

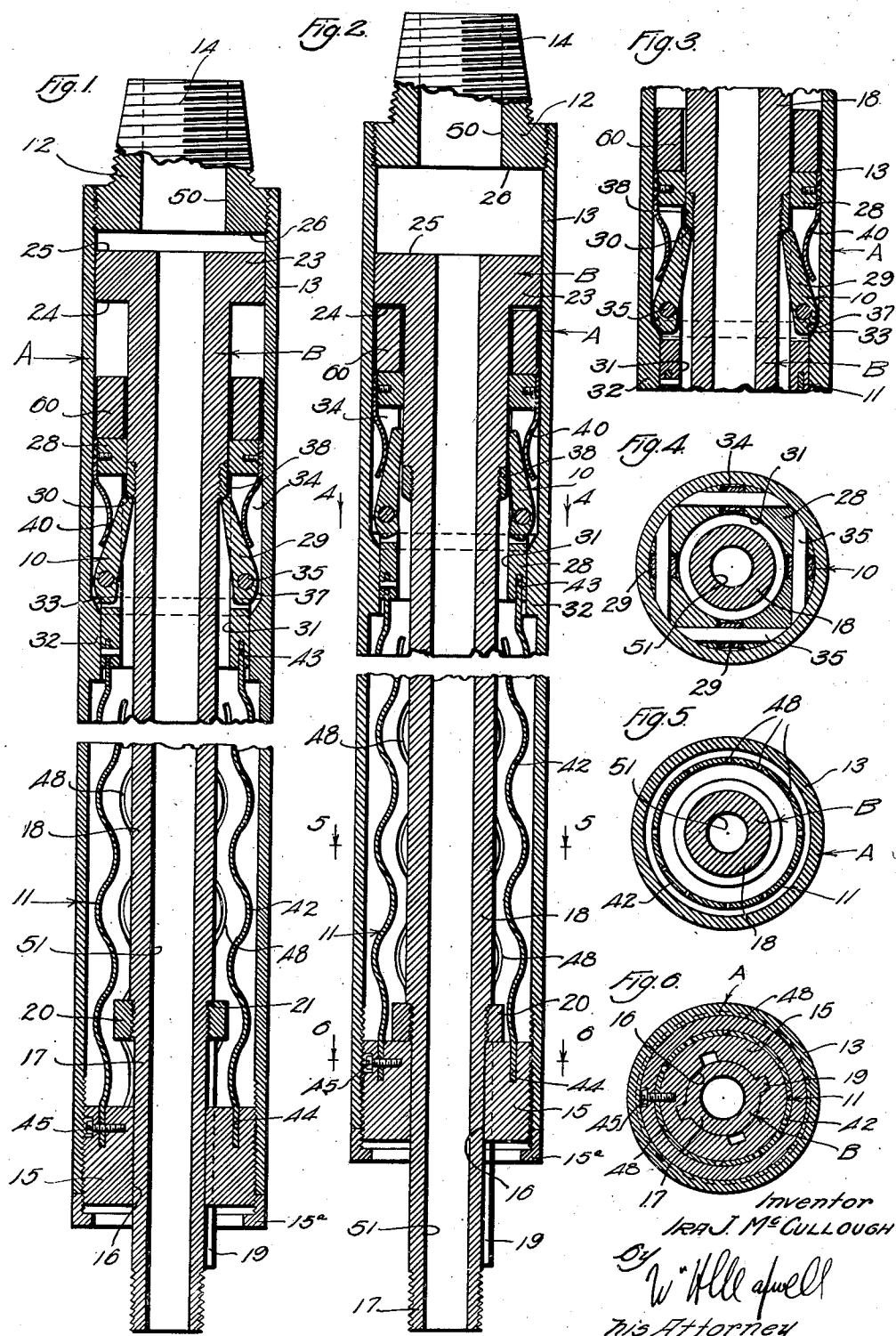
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JAR

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JAR

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This invention relates to a device for use in well drilling operations and relates more particularly to a jarring tool. It is a general object of the invention to provide a simple, practical, and effective jarring tool adapted to be used in fishing operations with the equipment employed in the rotary method of well drilling.

Another object of the invention is to provide a jarring tool adapted for use in fishing operations that embodies slackly linked sections related for limited relative longitudinal movement that are held in a contracted position against relative longitudinal movement by releasable latch means that automatically release the sections for movement upon a predetermined tensile strain being exerted upon the tool.

