

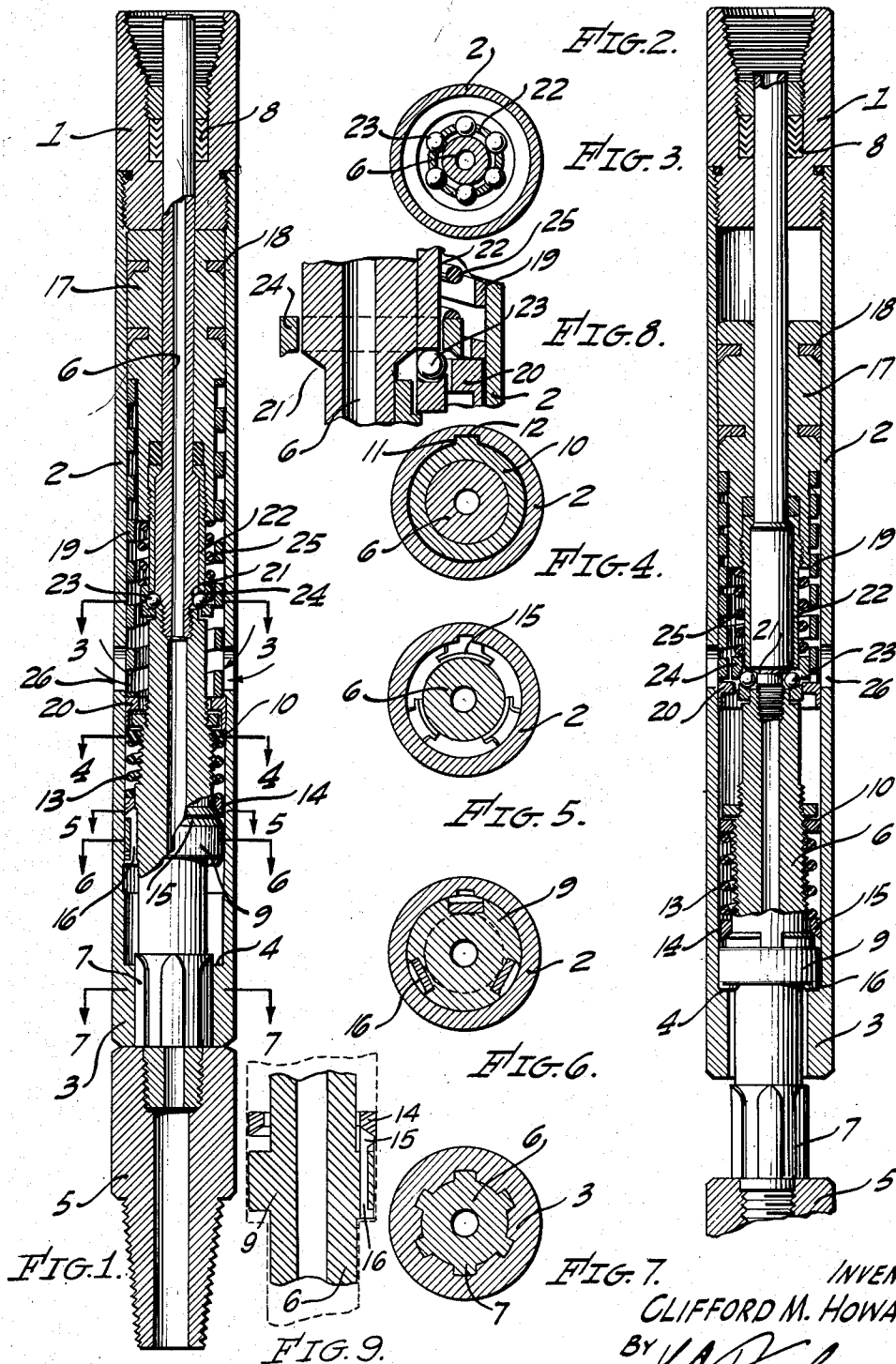
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LONGITUDINALLY STRIKING OIL WELL JAR

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LONGITUDINALLY STRIKING OIL WELL JAR

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9 Claims. (Cl. 255—27)

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This invention relates to an oil well jar and used particularly in the rotary drilling of an oil well and the prime object of my invention is to provide a novel jar which strikes longitudinally of the jar body and which will strike upwardly with great force to loosen an object which might be stuck in the bore of the well.

