Nov. 26, 1935. I. J. McCULLOUGH 2,022,138

JARRING TOOL

Filed Oct. 7, 1933

Fig. 1.

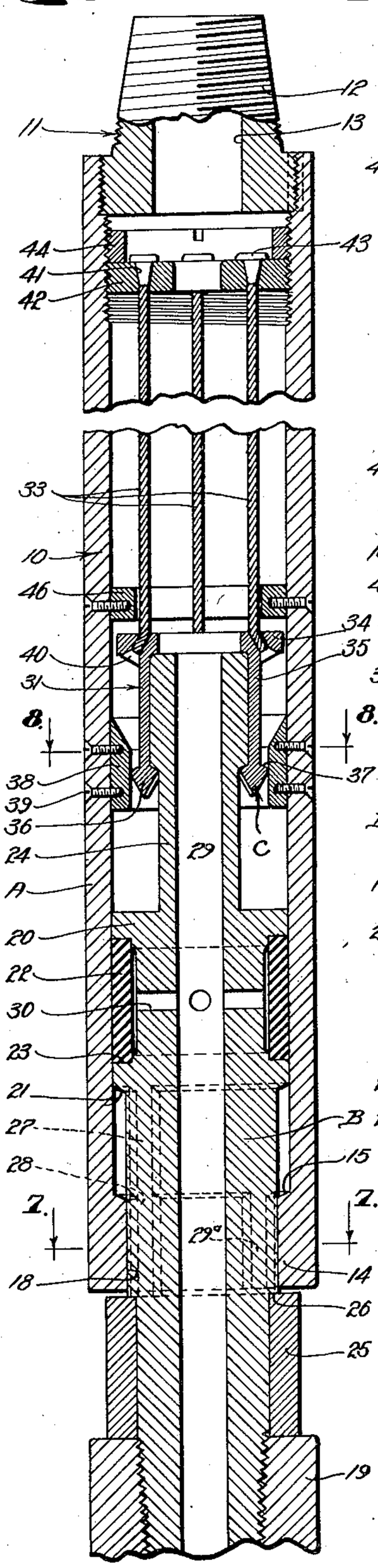



Fig. 2.

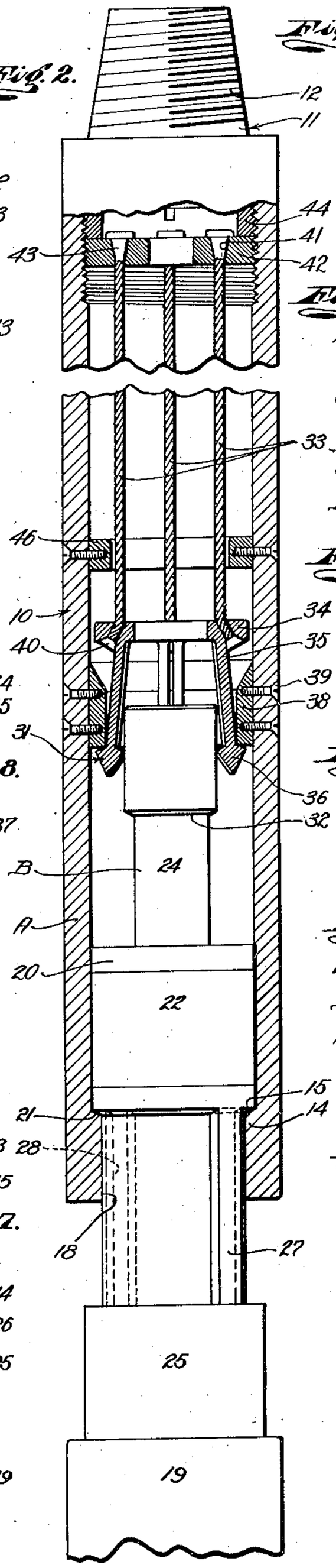



Fig. 3.

