

Jan. 24, 1933.

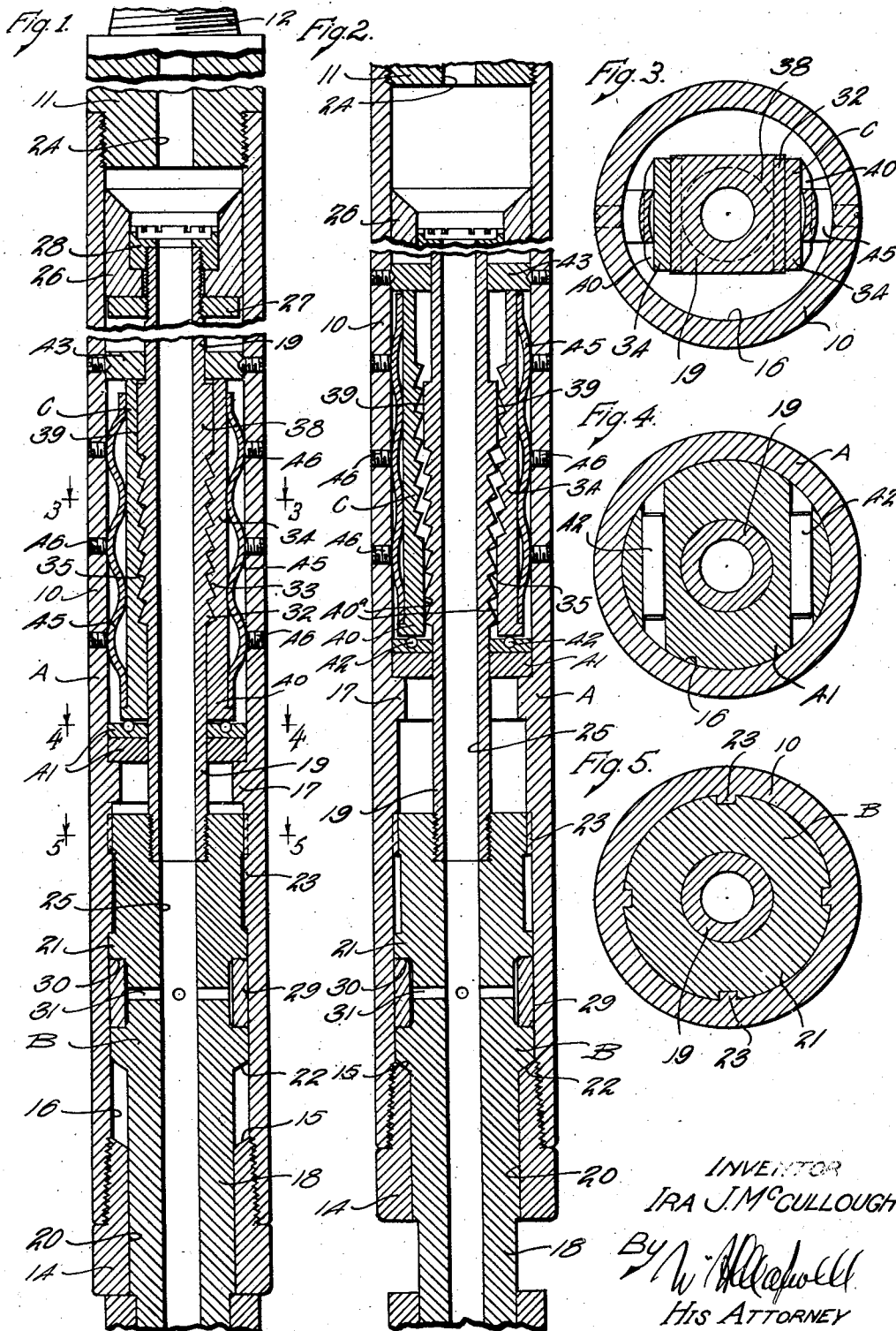
I. J. McCULLOUGH

1,895,227

JARRING TOOL

Filed June 13, 1930

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Fig. 6.