Another object of the invention is to provide a jarring tool that may be operated without rotating the operating string and without varying the pressure on the fluid in the operating string.

Another object of the invention is to provide a jarring tool of the character mentioned that embodies means whereby the slackly linked sections may be released for relative longitudinal movement upon any desired tensile strain being exerted on the tool.

It is another object of the invention to provide a jarring tool that is entirely automatic in its operation and that may be operated any number of times by simple reciprocation of the operating string.

A further object of the invention is to provide a jarring tool in which the parts are all simple and inexpensive of manufacture and in which the jarring parts or members that are brought into jarring or hammering engagement upon the tool being actuated or tripped are inexpensive of manufacture and are replaceable.

Other objects and features of my invention will be best and more fully understood from the following detailed description of a typical form and application of the invention, throughout which description reference is had to the accompanying drawings, in which:

Fig. 1 is a longitudinal detailed sectional

view of the jarring tool illustrating it in the set or contracted position. Fig. 2 is a view similar to Fig. 1 illustrating the parts in the tripped or actuated position. Fig. 3 is a longitudinal detailed sectional view of the latch means embodied in the tool showing it in the position immediately before being released. Fig. 4 is a transverse detailed sectional view taken as indicated by line 4—4 on Fig. 2. Fig. 5 is a detailed transverse sectional view taken as indicated by line 5—5 on Fig. 2, and Fig. 6 is a detailed transverse sectional view taken as indicated by line 6—6 on Fig. 2.

The tool provided by the present invention is adapted to be employed to effect a jarring or hammering action. The tool is intended primarily to be employed within a well during fishing operations to impart a jarring action to an object within the well to loosen it so that it can be removed or withdrawn from the well. Throughout the following description I will refer to the tool as being used in connection with a fishing tool in gripping engagement with a fish or object within a well. It is to be understood that the invention may be employed in various other situations and is not to be taken as limited to the particular application or use referred to.

The jarring tool provided by my present invention includes, generally, two main or body sections A and B connected or related for limited relative longitudinal movement, latch means 10 for releasably holding the sections A and B against relative longitudinal movement in a contracted position, and control means 11 for the latch means whereby the latch means is tripped or released upon a predetermined tensile strain being exerted on the tool.

The body sections A and B constitute or form an assembly adapted to be connected between the part or object to be jarred and an operating string. For example, the parts A and B are adapted to be connected between a fishing tool engaging the object to be jarred and an operating string such as a string of drill pipe, or the like. The body sections A and B may be connected between two portions of an operating string at any point above the object to be jarred. The sections

A and B are slackly linked or related for limited relative longitudinal movement and have parts or shoulders adapted to cooperate or jar together upon the latch means 10 being released when a tensile strain upon the tool reaches a predetermined degree or extent. The sections A and B are preferably telescoped or arranged one within the other. The section A is preferably in the form of a tubular member, while the section B is in the form of a stem extending into the section A.

The section A may include a cap or upper part 12 screw threaded on the upper end of a body section 13. The upper end part 12 may be detachably connected to the body portion 13 and may have an upwardly projecting screw threaded pin 14 to facilitate attachment to an operating string, or the like. The body portion 13 is an elongated tubular part. A knocker sub block 15 is screw threaded into the body portion 13. The block 15 is preferably screw threaded into the extreme lower end of the portion 13 and preferably has a portion projecting below the lower end of the portion 13. A lock nut 15^a may be threaded on the projecting portion of the sub block 15 to engage the lower end of the part 13 to lock or set the block in position. The plug 15 is provided with a central vertical or longitudinal opening 16.

The section B may be considered as being directly connected with a fishing tool or other device connected with the object to be jarred. The section B may consist of a simple unitary member 18 slidable in the opening 16 of the block 15 and projecting within the portion 13 of the section A. The lower portion 17 of the member 18 projects downwardly from the block 15 and may be provided with any suitable means for attachment to a fishing tool or a portion of an operating string, or the like. The portion 17 is preferably provided with splines or keys 19 to slidably operate in keyways in the opening 16 to connect the body sections A and B against relative rotation. A sleeve or collar 20 is screw threaded onto the portion 17 above the block 15. The collar 20 is spaced above the upper side of the block 15 when the body sections A and B are in the contracted or unactuated positions. The lower end of the collar 20 is adapted to cooperate with or be struck by the upper side of the block 15 when the latch means 10 releases the sections A and B to provide the jarring action. In the preferred form of the invention the portion 17 is of reduced diameter to provide a downwardly facing shoulder 21 and the upper end of the collar 20 seats against the shoulder 21.