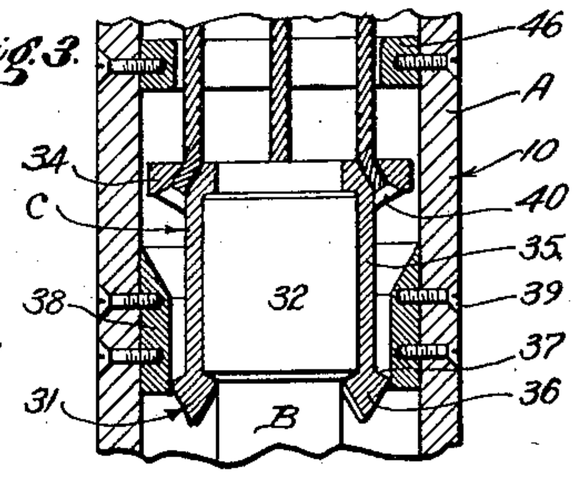



Fig. 4.

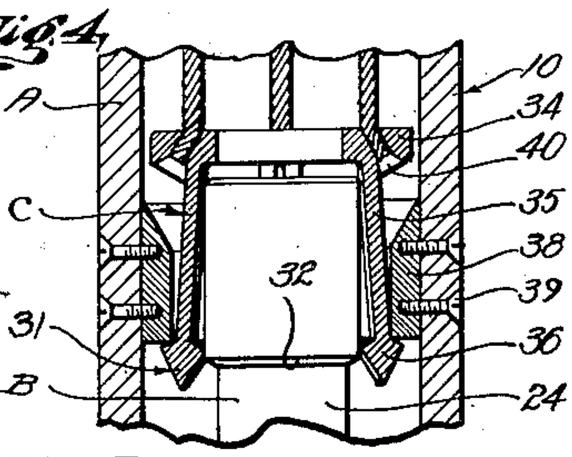



Fig. 5.

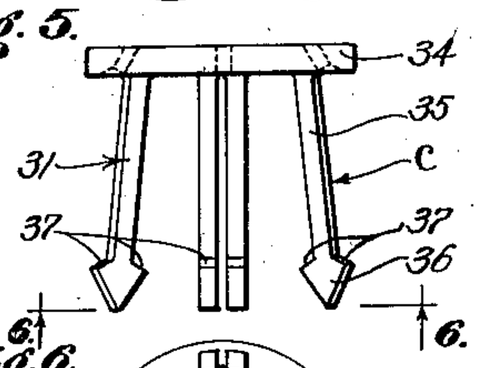



Fig. 6.

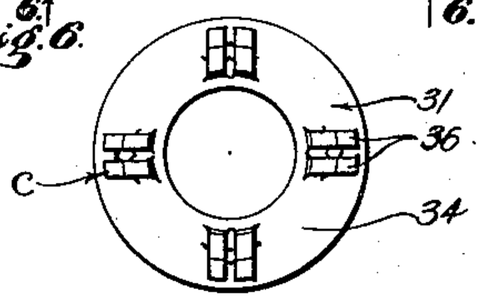



Fig. 7.

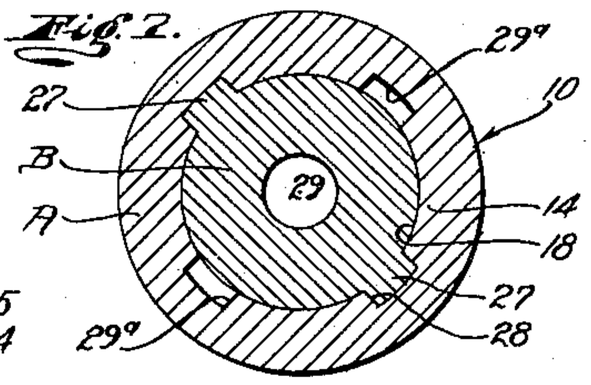
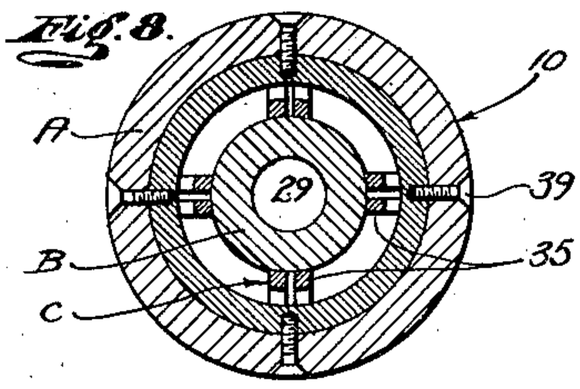



Fig. 8.




