Oct. 14, 1930. G. E. FENTRESS 1,778,252

ROTARY JAR

Filed Feb. 14, 1928

Fig. 1

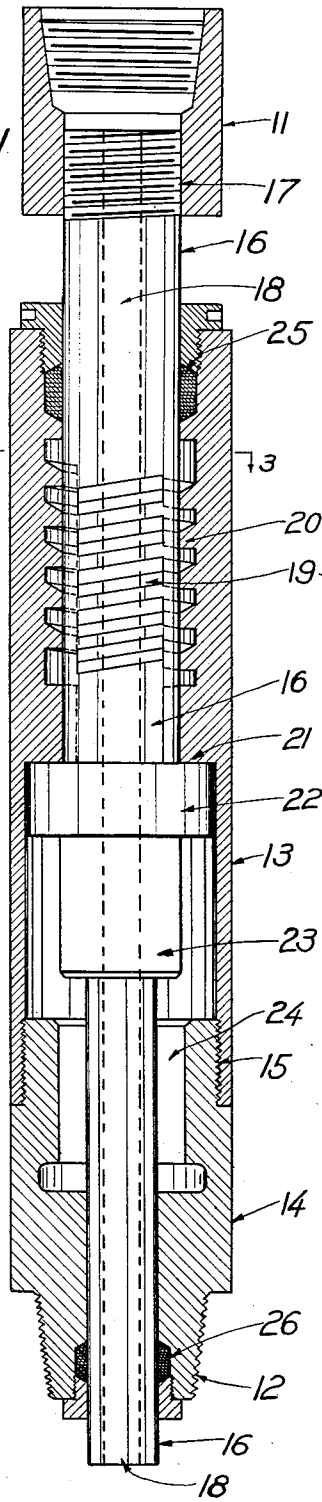


Fig. 2

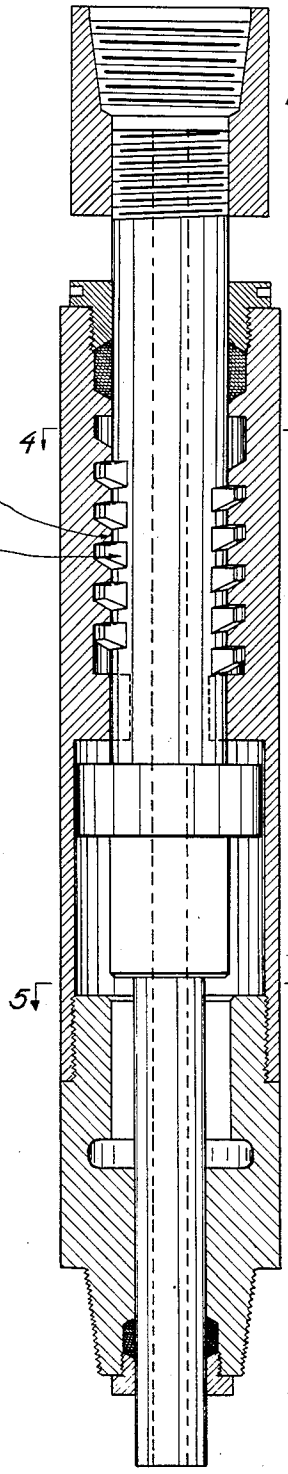


Fig. 3

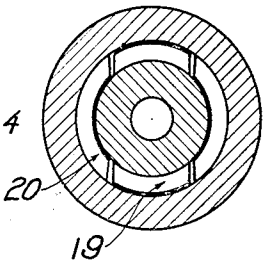


Fig. 4

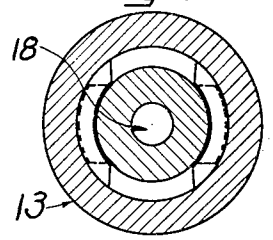
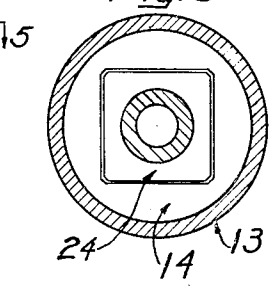


Fig. 5



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UNITED STATES PATENT OFFICE

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ROTARY JAR

Application filed February 14, 1928. Serial No. 254,280.

My invention relates to the art of rotary drilling with especial reference to certain improvements in rotary jars.

In oil well drilling and particularly at excessive depths, tools and pipe are liable to become stuck in the hole. A simple straight pull on such objects to the capacity of the hoisting equipment is not always powerful enough to recover them. In such emergencies the operation known as jarring is necessary. Jarring consists in striking a blow, in either direction, as close to the bound place as is possible, and the purpose of the tool referred to as a jar is to strike such blows. It is an object of my invention to provide a jar which produces a steady succession of blows and which is so designed as to be used in rotary drilling.

It is a further object of my invention to provide a jar which produces the desired jarring effect by a simple rotation of the drill pipe while maintaining it under a steady upward strain. The peculiar advantage of such jarring is that the blow is superimposed on a steady pull, thus greatly increasing its effectiveness. By jarring with a steady upward pull on the pipe any slack due, for instance, to loose connections, is absorbed by the pull, and the force of the blow is thus transmitted without loss, directly to the part to be jarred free.

It is a still further object of my invention to provide a rotary jar including rugged means for transmitting rotation. Experience has shown that it is good practice to run a jar above the bit when in difficult drilling. Such use requires the jar adapted to transmit the full drilling torque.

