted.

Another object is the provision of a device so constructed and arranged as to permit washing over. This is a point of great importance in the well drilling art.

Another object is the provision of a device constructed and arranged to allow rapid drilling in any formation.

Another object is the provision of a device wherein fishing jobs are reduced to a minimum, due to the fact that the device has no projections or mechanism on the outer surface thereof.

Another object is the provision of a novel locking device, whereby when the bit is off the formation at the bottom of the hole, free rotation of the drill pipe may be effected.

Other objects and advantages of the invention will be apparent to those familiar with the art to which this invention appertains.

The invention is simple in construction, inexpensive in cost of manufacture, and generally superior to devices now known to the inventor.

With the above mentioned and other objects in view, the invention consists in the novel and useful provision, formation, construction, association, and relative arrangement of parts, members and features, all as shown in a certain embodiment in the accompanying drawing, described generally, and more particularly pointed out in the claims.

In the drawing:

Figure 1 is a transverse vertical sectional view of a tool incorporating the invention,

Figure 2 is a sectional view on the line 2—2 of Figure 1, and on an enlarged scale from said figure,

Figure 3 is an enlarged sectional view on the line 3—3 of Figure 1, and,

Figure 4 is a plan view partly in section of the hammer member of the invention.

Referring now with particularity to the drawing, the improved hydraulic drilling jar is designated as an entirety by the numeral 1, and wherein 2 is a tubular body internally threaded adjacent ends thereof at 3 and 4, the threads 3 receiving the threaded end of a sub 5, the sub provided with the usual taper threaded pin 6, whereby the same may be secured to drill pipe. One member 7 of a clutch is screw-threaded for engagement with the threads 4. The other member 8 of the clutch is adapted to be secured by welding or otherwise, as indicated at 9, to the shank 10 of a bit 11. This clutch member is constructed as illustrated in Figure 3, wherein the two parts are shown, and each part is provided with a half round portion providing diametrically disposed shoulders 12 and 13. These shoulders under certain conditions of operation of the invention co-engage so that rotation of the body 2 of the device produces rotation of the bit 11. Within the body and above the clutch member 7 is an anvil 14 provided with a shank 15, the shank terminating in a threaded portion 16 for reception within the threaded box 17 of the shank 10 of the bit 11. The anvil and its shank are provided with a longitudinal bore 18 and the bit is provided with a central bore 19 communicating with the bore 18. Transverse passageways 20 in the bit communicate with the central bore thereof in the well understood manner.

Situated above the anvil is a hammer 21 provided with an elongated shaft 22, around a portion of which is a spiral helical thread 23. A portion of the shaft is received within a central opening 24 of the sub 5. Interposed in the body 2, secured thereto, between the end of the sub 5 and the commencement of the spiral thread 23 are two cam members 25 and 26. The cam members are slightly spaced apart, as shown at 27, to provide a way therebetween. Diametrically carried by the shaft 22 is a bar 28. This bar is adapted to ride upon the cam edge and to raise and lower the shaft 22 to allow impact between the hammer 21 and the anvil 14. The sub 5 is provided with one or more circulation bores 29

and a central bore 30 communicating with the circulation bores 29. The hammer 21 is provided with a central circulation bore 31 and angularly disposed bores 32 communicating above the hammer around the shaft 22 and with said central bore 31. The hammer 21 may be provided with dished or concaved sides 33 to permit mud-laden fluid to pass beyond the same more readily (see Figure 4).

The operation, uses and advantages of the invention just described, are as follows:

If we assume that the tool depicted in Figure 1 is secured to drill pipe, circulation may be maintained through the pipe and the drilling jar, as is obvious. When the tool is in the position shown in Figure 1, the bit is engaging the formation, and as the drill pipe is rotated, the body 2 is being rotated, which will produce rotation of the bit due to the clutch arrangement 7 and 8. The mud-laden fluid will rotate the shaft 22, causing the bar 28 to travel on the cam surface of the two cams and producing a jarring impact, at each rise and fall of the shaft, between the hammer and the anvil. This striking force is regulated by the pressure of the mud and may be rapid or slow.

If it is desired to stop the jarring action, the driller may pull upwardly upon the drill pipe, which will lift the body 2 upwardly and cause the clutch elements to disengage, the anvil head then resting upon the inner end of the clutch member 7. Thus, the body may continue to be rotated without the bit necessarily rotating or any jarring action thereof.