Inventor
Ira J. McCullough
By
His Attorney

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# UNITED STATES PATENT OFFICE

2,022,138

## JARRING TOOL

Ira J. McCullough, Huntington Park, Calif., assignor to James A. Kammerdiner, Los Angeles, Calif.

Application October 7, 1933, Serial No. 692,633

6 Claims. (Cl. 255—27)

This invention relates to a jarring tool and it is a general object of the invention to provide a simple, practical and effective tool for effecting a jarring action in a well.

An object of the invention is to provide a jarring tool that is fully operable by simple reciprocation of the operating string to which the tool is attached.

It is another object of the invention to provide a jarring tool that does not intefere with the circulation of fluid through the operating string.

It is another object of the invention to provide a jarring tool that embodies two sections that are connected for limited relative longitudinal movement and a means for releasably holding the sections in a contracted position which is releasable, upon a predetermined strain being imparted to the tool, to cause shoulders on the sections to be brought into jarring engagement.

It is a further object of the invention to provide a jarring tool in which the means for releasably holding the sections against movement may be adjusted to release the sections for movement upon various tensile strains being imparted to the tool.

Other objects and features of my invention will be best and more fully understood from the following detailed description of a typical preferred form of the invention throughout which disclosure reference may be had to the accompanying drawing in which:

Fig. 1 is a vertical or longitudinal detailed sectional view of the tool illustrating it in the contracted or unactuated position. Fig. 2 is a view similar to Fig. 1 showing the tool in the operated or jarring position. Fig. 3 is a vertical detailed sectional view of the latch or control portion of the tool, illustrating it in a partially operated position. Fig. 4 is a view similar to Fig. 3, illustrating the latch in the released position. Fig. 5 is a side elevation of the latch provided by this invention illustrating it apart from the other parts of the tool. Fig. 6 is a bottom view of the latch, being a view taken as indicated by line 6—6 on Fig. 5. Fig. 7 is a detailed transverse sectional view taken as indicated by a line 7—7 on Fig. 1, and Fig. 8 is a detailed transverse sectional view taken as indicated by line 8—8 on Fig. 1.

The jarring tool provided by my present invention includes, generally, two main or body sections A and B related for limited relative longitudinal movement, and a latch or control means C for releasably holding the sections A and B in a contracted position.

The body sections A and B of the tool constitute a unit or assembly adapted to be connected between an operating string and the object to be jarred or to be connected in an operating string connected with the object to be jarred. The sections A and B are related or connected for limited relative longitudinal movement and are preferably telescoped or arranged one within the other. In the particular form of the invention illustrated in the drawing, the upper section, or section A, is tubular while the lower section, or section B, is in the form of a stem extending into the upper section. It will be obvious that the lower section of the tool may be tubular to receive the upper section of the tool without departing from the broader aspects of the invention.

The tubular section A, which, in the particular form of the invention illustrated is the upper section, includes a main tubular portion 10 and an upper end or head 11. The head 11 is detachably screw threaded to the upper end of the main portion 10 and is provided with an upwardly projecting tapered screw threaded pin 12 to facilitate attachment to an operating string, or the like. The head 11 is provided with a longitudinal opening 13 communicating with the interior of the main portion 10. The main tubular portion 10 of the section A is an elongated member. The portion 10 may be of a uniform external diameter throughout its length. A reduced or inwardly projecting portion 14 is provided in the lower end of the portion 10 to provide an upwardly facing annular shoulder 15 in the interior of the section A.