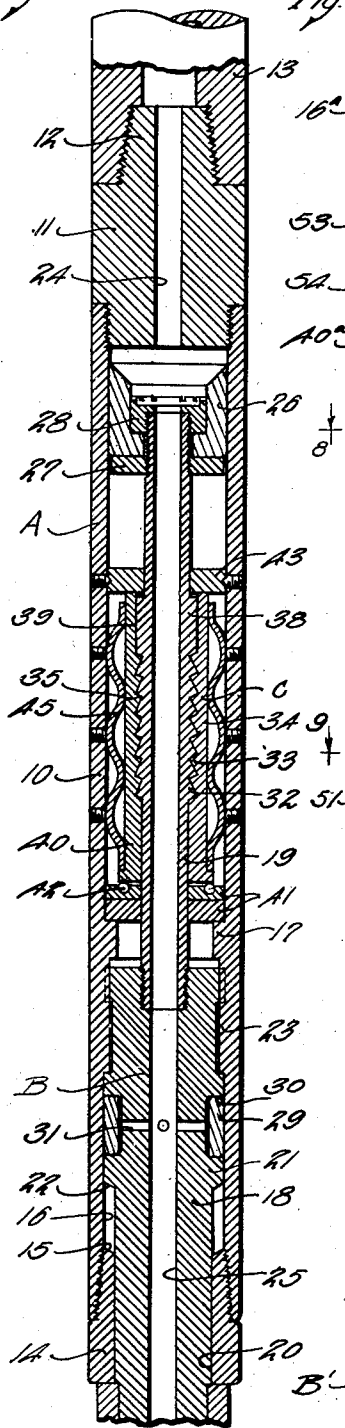


Fig. 7.

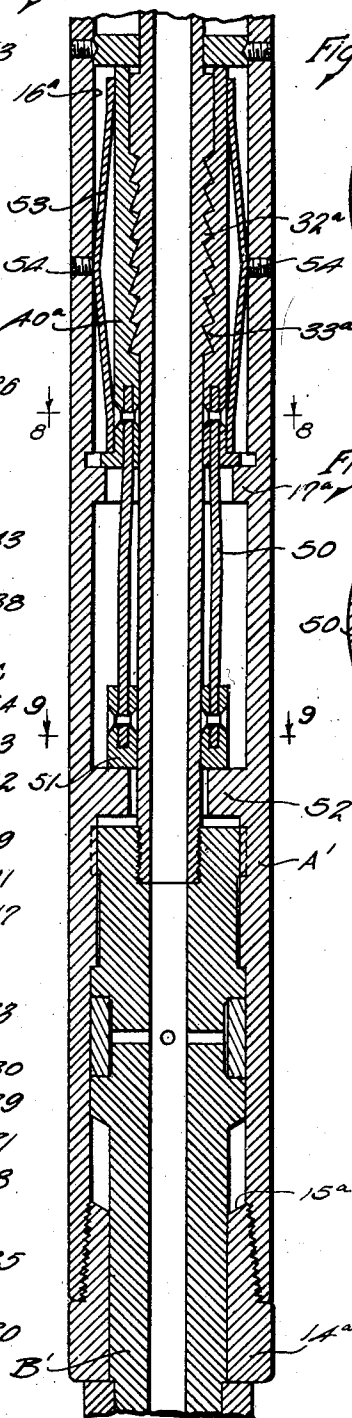


Fig. 8.

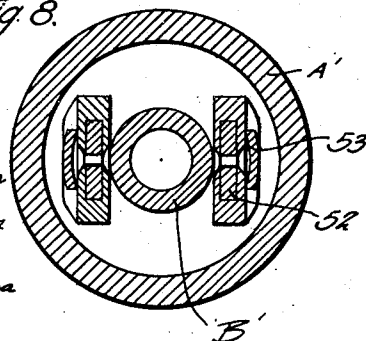
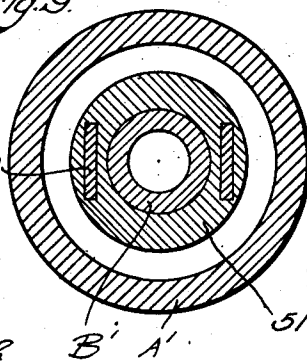


Fig. 9.