The member 18 is a comparatively long part extending a considerable distance through the body section A. The portions 17 and 18 of the section B are of considerably less diameter than the interior of the portion 13 of the section A so that there is provided

an annular space between the exterior of the section B and the inner walls of the section A. A head 23 is provided on the upper end of the member 18 to slidably operate against the inner walls of the portion 13. The lower side 24 of the head 23 is preferably made flat and at right angles to the longitudinal axis of the section B to provide a downwardly facing shoulder. The upper side 25 of the head 23 is also made flat and at right angles to the axis of the section B. The upper end part 12 of the body section A is of reduced diameter and presents a downwardly facing shoulder 26 to cooperate with the upper end 25 of the head to limit the relative longitudinal movement of the sections A and B in one direction. The lower end of the collar 20 cooperates with the upper side of the block 15 to limit the relative longitudinal movement of the sections A and B in the other direction.

The latch means 10 is provided to releasably hold the sections A and B against longitudinal movement in a contracted position where the shoulder on the section B, that is, the lower end of the collar 20, is spaced from the shoulder on the section A, that is, the upper end of the block 15. The latch means 10 is such that it is automatically released under control of the control means 11 upon a predetermined tensile strain being exerted on the sections A and B. The latch means 10 includes a cage or carrier 28, latches 29 on the carrier, and a shoulder 30 on one of the sections A or B adapted to cooperate with or be engaged by the latches 29. The latch cage or carrier 28 is supported on one of the body sections A or B through the control means 11 so that the latches 29 are adapted to cooperate with the shoulder 30 on the other body section to releasably hold the sections in the contracted position. The latches 29 are carried through the carrier 28 and the control means 11 so that they are released from the shoulder 30 upon the control means 11 being acted upon by a predetermined tensile strain to shift the latches 29 relative to the body section which supports them. In the particular embodiment of the invention illustrated in the drawings the latches 29 are mounted on the section A through the control means 11 to cooperate with the shoulder 30 on the section B.

The carrier 28 is arranged in the space between the exterior of the member 18 of the section B and the inner walls of the portion 13 of the section A. The carrier 28 is shiftably or slidably mounted between the sections A and B and is movable relative to the sections under control of the means 11. The carrier 28 is an annular or tubular part provided with a central opening 31 slidably passing the member 18 of the body section B. The exterior of the upper end of the carrier 28 is slidable on the inner walls of the por-

tion 13 of the section A, while the exterior of the lower portion of the carrier 28 is slidable on an annular flange or part 32 on the interior of the portion 13. The upper end 33 of the flange 32 provides an upwardly facing shoulder which is beveled or tapered downwardly and inwardly forming a cam face to cooperate with the latches 29 as will be hereinafter described.

The latches 29 are mounted in longitudinal slots 34 in the walls of the carrier 28. There may be any desired number of latches 29. In the particular case illustrated there are four latches equally spaced around the central axis of the carrier. The latches 29 are preferably pivotally mounted in the slots 34. A pivot pin 35 extends transversely between the walls of each slot 34 and extends through transverse openings in the latches 29 to pivotally mount the latches in the slots. The pins 35 extend through the latches 29 at points adjacent their lower ends. The upper ends of the latches 29 are adapted to engage or cooperate with the shoulder 30 on the section B and are preferably made round so as to readily move or operate off the shoulder. The lower ends of the latches 29 are made round or provided with cam faces 37 to engage the cam face 33 so that an inward thrust is imparted to the lower ends of the latches to shift the upper ends of the latches outwardly when a predetermined strain is exerted on the sections A and B.

The shoulder 30 is a downwardly facing shoulder on the member 18 of the body section B. In accordance with the preferred embodiment of the invention a bearing ring or collar 38 of hard material is mounted on the section B and its lower end provides the shoulder 30. The collar 38 is preferably screw threaded on the member 18 so as to be readily detachable or replaceable. The lower end of the collar 38 of the shoulder 30 is preferably made round or upwardly and outwardly tapered to permit the upper ends of the latches 29 to readily operate from it upon the cooperation of the cam faces 33 and 37. The upper end of the collar 38 may seat against a downwardly facing shoulder on the member 18.