A feature of my invention is to provide a novel jar of the character stated, which in collapsed position is so coupled that the bottom sub or tool can be attached to the lost object in the well. This coupling in extended position of the tool is released to permit free rotation of the upper portion of the jar.

Another object of my invention is to provide a novel means of releasably securing the striking piston to the mandrel, which is secured to the lost object.

Still another object of my invention is to provide a novel means of adjusting spring tension in the jar when it is in the bore of the well and attached to the lost object.

Still another feature of my invention is to provide a novel jar of the character stated, which also utilizes the hydro-static fluid head in the well in causing the piston to jar upwardly against the lost object.

Still another feature of my invention is to provide a novel jar of the character stated, in which spring tension is maintained on the lost object while the piston is striking upwardly to jar this object loose.

Other objects, advantages and features of invention may appear from the accompanying drawing, the subjoined detailed description and the appended claims.

In the drawing:

Figure 1 is a longitudinal sectional view of my jar in collapsed position.

Figure 2 is a longitudinal sectional view of my jar in extended position and about to trip.

Figure 3 is a sectional view taken on line 3—3 of Figure 1.

Figure 4 is a sectional view taken on line 4—4 of Figure 1.

Figure 5 is a sectional view taken on line 5—5 of Figure 1, and with the sliding ring removed.

Figure 6 is a sectional view taken on line 6—6 of Figure 1.

Figure 7 is a sectional view taken on line 7—7 of Figure 1.

Figure 8 is a fragmentary transverse sectional view of the releasable catch means for the piston.

Figure 9 is a fragmentary longitudinal sectional view of the mandrel and one of the tapered dogs mounted therein.

Referring more particularly to the drawing, the numeral 1 indicates a coupling positioned at the upper end of the tool and internally threaded to receive the drill pipe, which is not shown but

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which is usual and well known in the art. A barrel 2 extends downwardly from the coupling 1. The barrel 2 terminates at the bottom in an internally splined boss 3, this boss also having a top shoulder 4, and the purpose of these parts will be further described.

A sub 5 is attached to the lower end of a mandrel 6, which extends into the barrel 2 and extends longitudinally thereof. The mandrel 6 is provided with external splines 7, which fit into the internal splines of the boss 3. The mandrel 6 is tubular so that circulating fluid can pass longitudinally through the tool. The upper end of the mandrel 6 is packed off in the coupling 1 by suitable packing 8. The mandrel 6 has a limited longitudinal movement within the barrel 2 and this longitudinal movement compresses the actuating springs and also trips the latching mechanism, as follows:

A flange 9 is provided on the mandrel 6 and is spaced above the splines 7. A nut 10 screws on to the outside of the mandrel 6 and is provided with a tooth 11, which fits in a groove 12 on the inside of the barrel 2, thus if the mandrel 6 is held stationary and if the barrel 2 is rotated the nut 10 will move up or down on the mandrel 6 to compress a spring 13, which seats against the nut 10 and against a sliding ring 14 on the inside of the barrel 2. A plurality of tapered dogs 15 are each provided with a depending pin 16, which pin projects downwardly through the flange 9, and when the bottom of these pins strike the shoulder 4 the dogs 15 will be pushed upwardly, thus camming the ring 14 against the inside of the barrel 2 and holding this ring stationary. The pins 16 are rectangular in cross-section, thus holding the dogs 15 against rotation as long as the pins are in the collar 9. The spring 13 then pushes upwardly on the nut 10 and maintains a constant upward tension on the mandrel 6, the sub 5 and the lost object to which the sub is attached. If it is desired to increase the tension of the spring 13 the barrel 2 is rotated to the right, this threads the nut 10 downwardly on the mandrel 6 to further compress the spring 13.