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UNITED STATES PATENT OFFICE

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JARRING TOOL

Application filed June 13, 1930. Serial No. 460,896.

This invention relates to a tool for use in well drilling operations and relates more particularly to a jarring tool for effecting a hammering or jarring action within a well. It is a general object of the invention to provide a simple, practical, and effective jarring tool useful in fishing operations for imparting a jarring action to a fish or lost object in a well.

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

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

It is another object of the invention to provide a jarring tool that does not interfere with the free circulation of fluid through the operating string and which may be operated without varying the pressure on the circulating fluid.

It is another object of the invention to provide a jarring tool of the character mentioned in which the means for releasably holding the sections against relative longitudinal movement is completely encased so that it cannot become muddled up and made inoperative by solid matter in the circulation fluid.

Another object of the invention is to provide a jarring tool of the character mentioned in which the means for releasably holding the sections against relative movement is enclosed in chamber which may be filled with oil or other suitable lubricant.

It is another object of the invention to provide a jarring tool of the character mentioned in which the means for releasably holding the sections against longitudinal movement may be adjusted to release the sections for rela-

tive movement upon various tensile strains being put on the sections.

It is another object of the invention to provide a jarring tool of the character mentioned in which the means for releasably holding the sections of the tool against relative longitudinal movement includes cooperating clutch parts that are automatically disengaged upon a predetermined strain being imparted to the tool.

It is a further object of the invention to provide a jarring tool in which the cooperating clutch parts referred to above are simple and inexpensive in manufacture and are readily replaceable.

Other objects and features of the invention may be best and more fully understood from the following detailed description of typical forms and applications of the invention, throughout which description reference may be had to the accompanying drawings, in which:

Fig. 1 is a longitudinal detailed sectional view of a form of the invention illustrating the parts in the normal or contracted position. Fig. 2 is a view similar to Fig. 1 showing the parts in the actuated or jarring position. Figs. 3, 4, and 5 are enlarged transverse detailed sectional views taken as indicated by lines 3—3, 4—4, and 5—5, respectively on Fig. 1. Fig. 6 is a reduced longitudinal detailed sectional view of the tool illustrated in Fig. 1. Fig. 7 is a longitudinal detailed sectional view of another form of the invention. Figs. 8 and 9 are enlarged transverse detailed sectional views taken as indicated by lines 8—8 and 9—9, respectively on Fig. 7.

The embodiment of the invention illustrated in Figs. 1 to 6, inclusive of the drawings, includes, generally, two main or body sections A and B connected for limited relative longitudinal movement, and means C for releasably holding the sections A and B against relative longitudinal movement in a contracted position and operable to release the sections for relative movement upon a predetermined tensile strain being put on the sections A and B.

The body sections A and B of the tool form or constitute an assembly adapted to be connected between an operating string and the

object to be jarred or adapted to be interposed into 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, the section A is tubular, and the upper section of the tool is adapted to be connected to an operating string while the section B is in the nature of a stem extending into the tubular section A and adapted to be connected with the object to be jarred. It will be obvious that the lower section, which is adapted to be connected with the object to be jarred, may be tubular to receive the upper section of the tool, which is intended to be connected with the operating string, without departing from the broader principles of the invention.

The section A or upper section of the tool includes a main tubular portion 10 and a head 11 detachably screw threaded into the upper end of the portion 10. The head 11 may be in the nature of a sub and may be provided at its upper end with a screw threaded pin 12 adapted to be threaded into a suitable coupling or connecting member 13 at the lower end of the operating string. The lower end of the head 11 is threaded into the upper end of the portion 10 and provides a downwardly facing shoulder in the upper end of the portion 10. The main portion 10 of the section A may be of uniform external diameter throughout its length. The portion 10 is preferably comparatively long and a sub 14 is screw threaded into its lower end. The upper end of the sub 14 provides an upwardly facing shoulder 15 in the opening 16 of the main portion 10. An inwardly projecting radial flange 17 is provided in the opening 16. The flange 17 is spaced some distance above the shoulder 15.