Another object of my invention is to provide a jar which utilizes the elasticity of the drill pipe in the production of blows.

I attain these objects by means of the mechanism illustrated in the accompanying drawing in which:

Figure 1 is a sectional elevation showing the striking elements in contact.

Figure 2 is a sectional elevation showing the striking elements separated and about half set to deliver a blow.

Figure 3 is a section on the line 3—3 of Figure 1.

Figure 4 is a section on the line 4—4 of Figure 2.

Figure 5 is a section on the line 5—5 of Figure 2.

My improved jar is connected to the drill pipe by the sub 11 at its upper end, and by the threaded pin 12 at its lower end. The jar thus becomes a part of the drill stem. The body of this jar is composed of two parts, a sleeve 13 and a sub 14, the sub closing the lower end of the sleeve and secured thereto by the threads 15. This body is relatively stationary during jarring, the moving part of the jar being mandrel 16, functioning within the sleeve and joined to the top sub by threads 17. The mandrel extends entirely through the body of the jar, the central bore 18 permitting the usual mud circulation.

The means for causing the jarring blows comprises the thread 19 on the mandrel and the mating thread 20 in the sleeve. These threads are interrupted as indicated in Figure 3. An anvil 21 is provided in the sleeve and a mating hammer 22 is provided on the mandrel. Hammer and anvil are in contact when the threads are ready to engage. By rotating the mandrel the threads engage and the advance of the thread causes the mandrel to move downward in relation to the sleeve, thus separating the anvil and hammer faces. The interruption in each thread is great enough to permit a free upward movement of the mandrel when the thread 19 has rotated past its engagement with thread 20. During that portion of the revolution in which the threads are engaged the drill pipe is further stretched, and as the threads disengage the mandrel is forcibly jerked upward by the elasticity of the pipe, the hammer striking the anvil a goodly blow, depending for its force on the pipe tension, the weight of the hammer and the speed of rotation.

The means for transmitting rotation through my improved jar comprises the square 23 formed on the mandrel and the socket 24 formed on the sub 14, the socket being adapted to receive said square. When drilling, the mandrel is lowered until these

parts engage, thus locking the jar. When again required for use the free movement of the mandrel inside the sleeve is sufficient to disengage the square 23 from the socket, permitting the mandrel to be rotated without rotating the sleeve.

Mud is excluded from the interior of my improved jar by the stuffing boxes 25 and 26. A sufficient amount of lubricant is maintained inside the jar to materially reduce the wear on the threads.

When using my present invention a bit may be jarred loose by pulling a suitable stretch in the drill pipe by means of the calf wheel and then rotating the drill pipe. The speed of rotation and the amount of tension are subject to control by the driller. The rotation produces a succession of upward jarring blows of great force and as the jar makes headway the tension in the pipe is maintained by means of the calf wheel.

In rotary jars heretofore used it has been necessary to manually operate the jar. The driller first lowered the drill pipe, rotated it to latch the jars, pulled the desired tension in the drill pipe and finally rotated the pipe backwards to unlatch the jars, thus allowing the elasticity of the pipe to produce the desired blow. This operation is obviously laborious and is also destructive to equipment. A distinct danger exists in rotating the pipe left handed in that a tool joint might unscrew.

My improved jar is easy on equipment and strikes a rapid succession of blows. A long travel of the mandrel is neither necessary nor desirable to the production of a hard blow. A large wearing surface is provided to receive the impact, and the threads can be made large enough to wear a considerable time. The economy of such a jar is obvious.

I claim as my invention:

1. A rotary jar comprising: an outer-sleeve; means at the lower end of said sleeve for connecting the same to a drill stem; a mandrel longitudinally disposed through said sleeve; means at the upper end of said mandrel for connecting the same to said drill stem; a hammer comprising a collar integral with said mandrel and presenting an impacting flat face upwards; an anvil within said sleeve adapted to receive the impact of said hammer on its entire downward-looking face; a plurality of interrupted threads on said mandrel and mating interrupted threads on said sleeve, said threads engaging in such manner that said hammer moves downwardly in relation to said anvil during the engagement of said threads, said threads being independent of said hammer and said anvil, the interruption of said threads being sufficient to permit the mandrel to longitudinally travel through said sleeve and cause the hammer to strike said anvil, said threads, anvil, and hammer being so arranged that continuous rotation of said mandrel relative to said sleeve in conjunction with a steady upward strain on said drill stem produces a continuous succession of blows of said hammer on said anvil.

2. A rotary jar comprising: an outer sleeve; means at the lower end of said sleeve for connecting the same to a drill stem; a mandrel longitudinally disposed through said sleeve; means at the upper end of said mandrel for connecting the same to said drill stem; a hammer on said mandrel within said sleeve; an anvil in said sleeve adapted to receive an impact from said hammer on its entire downward-looking face; means dissociated from said hammer and anvil for producing a steady succession of upward blows of said hammer on said anvil by continuous rotation of said mandrel relative to said sleeve in conjunction with a steady upward strain on said drill stem.

3. A device as and for the purpose set forth in claim 2, in which the mandrel is provided with a polygonal section and the sleeve is provided with a socket adapted to receive said polygonal section of the mandrel, when said mandrel is lowered in relation to said sleeve, in such manner that rotation may be transmitted through said jar at the will of the operator.

In witness that I claim the foregoing I have hereunto subscribed my name this 9th day of February, 1928.

GEORGE E. FENTRESS.