The section B of the tool is in the form of a stem to extend into the section A and in the particular construction shown in the drawing, is the lower section and is adapted to be connected with the object to be jarred. The section B is slidably arranged through the opening 18 in the reduced portion 14 of the section A to project into the interior of the portion 10 and to project downwardly from the lower end of the section A. A suitable coupling or connecting member 19 may be screw threaded on to the lower projecting portion of the section B to facilitate connection with a fishing tool or the operating string. An enlargement 20 is provided on the section B within the portion 10 of the section A. The enlargement 20 provides a downwardly facing shoulder 21 which is spaced from the shoulder 15 of the section A when the sections are in the contracted

position illustrated in Fig. 1 of the drawing. The exterior of the enlargement 20 slidably engages the inner walls of the portion 10 and suitable packing 22 may be arranged in an annular recess 23 in the enlargement to seal with the walls of the portion 10. The section B has a reduced portion 24 projecting upwardly from the upper end of the enlargement 20.

A sleeve or collar 25 is arranged on the section B between the lower end of the section A and the upper end of the connecting member 19. The collar 25 is provided to engage the lower end of the section A to limit the stroke or extent of relative movement between the sections A and B in one direction while the shoulders 15 and 21 limit the extent of the relative movement between the sections in the opposite direction. The upper end of the collar 25 may be arranged against a shoulder 26 on the section B which retains the collar in position on the section.

In accordance with the preferred embodiment of the invention, means is provided for holding the sections A and B against relative rotation. Any suitable form of key or spline connection may be provided to hold the sections against relative rotation. In the drawing I have shown keys or splines 27 on the stem or section B to slidably operate in longitudinal keyways 28 in the section A. Longitudinal grooves 29a may be formed in the walls of the opening 18 to permit the escape of fluid trapped in the space between the shoulders 15 and 21. In accordance with the invention, a fluid passage 29 is provided through the section B. The passage 29 extends from one end of the section to the other, the upper end of the passage communicating with the interior of the portion 10 of the section A and the opposite end of the passage discharging at the lower end of the section. Lateral passages or ports 30 extend between the passage 29 and recess 23 to permit fluid pressure in the passage 29 to force the packing 22 outwardly into effective sealing engagement with the walls of the portion 10.

The latch or control means C releasably holds the sections A and B in the contracted position and is operable to release the sections for relative longitudinal movement, upon a predetermined strain being imparted to the tool, to bring the shoulder 15 into jarring engagement with the shoulder 21. The control means C includes, generally, a latch 31 for engaging a projecting part or shoulder 32 on one section of the tool and a yielding connection 33 between the latch 31 and the other section yieldable upon a predetermined tensile strain being exerted upon a tool to permit the releasing of the latch 31.

In the particular embodiment of the invention shown in the drawing, the latch 31 is connected with the section A by the means 33 to cooperate with the shoulder 32 on the lower section B. The shoulder 32 is a downwardly facing annular shoulder on the reduced portion 24 of the section B and the latch 31 is arranged within the portion 10 of the section A to cooperate with the shoulder 32 to releasably hold the sections in the contracted position. The shoulder 32 is spaced some distance below the upper end of the reduced portion 24. The latch 31 is suspended within the section A solely by the means 33 as will be hereinafter described.

The latch 31 includes a ring or annular body 34 and a plurality of spring fingers 35 to cooperate with the shoulder 32. The fingers 35 project downwardly from the body 34 and may be equally spaced around the body. The fingers 35 are provided at their lower ends with enlargements 36 having upwardly facing shoulders 37 on their inner sides to engage the shoulder 32. The latch 31 is formed so that the fingers 35 normally project downwardly and radially outward from the body 34 as will be apparent from an inspection of Fig. 5 of the drawing. The fingers 35 may be longitudinally divided or split to render them particularly flexible.