The section B or lower body section of the tool is in the nature of a mandrel or stem and extends into the lower end of the tubular section A. The section B may be of sectional construction and may include a lower portion 18 and an upper portion 19. The lower portion 18 is slidable in the opening 20 of the sub 14 and projects downwardly from the lower end of the sub. The projecting lower end of the portion 18 is adapted to be connected with the object to be jarred, for example, it may be attached to a fishing tool in engagement with the fish or object to be jarred. The portion 18 projects upwardly into the opening 16 from the sub 14 and a head or enlargement 21 is provided at its upper end.

The enlargement 21 is slidable in the opening 16 and its upper end is adjacent the flange 17 when the parts or sections A and B are in the contracted position. The lower end of the enlargement 21 provides a downwardly

facing shoulder 22 on the exterior of the section B. The shoulder 22 is spaced above the shoulder 15 of the section A when the sections A and B are in the unactuated or contracted position. The shoulders 15 and 22 are adapted to cooperate to provide a jarring action between the sections A and B and operate to limit the relative longitudinal movement between the sections in one direction.

In accordance with the invention the sections A and B are connected against relative rotation. In the particular form of the invention shown in the drawings, a suitable spline connection 23 is provided between the enlargement 21 and the main portion 10 of the section A to connect the sections A and B against relative rotation.

The upper portion 19 of the section B projects upwardly from the head 21 through the opening 16. The upper portion 19 is comparatively long and is provided to carry parts of the means C. In the preferred form of the invention means is provided for circulating fluid through the tool. A fluid passage 24 is provided in the head 11 to discharge into the upper end of the opening 16. A central longitudinal fluid passage 25 is provided through the portions 18 and 19 of the section B. The passage 25 may extend completely through the section B from one end to the other. A plunger or body of packing 26 is carried at the upper end of the portion 19 to slidably seal with the walls of the opening 16. The packing 26 may be carried between a collar 27 on the portion 19 and a clamping or compression nut 28 screw threaded on the upper end of the portion 19.

Packing 29 may be arranged in an annular groove 30 in the enlargement 21 to seal with the walls of the opening 16. The packing 29 may be expanded into an effective sealing engagement with the walls of the opening 16 by the circulating fluid passing through the passage 25. Lateral ports 31 may communicate between the passage 25 and the groove 30 to permit the fluid under pressure in the passage 25 to act outwardly on the packing 29. The means C is arranged in the opening 16 between the packing 26 and the head 21 and the packing 26 and 29 prevents fluid from reaching the means C in the opening 16. The packing 26 and 29 being on the section B provide a chamber in the portion 10 for carrying the means C that may be filled with heavy oil, or the like, for lubricating the means C, and which is of constant capacity during operation of the tool so that the lubricant does not have a tendency to leak past the packing.

The means C acts to releasably hold the sections A and B against relative longitudinal movement in the contracted position where the shoulder 22 is spaced above the shoulder 15 and is operable to release the sections for relative longitudinal movement upon a predetermined tensile strain being put

on the sections to cause the shoulder 15 to be brought into engagement with the shoulder 22 to impart an upward jarring action to the section B and the fish or object connected to the section B. The means C includes one or more clutch parts on one of the sections of the tool to cooperate with one or more clutch parts shiftably carried by the other section of the tool. In the embodiment of the invention illustrated in Figs. 1 to 6 inclusive of the drawings, there are two series or sets of clutch parts 32 on the section B to cooperate with clutch parts 33 on two members 34 shiftably carried by the section A.