A piston 17 surrounds the mandrel 6 and slides vertically thereon and in the upward position of the piston 17 it strikes against the bottom of the coupling 1, thus creating an upward jar, which is transmitted through the barrel 2 to the boss 3, thence to the flange 9, and to the mandrel 6 and sub 5. The piston 17 is provided with rings 18 to prevent leakage past this piston. A heavy spring 19 bears against the bottom of the piston 17 and also against a fixed stop 20 on the inside of the barrel 2. The spring 19 urges the piston 17 upwardly against the bottom of the coupling 1 to the position shown in Figure 1.

Figure 2 illustrates the cocked position of the parts and where the piston 17 is about to be re-

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leased to strike against the bottom of the coupling 1. This mechanism is as follows:

The mandrel 6 is enlarged and this enlargement terminates in an annular shoulder 21. A sleeve 22 extends downwardly from the piston 17 and surrounds the enlargement of the mandrel 6. The sleeve 22 is provided with a number of radial holes close to the bottom thereof and a plurality of balls 23 are positioned in these holes. The balls 23 engage the shoulder 21 in the cocked position of the tool and these balls are held or pressed inwardly by means of a latch ring 24, which surrounds the sleeve 22 and tends to press these balls inwardly. A spring 25 bears against the top of the latch ring 24 and urges this ring downwardly to hold the balls 23 inwardly or latched. When the balls 23 are in the position shown in Figures 1 and 2, the piston 17 is latched to the mandrel 6 and cannot move relative to this mandrel. When the balls 23 move outwardly, as shown in Figure 8, the piston 17 is free to move vertically on the mandrel 6 and strike against the bottom of the coupling 1. The latch ring 24 is pressed upwardly when this ring engages the stop 20, as shown in Figure 8. In the position of parts shown in Figure 8, the balls 23 can move outwardly away from the shoulder 21 and thereafter the piston 17 is forced upwardly by the spring 19.

Operation

In operation, the tool is lowered into the well on a string of drill pipe and the sub 5 either threads into the lost object or a suitable fishing tool is attached to this sub. When a solid attachment to the lost object is obtained, the drill pipe is pulled upwardly which moves the parts to the position shown in Figure 2, that is, the splines 7 disengage the boss 3. The barrel 2 may now rotate, if desired, while the mandrel 6 remains stationary. The upward pull previously described has caused the pins 16 to engage the shoulder 4. This locks the ring 14 and the spring 13 may be further tensioned by threading the nut 10 downwardly on the mandrel 6. The spring 13 now maintains a constant upward pull on the mandrel 6 and therefore on the lost object. The latch ring 24 is also just touching the stop shoulder 20 and a slight further upward movement will push the latch ring 24 upwardly to the position shown in Figure 8, thus permitting the balls 23 to snap outwardly thereby releasing the piston 17 and permitting this piston to be pushed upwardly against the bottom of the coupling 1, by the spring 19. The piston 17 will also be forced upwardly by the hydro-static pressure which is exerted through the ports 20, which open through the barrel 2 and permit fluid to press upwardly against the bottom of the piston 17.

To reset the tool, the barrel 2 is lowered to the position shown in Figure 1, the balls 23 then are pressed inwardly against the shoulder 21 thereby latching the piston 17 to the mandrel 6. Thereafter, the barrel 2 is again pulled upwardly to the position shown in Figure 2, and the operation is repeated.

Having described my invention, I claim:

1. A longitudinally striking oil well jar comprising a barrel, a threaded coupling on the barrel serving as the anvil, a mandrel extending into the barrel, said mandrel having a limited longitudinal movement in the barrel, coupling means on the mandrel attachable to a lost article in the well, a piston longitudinally slidable in the barrel serving as the hammer, a spring in the barrel bearing against the piston and urging the same

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against the coupling, and latch means on the piston releasably engaging the mandrel, whereby the piston is releasably held with the spring compressed and with the piston spaced from the coupling trip means engaging the latch means and disengaging the same on longitudinal movement of the barrel, and spring means bearing against the mandrel and urging said mandrel upward in the barrel, a ring slidably mounted in the barrel, said spring means resting on the ring, and means on the mandrel engageable with the ring to clamp said ring against the barrel whereby upward movement of the barrel will tension said spring means.