Means is provided for yieldingly urging the upper ends of the latches 29 toward or into engagement with the shoulder 30. A leaf spring 40 may depend or project downwardly into each slot 34 to engage the latches 29. The springs 40 are curved inwardly and formed to engage the outer sides of the latches 29 to urge the upper ends of the latches inward. The springs 40 operate to return the latches to their normal or set positions after actuation.

The control means 11 operates to control the release of the latch means 10 by supporting the carrier 28 so that the cam faces 37 of the latches engage the cam shoulder 33 upon a predetermined tensile strain being exerted on

the sections A and B. The control means 11 is in the nature of compressible or yielding means that is compressed or contracted upon a given tensile strain being exerted on the body sections A and B so that the carrier 28 and the latches 29 are moved or shifted relative to the section A. The control means 11 includes a compressible member or members 42 mounting or supporting the carrier 28 on the section A. The member 42 in the case illustrated mounts the carrier 28 on the sub block 15. The compressible part 42 may be an elongated tubular member surrounding the section B having its upper end attached to the carrier 28 and its lower end attached to the block 15. The upper end of the compressible part 42 may seat in an annular recess 43 in the lower end of the carrier 28, while the lower end of the compressible member may seat in an annular recess 44 in the block 15. The part 42 may be secured to the block 15 by suitable screws 45. The part 42 is preferably corrugated annularly or circumferentially as clearly illustrated in the drawings. If desirable the part 42 may have a plurality of spaced longitudinal slots 48. The slots may extend from one end of the part to its other end and render the part more flexible. The slots 48 divide the compressible part 42 so that it forms a multiplicity of compressible springlike portions. The part 42 normally supports the carrier 28 on the section A so that the lower cam ends 37 of the latches 29 are spaced from the cam shoulder 38. When compressed to a certain degree through a tensile strain exerted on the sections A and B, the lower ends of the latches 29 are brought into engagement with the cam shoulder 33 as illustrated in Fig. 3 of the drawings. The portion 13 of the section A also stretches or is elongated under the tensile strain so that the combined movement of the shoulder 33 of the section A in one direction and the movement of the carrier 28 in the other direction caused by compression of the member 42 brings the lower ends of the latches into engagement with the shoulder 33.

Means is provided for circulating fluid through the tool and in the form of the invention shown the upper end 12 of the section A is provided with an opening 50 to receive fluid from an operating string, or the like, which discharges into the interior of the portion 13. The section B is provided with an opening or passage 51 extending longitudinally through it from one end of it to the other to deliver the circulation fluid to the fishing tool or other device attached to the lower end of the section B.

A shiftable ring or annular block 60 may be arranged in the annular space between the portion 18 of the section B and the interior of the section A above the carrier 28. The block 60 is freely arranged within the section A and is movable between the upper end of

the carrier 28 and the lower side 24 of the head 23. The block 60 is entirely unattached and upon release of the latch means 10 the block is thrown against the lower side 24 of the head 23 to impart an added upward blow or jarring action to the section B.

It is believed that the operation of the tool provided by the present invention will be readily understood from the foregoing detailed description. With the parts in the positions illustrated in Fig. 1 of the drawings, a tensile or longitudinal strain may be exerted on the sections A and B by pulling upwardly on the section A by means of a fishing string or pipe, or the like, when the section B is held stationary through attachment with a fishing tool engaging a stationary object. Upon a certain predetermined strain being exerted on the sections A and B, for example, a certain upward strain being exerted on the section A while the section B is held stationary, the compressible part or parts 42 of the means 11 will be contracted or compressed to a certain extent and the portion 13 of the section A will be lengthened or stretched. This compression of the part or parts 42 and the elongation of the portion 13 causes movement of the cam shoulder 33 relative to the lower ends of the latches 29 to bring these cam parts into engagement. Engagement of the cam faces 37 and 33 while the tensile strain is being exerted on the tool causes the lower ends of the latches 29 to be urged inwardly to swing the upper ends of the latches out of engagement with the shoulder 30. When the latches 29 are released from the shoulder in this manner the sections A and B move relative to one another to bring the lower end of the collar 20 and the upper side of the knocker sub block 15 into engagement. The block 60 is also thrown into engagement with the lower side 24 of the head 23.