The two sets or series of clutch parts 32 are provided on diametrically opposite sides of the portion 19 of the section B. The parts 32 are preferably integral with the portion 19 and are in the nature of serrations or teeth having outwardly and slightly upwardly inclined lower sides 35. In accordance with the preferred form of the invention the teeth or clutch parts 32 are straight and parallel and of substantially the same size. In the form of the invention illustrated the part of the portion 19 carrying the parts 32 is of rectangular cross sectional configuration and the clutch parts 32 are provided on opposite sides of this rectangular part 38. Flat vertical sides 39 extend upwardly from the outer edges of the upper-most clutch faces 34. There may be any desired number of parts 32 and the parts may be of any desired size or proportion. It is preferred to provide several clutch parts 32 on opposite sides of the part 38 and to form the parts comparatively large and heavy.

The two members 40 are carried by the section A so that they are shiftably radially inward and outward into and out of engagement with the clutch parts 32. The members 40 may be in the nature of vertically arranged plates positioned at opposite sides of the portion 19 and substantially parallel to the longitudinal axis of the tool. The clutch parts 33 are of the same shape and character as the clutch parts 32 to effectively mesh or cooperate with the parts 32 when the members 40 are in the in position. Flat vertical parts or shoulders 40^a extend downwardly from the outer edge of lowermost part 33 of each member 40. The lower ends of the members 40 are supported by the flange 17. In the particular embodiment of the invention illustrated in the drawings, two rings 41 are provided on the upper side of the flange 17 to carry the members 40. Rollers 42 may be provided on the upper side of the uppermost ring 41 to effectively carry the lower ends of the members 40. The rollers 42 carry the members 40 so that they may readily shift outwardly upon disengagement of the clutch parts 32 and 33 as will be hereinafter described. A flange or ring 43 is provided in the opening 16 at the upper ends of the mem-

bers 40 to hold them against upward movement in the section A.

The invention provides means for yieldingly retaining or holding the members 40 in positions where the clutch parts 33 cooperate with the parts 32 to hold the sections A and B against relative longitudinal movement. Springs 45 are arranged between the outer sides of the members 40 and the walls of the opening 16 to urge the members 40 inwardly. The springs 45 are elongated vertically arranged leaf springs having transverse corrugations engaging the outer sides of the members 40 and the walls of the opening 16 at longitudinally spaced points. The springs 45 operate to yieldingly hold the members 40 in positions where the clutch parts 33 are in cooperative engagement with the parts 32 so that the sections A and B are normally held against relative longitudinal movement. The springs 45 hold the members 40 in position where the parts 32 and 33 are in cooperation until a predetermined tensile strain is exerted on the sections A and B when the parts 33 ride outwardly on the clutch faces 34 and the members move outwardly against the action of the springs 45. In practice the springs 45 are formed so that they hold the members 40 in position where the parts 32 and 33 are in cooperation until a heavy strain is put on the tool at which time the parts 32 and 33 suddenly disengage.

The present invention provides means for varying or adjusting the pressure exerted by the springs 45 inwardly against the members 40. By varying the pressures which the springs 45 exert inwardly against the members 40, the means C may be adjusted to release the sections A and B for relative movement upon any given or desired tensile strain being exerted upon the tool. Set screws or adjusting screws 46 are threaded through openings in the main portion 10 of the section A to engage the corrugations of the springs 45. The set screws 46 may be threaded through the openings in the portion 10 to clamp against the spring 45 and increase the pressures which the springs exert against the members 40. It will be obvious that when the screws 46 are threaded against the springs 45 that the outward force required to overcome the action of the springs will be increased.

In the form of the invention illustrated in Figs. 7, 8, and 9 of the drawings, the main or body sections A' and B' may be of substantially the same construction as the sections A and B of the form of the invention described above. In this form of the invention the members 40^a embodying the clutch parts 33^a for cooperating with clutch parts 32^a on the section B' are connected to the section A' by leaf springs 50. The members 40^a may be supported on a flange 17^a on the body section A'. The springs 50 are attached to the lower ends of the members 40^a and project

downwardly from the members. The lower ends of the springs 50 are attached to a ring 51. The ring 51 is supported on an inwardly projecting flange 52 on the body section A'.
 5 The springs 50 normally urge the members 40^a inwardly. Leaf springs 53 may be arranged between the outer sides of the members 40^a and the walls of the body opening 16^a. The leaf springs 53 have their opposite
 10 ends engaging the members 40 and their center portions engaging the walls of the opening 16^a. Adjusting screws 54 may be threaded through openings in the body section A' to engage the springs 53. The
 15 springs 50 and 53 operate to normally yieldingly hold the members 40^a in the in position where the clutch parts 33^a are in cooperative engagement with the parts 32^a.

