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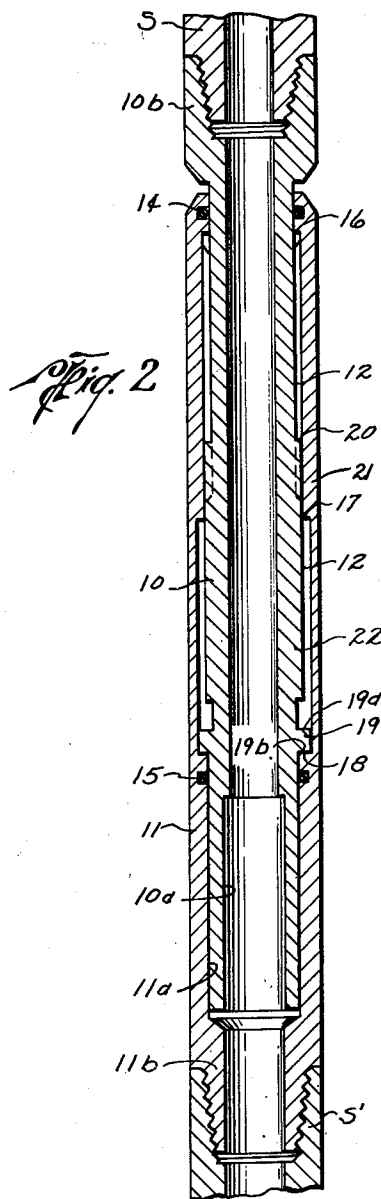
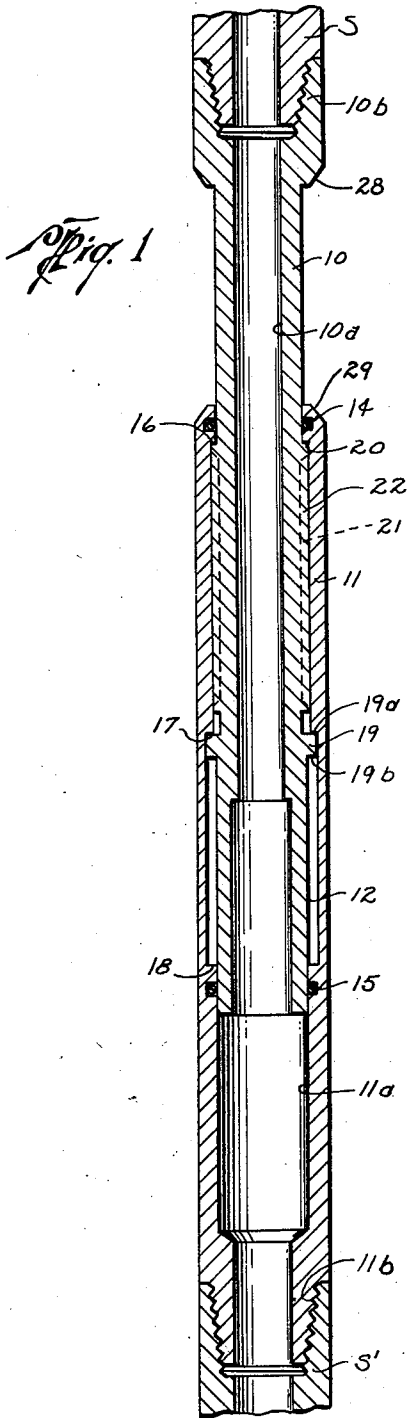
D. W. OSMUN