2. A longitudinally striking oil well jar comprising a barrel, a threaded coupling on the barrel serving as the anvil, a mandrel extending into the barrel, said mandrel having a limited longitudinal movement in the barrel, coupling means on the mandrel attachable to a lost article in the well, a piston longitudinally slidable in the barrel serving as the hammer, a spring in the barrel bearing against the piston and urging the same against the coupling, and latch means on the piston releasably engaging the mandrel, whereby the piston is releasably held with the spring compressed and with the piston spaced from the coupling, and trip means engaging said latch means on longitudinal movement of the mandrel to release said latch means and free the piston from said mandrel, and spring means bearing against the mandrel and urging said mandrel upward in the barrel, a ring slidably mounted in the barrel, said spring means resting on the ring, and means on the mandrel engageable with the ring to clamp said ring against the barrel whereby upward movement of the barrel will tension said spring means.

3. A longitudinally striking oil well jar comprising a barrel, a threaded coupling on the barrel serving as the anvil, a mandrel extending into the barrel, said mandrel having a limited longitudinal movement in the barrel, coupling means on the mandrel attachable to a lost article in the well, a piston longitudinally slidable in the barrel serving as the hammer, a spring in the barrel bearing against the piston and urging the same against the coupling, and latch means on the piston releasably engaging the mandrel, whereby the piston is releasably held with the spring compressed and with the piston spaced from the coupling, and trip means engaging said latch means on longitudinal movement of the mandrel to release said latch means and free the piston from said mandrel, and spring means bearing against the mandrel and urging said mandrel upward in the barrel, a ring slidably mounted in the barrel, said spring means resting on the ring, and means on the mandrel engageable with the ring to clamp said ring against the barrel whereby upward movement of the barrel will tension said spring means, a nut threaded on the mandrel, said spring means bearing against the nut, said nut being revolvable with the barrel to screw on the mandrel and tension said spring means.

4. A longitudinally striking oil well jar comprising a barrel, a coupling on the upper end of the barrel serving as the anvil, a mandrel extending longitudinally in the barrel and having a limited longitudinal movement therein, a splined coupling connecting the mandrel and the barrel, a sub on the lower end of the mandrel providing coupling means to a lost article in the well, a piston slidably mounted on the mandrel serv-

ing as the hammer, a spring bearing against the piston and urging the piston against the bottom of the coupling, the mandrel having an annular recess therein, a sleeve depending from the piston, balls mounted in the sleeve and releasably fitting into said recess to couple the piston and the mandrel, a latch ring engaging the balls and pressing the same into said recess, and means fixedly mounted in the barrel and engageable by the latch ring to release the balls and disengage said recess.

5. A longitudinally striking oil well jar comprising a barrel, a coupling on the upper end of the barrel serving as the anvil, a mandrel extending longitudinally in the barrel and having a limited longitudinal movement therein, a splined coupling connecting the mandrel and the barrel, a sub on the lower end of the mandrel providing coupling means to a lost article in the well, a piston slidably mounted on the mandrel serving as the hammer, a spring bearing against the piston and urging the piston against the bottom of the coupling, the mandrel having an annular recess therein, a sleeve depending from the piston, balls mounted in the sleeve and releasably fitting into said recess to couple the piston and the mandrel, a latch ring engaging the balls and pressing the same into said recess, and means fixedly mounted in the barrel and engageable by the latch ring to release the balls and disengage said recess, a stop on the barrel engageable by the latch ring on longitudinal movement of the mandrel, whereby the balls are released from engagement with the shoulder.