In the form of the invention illustrated
 20 in Figs. 7, 8, and 9, of the drawings, the springs 50 and 53 hold the members 40 in the in position where the clutch parts 32^a and 33^a cooperate to hold the sections A and B against relative longitudinal movement. Upon a pre-
 25 determined upward strain being exerted on the section A' while the section B' is held stationary, the clutch parts 33^a suddenly disengage from the parts 32^a and the members 40^a move outwardly against the action of the
 30 springs 50 and 53 to allow the section A' to move upwardly relative to the section B' to bring the shoulder 15 into jarring engagement with the shoulder 22.

In employing the form of the invention illustrated in Figs. 1 to 6 of the drawings, the
 35 tool is connected in an operating string, preferably, immediately above a fishing tool for engaging the object to be jarred. When the fishing tool connected with the section B is
 40 in engagement with the fish or object to be jarred, an upward pull or strain is put on the section A through the operating string carrying the tool. The clutch parts 32 and 33
 45 cooperate to hold the sections A and B against relative longitudinal movement in the contracted position. In practice the springs 45 are made comparatively heavy so that they hold the members 40 against outward move-
 50 ment until a heavy upward strain is exerted on the tool. When a heavy upward strain is put on the tool the operating string is stretched or elongated to a considerable extent. Upon a predetermined upward strain being put on the tool through the operat-
 55 ing string, the clutch parts 33 slip over the clutch faces 35 and the members 40 are shifted outwardly against the action of the springs 45. Upon disengagement of the clutch parts 32 and 33, the section A is pulled
 60 upwardly with great force through the joint action of the tensile strain put on the operating string and returning of the operating string to its normal length. When the means C is released in this manner the section A is
 65 rapidly moved upwardly with great force

and the shoulder 15 is brought into engagement with the shoulder 22 to impart a heavy upwardly jarring action to the section B and the parts connected therewith. Upon upward movement of the section A the clutch
 70 parts 33 ride over the flat faces 39 of the portion 19 and the lower end parts 40^a of the members 40 slide over the lowermost clutch parts 32. The tool may be reset for actuation by lowering the section A to a position such
 75 as illustrated in Fig. 1 of the drawings. Upon the section A being shifted to its normal contracted position the springs 45 operate the members 40 inwardly to positions where the parts 33 engage or cooperate with the parts 32.
 80

During operation of the tool the tensile strain is communicated from the section A to the members 40 through the flange 17 and the rings 41. When the clutch parts 32 and
 85 33 are in engagement, the members 40 are put under a compression strain. The rollers 42 mount the members 40 on the section A so that they may rapidly shift outward upon a given tensile strain being put on the tool. Further, the rollers carry the members 40
 90 so that they may be returned to the operative position in engagement with the clutch parts 32 by the springs 45. The interior of the tubular portion 10 between the packing 26 and 29 constitutes a chamber for carrying a liquid for lubricating the means C. This chamber is of constant size or capacity as the spaced packing 26 and 29 move together or in unison during relative movement between the sections A and B.
 95 100

It is to be noted that the invention provides a jarring tool that is particularly effective in operation and is dependable and easy to operate. The packing 26 and 29 positively prevents fluid from interfering with
 105 the operation of the means C and the various other parts of the tool. The clutch portions of the tool namely, the portion 19 and the members 40 are simple and inexpensive of manufacture and may be readily replaced
 110 when necessary or desired. The tool may be operated without varying the pressure on the circulating fluid and operation of the tool does not in any way interfere with free circulation of the fluid.
 115

Having described only a typical and 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 within the scope of the following claims.
 120

Having described my invention, I claim:
 1. A well tool of the character described including, two sections related for limited
 125 relative longitudinal movement, and means for releasably holding the sections against relative longitudinal movement including, cooperating toothed clutch parts carried by the sections, and yieldable means holding

the clutch parts in cooperative engagement.