Means is provided for confining the fingers 35 to retain them in position where the shoulders 37 will cooperate with the shoulder 32 when the sections A and B are in the contracted position. A retaining ring 38 is mounted on the interior of the portion 10 to hold the fingers 35 in so that the shoulders 37 engage the shoulder 32. The retaining ring 38 may be secured to the section A by suitable screws 39. The ring 38 has an axially extending inner wall which slidably carries the outer sides of the enlargement 36. The ring 38 is positioned so that it is opposite or radially outward of the shoulder 32 when the sections A and B are in the contracted position. The lower end of the ring 38 is spaced below the shoulder 32 when the parts are in the normal or unactuated position. The lower end of the ring 38 and the outer sides of the enlargements 36 may be rounded as illustrated throughout the drawing. When the connecting or control means 33 yields a predetermined amount upon a certain strain being exerted on the tool, the section A moves upwardly relative to the section B so that the lower end of the retaining ring 38 is moved to a position above the shoulder 32 and the fingers 35 are permitted to spring outwardly out of engagement with the shoulder 32.

Fig. 3 of the drawing illustrates the latch means in a partially operated position and Fig. 4 illustrates the latch means in the released position where the section A is free to be operated upwardly relative to section B. The upper end of the retaining ring 38 may be tapered downwardly and inwardly.

The connection 33 between the latch 31 and the section A yields upon a predetermined tensile strain being imparted to the tool, to permit releasing of the spring fingers 35 from the shoulder 32. The connection 33 forms the sole means for carrying or suspending the latch 31 and suspends the latch 31 from the upper end of the section A. The connection 33 includes a plurality of yieldable or resilient members in the form of cables which are attached to the section A and carry the latch 31. The members 33 may be formed of suitable stranded cable. The members 33 are arranged longitudinally or vertically within the section A and their lower ends are attached to the latch 31 and their upper ends are secured to the section A. In the drawing I have illustrated four equally spaced members 33 extending through openings in the latch body 34 and having heads 40 at their lower ends to engage the underside of the body 34. The members 33 are preferably comparatively long and their upper ends are secured to the section A at a point adjacent its upper end. The members 33 may extend through openings 41 in a ring 42 screw threaded into the portion 10 of the section A and may have heads 43 engaging the upper sides of the ring to prevent their displacement. The ring 42 is mounted so that it may be adjusted vertically or longitudinally of the section A by screwing it through the portion 10 to provide a means of adjusting the control means C. A lock washer or lock ring 44 may be threaded into the

portion 10 to set or lock the ring 42 in position. A guide ring or member 46 may be mounted on the inner walls of the portion 10 to guide the cable members 33 and to limit the upward movement of the latch 31. The guide member 46 is spaced some distance above the retaining ring 38.

The members or cables 33 are sufficiently yieldable and resilient to yield a given extent under a predetermined tensile strain to permit the release of the latch 31 and to return to their normal length when the tool is reset for another operation. The cables 33 are sufficiently long so that they are adapted to yield the desired amount under a predetermined tensile strain without becoming over-stretched or without failing. It will be apparent that by adjusting the ring 42 longitudinally of the section A that the tensile strain required to stretch or elongate the members 33 sufficiently to permit the release of the latch 31 may be varied to provide for the operation of the tool under any given strain.

In operation, assuming that the section B is connected with a stationary object to be jarred, and that the section A is attached to an operating string, an upward pull or strain is exerted on the section A. The upward pull on the section A through the operating string causes stretching or elongation of the string and the cable members 33. Upon a predetermined strain being exerted upwardly on the section A, the cables 33 are stretched so that the section A moves upwardly to a position where the lower end of the retaining ring 38 is above the shoulders 32 in which position the spring fingers 35 are free to spring outwardly to release the section A for movement relative to section B. Upon releasing of the latch fingers 35 from the shoulder 32 the upward strain together with the resilience of the stretched operating string, causes the shoulder 15 to be brought into engagement with the shoulder 21 with great force to impart a substantial jarring action to the section B. To reset the tool or to return the parts of the tool to their contracted positions after actuation, the upper section 10 is lowered to the position illustrated in Fig. 1 of the drawing. Upon the upper section A being lowered to its down or contracted position, the cable members 33, which remain under tension until the tool is reset due to the enlargements 36 engaging under the ring 38, operate through their resilience to pull the latch 31 upwardly so that the spring fingers 35 are forced inwardly and pulled upwardly into the ring 38. With the latch 31 in its up position where the enlargements 35 engage the shoulder 32, the tool is set or prepared for further operation.