If it is desired to stop rotation of the shaft, this is accomplished upon raising the drill pipe to lift the body 2 upwardly, the bar 28 being received within the ways 27 between the two cams, thus locking the shaft against rotation. Circulation may continue as before, however. The bar 28 is of sufficient depth to the end that it will never become disengaged from between the two cams and the lengths of the different parts within the body are so proportioned that none of the parts will separate sufficiently to prevent re-establishment of their function. For instance, when it is desired to commence drilling again, the drill pipe may be lowered and the bar 28 will then move from between the two cams so as to again engage the cam surface to produce a jarring action between the hammer and anvil. Likewise, the clutch members may again engage so that rotation of the bit will occur during rotation of the drill pipe.

It is, of course, intended that all bores in the several members, such as the sub, the hammer and anvil, and fish tail bit, are so proportioned as to readily allow passage of fluid therethrough, and without undue back pressure.

I claim:

1. A drilling jar adapted to be secured to drill pipe and rotated thereby, including a tubular body, an anvil within said body, a bit secured to one end of said anvil, an external separable jaw clutch between the body and said bit, the body when rotating producing rotation of said bit when the clutch is engaged, lifting of the body disengaging said clutch to permit rotation of the body independent of rotation of the bit, a hammer within the body, and means for producing impact between the hammer and the anvil to produce a jarring action on said bit, said means functioning independent of rotation of the body.

2. A drilling jar adapted to be secured to drill pipe and rotated thereby including: a tubular body provided at one end with a top sub for connection with drill pipe, a bottom sub for the opposite end of said body provided with a jaw forming one member of a clutch, an anvil within said body provided with a shank extending through said bottom sub, a bit secured to said anvil shank, a jaw secured to said bit and forming a second member of said clutch, a hammer within the body, a shaft secured to said hammer and extending axially of the body, the said top sub being bored to receive one end of said shaft, a spiral helical thread surrounding said shaft, a transverse member secured to the shaft, and a cam to be engaged by said transverse member to raise and drop said shaft during rotation thereof to permit impact between hammer and anvil to cause a jarring action upon the bit, said shaft being rotated by fluid impact against said spiral helical thread, and said bit being rotated by bodily rotation of said body.

3. A drilling jar adapted to be secured to drill pipe and rotated thereby, including: a tubular body, a sub for one end of said body to secure the same to drill pipe, a jaw sub forming one member of a clutch for the lower end of said body, an anvil within the body provided with a shank passed through the said lower sub, a bit secured to said shank, a second jaw forming the second member of the clutch carried by the bit, said clutch members being separable to permit rotation of the body independent of the bit, a shaft axially disposed within the body, a hammer carried by one end of the shaft adapted to engage the anvil to produce a jarring action upon the bit, fluid impact means for said shaft for rotating the shaft independent of rotation of the body, a pair of separated cams within the body, a rider for said cams carried by the shaft and adapted to raise and drop the hammer during rotation of the shaft, the relationship being such that a positioning of the rider between the cams prevents rotation of said shaft and stops impact between the hammer and anvil.

4. A rotary drilling jar including a tubular body, a hammer and an anvil within said body, a shaft for the hammer; a pair of cams forming a way therebetween, secured within the body; a rider for engagement with said cams, secured to the shaft; and means on said shaft adapted to rotate said shaft responsive to fluid impact on said means, said shaft when rotated being raised and dropped by rider contact with said cams to cause impact between the hammer and anvil, the rider being received in the way between said cams upon movement of the body in one direction to stop rotation of the shaft.

5. A drilling jar adapted to be secured to drill pipe, including a body, a hammer and an anvil within the body, a cam, a rider in cam engagement for raising the hammer and allowing the same to drop to cause impact with said anvil, and means whereby the rider may be locked against movement on said cam.

6. A dirilling jar adapted to be secured to drill pipe and rotated thereby, including a tubular body, a pair of cams spaced apart to provide a way, a rider, a shaft carrying said rider, a hammer for one end of said shaft, and an anvil to receive the blow of the hammer when the shaft is rotated to cause said rider to raise and drop the shaft by its cam engagement, said rider when positioned in said way locking the hammer against movement.

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