2. A well tool of the character described including, two sections related for limited relative longitudinal movement, and means for releasably holding the sections against relative longitudinal movement including, clutch parts on the sections having cooperating teeth releasable upon a predetermined strain being put on the sections.

10 3. A well tool of the character described including, two sections related for limited relative longitudinal movement, and means for releasably holding the sections against relative longitudinal movement including, a
15 toothed clutch part on one section, and a toothed clutch part shiftably carried by the other section cooperating with the first mentioned clutch part.

20 4. A well tool of the character described including, two sections related for limited relative longitudinal movement, and means for releasably holding the sections against relative longitudinal movement including, a
25 clutch part on one section having a plurality of teeth, a clutch part shiftably carried by the other section and having a plurality of teeth, and means yieldingly holding the shiftable clutch part in a position where its
30 teeth are in meshing engagement with the teeth of the first mentioned clutch part.

35 5. A well tool of the character described including, two sections related for limited relative longitudinal movement, and means for releasably holding the sections against relative longitudinal movement including, a
40 clutch part on one section, a clutch part carried by the other section for movement transverse of the said other section, and spring means yieldingly holding the shiftable clutch part in engagement with the first mentioned clutch part.

45 6. 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 operable to release the sections for relative longitudinal movement upon a predetermined strain being applied to the sections including, a toothed
50 clutch portion on one section, a member, teeth on the member adapted to engage the teeth of said portion, the member being carried by the other section for movement relative to the said portion, and means for yieldingly
55 holding the member in a position where the teeth are in engagement.

60 7. 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 toothed portion on one section, a member, teeth on the member adapted to cooperate with the teeth of said portion, the member
65 being carried by the other section for move-

ment relative to the said portion, and adjustable spring means for yieldingly holding the member in a position where the teeth are in engagement.

8. 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 clutch part on one section, a member carried by the other section for movement transverse of the said other section to be movable into and out of engagement with the clutch part, a spring normally yieldingly urging the member into engagement with the clutch part, and means for adjusting the spring.

9. 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 clutch part on one section, a member carried by the other section for movement transverse of the said other section to be movable into and out of engagement with the clutch part, a spring normally yieldingly urging the member into engagement with the clutch part, and means for adjusting the spring including an adjusting screw adapted to engage the spring.

10. A well tool of the character described including, two sections connected for limited relative longitudinal movement, and means releasably holding the sections against relative movement operable to release the sections for relative longitudinal movement upon a predetermined strain being put on the sections including, a clutch part on one section, a member shiftably carried by the other section, a clutch part on the member engageable with the first mentioned clutch part, the clutch parts being related so that the member is shifted outward to cause disengagement of the clutch parts upon a strain being put on the sections, and means for yieldingly holding the member in a position where the clutch parts are in engagement.

11. A well tool of the character described including, two sections connected for limited relative longitudinal movement, and means releasably holding the sections against relative movement operable to release the sections for relative longitudinal movement upon a predetermined strain being put on the sections including, a clutch part on one section, a member shiftably carried by the other section, a clutch part on the member engageable with the first mentioned clutch part, the clutch parts being related so that the member is shifted outward to cause disengagement of the clutch parts upon a strain being put on the sections, and a spring yieldingly holding the member in a position where the clutch parts are in engagement.

12. A well tool of the character described

including, two sections connected for limited relative longitudinal movement, and means releasably holding the sections against relative movement operable to release the sections for relative longitudinal movement upon a predetermined strain being put on the sections including, a clutch part on one section, a member shiftably carried by the other section, a clutch part on the member engageable with the first mentioned clutch part, the clutch parts being related so that the member is shifted outward to cause disengagement of the clutch parts upon a strain being put on the sections, a spring yieldingly holding the member in a position where the clutch parts are in engagement, and means for adjusting the action of the spring.