It is to be noted that the jarring tool provided by my present invention is particularly simple in construction and operation. The tool may be operated and reset for operation through simple reciprocation of the operating string to which it is attached. Further, the circulation of the fluid through the operating string and the tool is not cut off or varied during operation of the tool. The wearing parts, that is the latch 31, cables 33, ring 38, etc., are of simple and inexpensive construction and are readily replaceable.

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, and means for releasably holding the sections against relative longitudinal movement including, a tubular member in one section, a latch, integral spring fingers on the latch extending through the tubular member and held thereby in cooperation with a shoulder on the other section, the fingers formed to normally spring out of engagement with the shoulder through their inherent resiliency, and a yielding connection between the latch and the section carrying the retaining member whereby the sections are moved relative to one another upon a predetermined strain being exerted on the tool to move the member out of retaining position.

2. A well tool of the character described including, two sections connected for limited relative longitudinal movement, and means for releasably holding the sections against relative longitudinal movement including, a shoulder on one section, a projecting retaining member on the other section, a latch, spring fingers on the latch extending through said member to be held in cooperation with the shoulder by said member, fingers normally tending to spring out of engagement with the shoulder through their inherent resiliency, and a yielding connection between the latch and said other section whereby the sections are moved relative to one another upon a predetermined strain being exerted on the tool to move the member out of finger retaining position, said connection including an extensible and resilient cable connecting the latch with said other section.

3. A well tool of the character described including, two sections connected for limited relative longitudinal movement, and means for releasably holding the sections against movement in a contracted position, including a shoulder on one section, a latch, spring fingers on the latch having projections adapted to engage the shoulder, the fingers normally tending to spring out of engagement with the said shoulder, means releasably holding the fingers in position where the projections engage the shoulder, including projecting enlargements on the fingers, and a tubular retaining member fixed on the other section through which the fingers extend and which has engagement with the enlargements to confine the fingers, and a connection between the latch and the said other section yieldable upon a predetermined strain being exerted on the tool to cause the retaining member to be moved out of retaining engagement with the enlargements.

4. In a well tool of the character described including, two sections related for limited relative longitudinal movement, and means releasably holding the sections against relative movement including a latch, a shoulder on one section, spring fingers on the latch having enlargements to engage under the shoulder, the fingers normally tending to spring out of engagement with the shoulder through their inherent resiliency, a tubular retaining member on the other section through which the fingers extend and cooperating with the enlargements to retain them in engagement with the shoulder, and a connection between the latch and the said other section yieldable upon a predetermined strain being exerted on the tool to release the retaining member from the enlargements.

5. In a well tool, a tubular section, a stem section extending into the tubular section, the sections being related for limited relative longi-

tudinal movement, and means releasably holding the sections against relative movement, including a latch within the tubular section, a shoulder on the stem section, a retaining member on the wall of the tubular section a spring finger on the latch extending through the member, an enlargement on the finger held in engagement with the shoulder by said member, the finger normally tending to spring outward through its inherent resiliency to disengage the enlargement from the shoulder, and an extensible member suspending the latch from the tubular section yieldable upon a predetermined strain to cause disengagement of the retaining member from the enlargement.

6. A rotary jar including a tubular section, and a stem section extending into the tubular section, the sections being related for limited relative longitudinal movement, a tubular part on the interior of the tubular section, an enlargement on the stem section presenting an axially facing shoulder, a latch having a spring finger extending longitudinally through said part to be retained in engagement with the shoulder by said part, and means connecting the latch with the tubular section and yieldable under a longitudinal strain on the sections whereby the retaining part may be moved out of retaining cooperation with the finger.

IRA J. McCULLOUGH.