In practice the section B is usually stationary and the operating string to which the section A is attached is elongated or stretched through the tensile strain and tends to contract or return to its normal condition upon releasing of the latch means 10 so that a violent upward jarring action is imparted to the section B when the block 15 engages the collar 20. It is to be noted that the tool provided by this invention embodies but few simple parts and the collar 20 and the block 15, which constitute the jarring shoulders or parts, are of simple construction and are easily replaced. It is to be further noted that the latch engaging shoulder 30 is provided by a simple replaceable collar 38. The tool may be adjusted to cause the releasing of the latch means 10 upon any desired strain, by rotating or screwing the block 15 to vary or adjust the spacing of the lower ends of the latches 29 relative to the shoulder 33.

Having described only a typical preferred form of my invention, I do not wish to limit

myself to the specific details set forth, but wish to reserve to myself any changes or variations that may appear to those skilled in the art or fall within the scope of the following claims.

Having described my invention, I claim:

1. A well tool of the character described including, two sections connected for limited relative longitudinal movement, latch means for releasably holding the sections against relative movement, and control means whereby the latch means is released upon a predetermined strain being applied to the sections to cause relative longitudinal movement between them including, an elongated corrugated yielding part supporting the latch means on one section.

2. A well tool of the character described including, two sections, one a tubular section, the other a stem section extending into the tubular section, the sections being related for limited relative longitudinal movement, a latch within the tubular section, a corrugated compressible part releasably holding the latch where it holds the sections against relative movement, and means for releasing the latch upon compression of the said part through a predetermined strain being exerted on the sections.

3. A well tool including two relatively movable sections connected for limited longitudinal movement, means releasably holding the sections against relative movement, and control means whereby the said means is released upon a predetermined tensile strain being put on the sections, the control means including a corrugated yielding part supporting said means on one of the sections.

4. A well tool including two relatively movable sections connected for limited longitudinal movement, means releasably holding the sections against relative movement, and control means whereby the said means is released upon a predetermined tensile strain being put on the sections, the control means including a tubular corrugated part yieldingly supporting said means on one of the sections.

5. A well tool including, two sections related for relative longitudinal movement, a latch, a yielding corrugated part normally supporting the latch on one section in a position where it releasably holds the sections against relative movement, and cam means operable to release the latch upon a predetermined strain being exerted on the sections to cause yielding of said part.

6. A well tool including, two sections related for limited relative longitudinal movement, a latch, a shoulder on one section, a slotted tubular compressible part normally supporting the latch in a position in engagement with the shoulder to releasably hold the sections against movement, and cam means operable to shift the latch out of en-

gement with the shoulder upon a predetermined strain being exerted on the sections to compress said part.

7. A well tool of the character described including, two body sections related for relative longitudinal movement, a shoulder on one section, a latch, a yielding corrugated part mounting the latch on the other section adapted to yield to allow relative movement between the latch and said other section, and cam means for disengaging the latch from the shoulder upon said relative movement between the latch and said section.

8. A well tool including, two body sections related for relative longitudinal movement, a shoulder on one section, a latch, a corrugated tubular compressible part normally supporting the latch on the other section where it engages the shoulder to hold the sections against relative movement and adapted through compression to permit relative movement between the latch and the said other section, and cam means for disengaging the latch from the shoulder upon said relative movement of the latch and section.

9. A well tool including, two sections, one a tubular section, the other a stem section extending into the tubular section, a shoulder on the stem section, a pivoted latch, a compressible part surrounding the stem section and supporting the latch on the tubular section where it releasably engages the shoulder to hold the sections against relative movement and compressible to permit relative movement between the latch and the tubular section, and a cam face on the tubular section to cooperate with the latch upon said relative movement between the latch and the section to disengage it from the shoulder.

10. A jarring tool including, a tubular section, a stem section extending into the tubular section and having a shoulder, the sections being related for limited relative longitudinal movement, a block movable in the tubular section, a plurality of latches pivotally mounted on the block and operable to engage the shoulder, a compressible member mounting the block in the tubular section so that the latches normally engage the shoulder to hold the sections against relative movement, and a cam face on the wall of the tubular section for engaging the latches to release them from the shoulder when the member is compressed upon a predetermined strain being put on the sections.

In witness that I claim the foregoing I have hereunto subscribed my name this 5th day of March, 1930.

IRA J. McCULLOUGH.