13. A well tool of the character described including a tubular section, a stem section extending into the tubular section, the sections being connected for limited relative longitudinal movement, and means for releasably holding the sections against relative longitudinal movement operable to release the sections for relative longitudinal movement upon a predetermined tensile strain being put on the sections including clutch parts on the stem section, a member carried by the tubular section for radial movement, clutch parts on the member to cooperate with the clutch parts of stem section, the clutch parts of the stem section and the member being related so that the member is shifted outward upon a tensile strain being put on the sections, and means for holding the member in a position where the clutch parts are in engagement until a predetermined tensile strain is put on the sections.

14. A well tool of the character described including a tubular section, a stem section extending into the tubular section, the sections being connected for limited relative longitudinal movement, there being a fluid passage through the sections, and means within the tubular section sealed from the fluid passage for releasably holding the sections against relative longitudinal movement and operable to release the sections for relative longitudinal movement upon a predetermined tensile strain being put on the sections including clutch parts on the stem section, a member carried by the tubular section for radial movement, clutch parts on the member to cooperate with the clutch parts of stem section, the clutch parts of the stem section and the member being related so that the member is shifted outward upon a tensile strain being put on the sections, and means for holding the member in a position where the clutch parts are in engagement until a predetermined tensile strain is put on the sections.

15. A well tool of the character described including a tubular section, a stem section extending into the tubular section, the sections

being connected for limited relative longitudinal movement, and means for releasably holding the sections against relative longitudinal movement operable to release the sections for relative longitudinal movement upon a predetermined tensile strain being put on the sections including clutch parts on the stem section, a member carried by the tubular section for radial movement, clutch parts on the member to cooperate with the clutch parts of stem section, the clutch parts of the stem section and the member being related so that the member is shifted outward upon a tensile strain being put on the sections, and a spring arranged between the member and the interior of the tubular section for holding the member in a position where the clutch parts are in cooperation until a predetermined tensile strain is put on the sections.

16. A jarring tool of the character described including, a tubular section, a stem section extending into the tubular section, the said sections being connected for limited relative longitudinal movement, means within the tubular section for releasably holding the sections against relative longitudinal movement operable to release the sections for relative longitudinal movement upon a predetermined strain being applied to the sections, spaced packing on the stem section sealing with the interior of the tubular section and closing the tubular section at opposite ends of the said means, and fluid pressure means for expanding the packing.

17. A jarring tool of the character described including, a tubular section, a stem section extending into the tubular section, the said sections being connected for limited relative longitudinal movement, means within the tubular section for releasably holding the sections against relative longitudinal movement operable to release the sections for relative longitudinal movement upon a predetermined strain being applied to the sections, spaced packing on the stem section sealing with the interior of the tubular section and closing the tubular section at opposite ends of the said means, there being a fluid passage through the sections and means whereby fluid under pressure in the passage expands the packing.

18. A jarring tool of the character described including, a tubular section, a stem section extending into the tubular section, the said sections being connected for limited relative longitudinal movement, means within the tubular section for releasably holding the sections against relative longitudinal movement operable to release the sections for relative longitudinal movement upon a predetermined strain being applied to the sections, packing on the stem section at the lower end of the said means sealing with the interior of the tubular section, packing on the stem section at the upper end of the said means

sealing with the interior of the tubular section, and fluid pressure means for expanding the last mentioned packing.

19. A well tool of the character described including, a tubular section, a stem section extending into the tubular section, the sections being related for limited relative longitudinal movement, and means for releasably holding the sections against relative longitudinal movement including teeth on the stem section, a shoulder on the tubular section, and a toothed member slidable on the shoulder between a position in engagement with the teeth and a position free of the teeth.

20. A well tool of the character described including, a tubular section, a stem section extending into the tubular section, the sections being related for limited relative longitudinal movement, and means for releasably holding the sections against relative longitudinal movement including teeth on the stem section, a shoulder on the tubular section, a member shiftable transversely on the shoulder, and a spring between the member and the wall of the tubular section yieldably holding the member in cooperation with the teeth.

In witness that I claim the foregoing I have hereunto subscribed my name this 4th day of June, 1930.

IRA J. McCULLOUGH.

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