6. A longitudinally striking oil well jar comprising a barrel, a coupling on the upper end of the barrel serving as the anvil, a mandrel extending longitudinally in the barrel and having a limited longitudinal movement therein, a splined coupling connecting the mandrel and the barrel, a sub on the lower end of the mandrel providing coupling means to a lost article in the well, a piston slidably mounted on the mandrel serving as the hammer, a spring bearing against the piston and urging the piston against the bottom of the coupling, the mandrel having an annular recess therein, a sleeve depending from the piston, balls mounted in the sleeve and releasably fitting into said recess to couple the piston and the mandrel, a latch ring engaging the balls and pressing the same into said recess, and means fixedly mounted in the barrel and engageable by the latch ring to release the balls and disengage said recess, a spring in the barrel bearing against said mandrel and urging said mandrel upwardly into the barrel.

7. A longitudinally striking oil well jar comprising a barrel, a coupling on the upper end of the barrel serving as the anvil, a mandrel extending longitudinally in the barrel and having a limited longitudinal movement therein, a splined coupling connecting the mandrel and the barrel, a sub on the lower end of the mandrel providing coupling means to a lost article in the well, a piston slidably mounted on the mandrel serving as the hammer, a spring bearing against the piston and urging the piston against the bottom of the coupling, the mandrel having an annular recess therein, a sleeve depending from the piston, balls mounted in the sleeve and releasably fitting into said recess to couple the piston and the mandrel, a latch ring engaging the balls and pressing the same into said recess, and means fixedly mounted in the barrel and engageable by the latch ring to release the balls and disengage said recess, a

spring in the barrel bearing against said mandrel upwardly and urging said mandrel into the barrel, one end of said spring resting on a sliding ring in the barrel, and means pressing said ring against the barrel to prevent sliding thereof, said means being operable on longitudinal movement of the mandrel upwardly.

8. A longitudinally striking oil well jar comprising a barrel, a coupling on the upper end of the barrel serving as the anvil, a mandrel extending longitudinally in the barrel and having a limited longitudinal movement therein, a splined coupling connecting the mandrel and the barrel, a sub on the lower end of the mandrel providing coupling means to a lost article in the well, a piston slidably mounted on the mandrel, a spring bearing against the piston and urging the piston against the bottom of the coupling, the mandrel having an annular recess therein, a sleeve depending from the piston, balls mounted in the sleeve and releasably fitting into said recess to couple the piston and the mandrel, a latch ring engaging the balls and pressing the same into the recess, and means fixedly mounted in the barrel and engageable by the latch ring to release the balls and disengage said recess, said barrel having fluid intake ports therein below said piston, whereby hydrostatic fluid pressure is exerted on the piston.

9. A longitudinally striking oil well jar comprising a barrel, a coupling on the upper end of the barrel serving as the anvil, a mandrel extending longitudinally in the barrel and having a limited longitudinal movement therein, a splined coupling connecting the mandrel and the barrel, a sub on the lower end of the mandrel providing coupling means to a lost article in the well, a piston slidably mounted on the mandrel, a spring bearing against the piston and urging the piston against the bottom of the coupling, the mandrel having an annular recess therein, a sleeve depending from the piston, balls mounted in the sleeve and releasably fitting into said recess to couple the piston and the mandrel, a latch ring engaging the balls and pressing the same into the recess, and means fixedly mounted in the barrel and engageable by the latch ring to release the balls and disengage said recess, a second spring in the barrel bearing against said mandrel and urging said mandrel upwardly into the barrel, one end of said second spring resting on a sliding ring in the barrel, and means pressing said ring against the barrel to prevent sliding thereof, said means being operable on longitudinal movement of the mandrel, said barrel having fluid intake ports therein below said piston, whereby hydrostatic fluid pressure is exerted on the piston.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,717,972	Hartson	June 18, 1929
1,801,673	Knox	Apr. 21, 1931
2,008,765	McCullough	July 23, 1935
2,122,751	Phipps	July 5, 1938
2,144,869	Boulter	Jan. 24, 1939
2,166,299	Kennedy et al.	July 18, 1939
2,425,012	Snyder	Aug. 5, 1947
2,544,473	Smith	Mar. 6, 1951