2,818,232

JARRING TOOLS

Filed July 28, 1952

3 Sheets-Sheet 1



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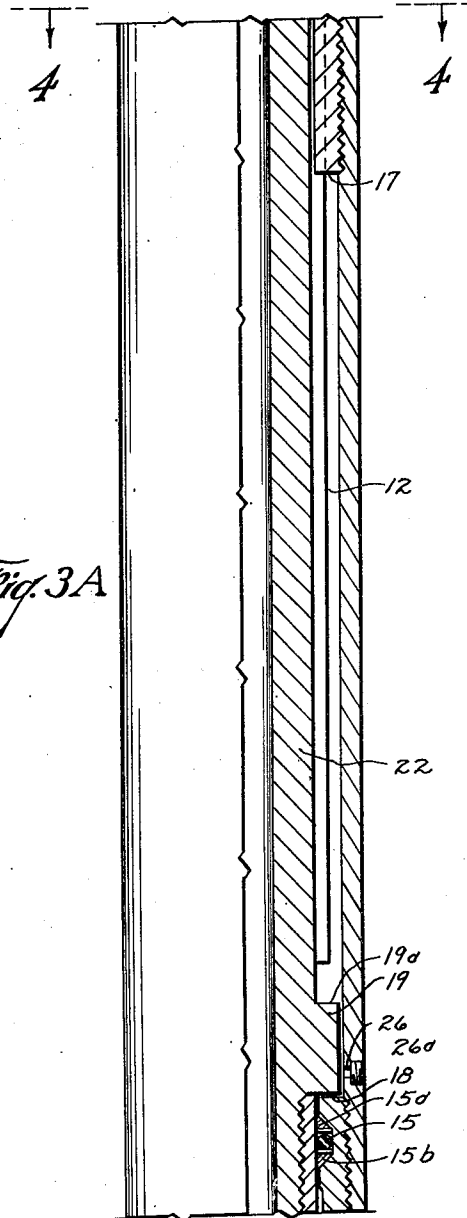
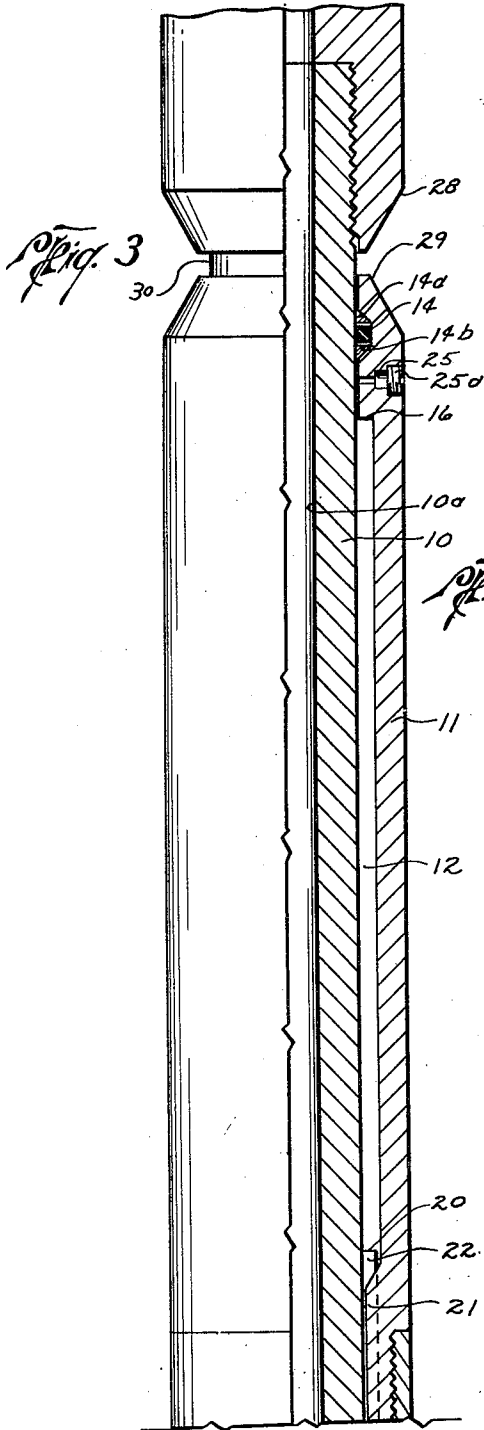
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Fig. 3B

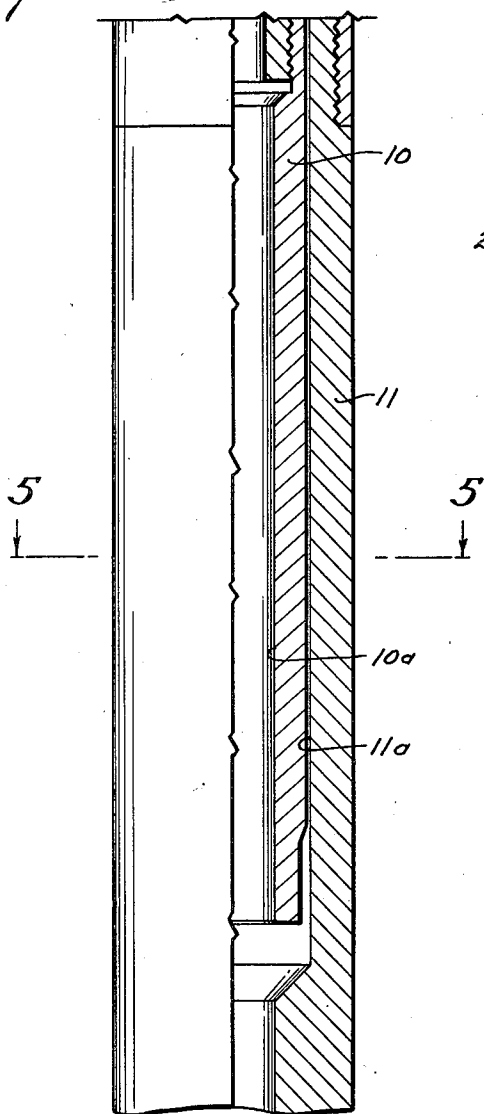


Fig. 4

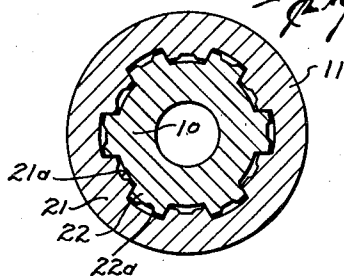
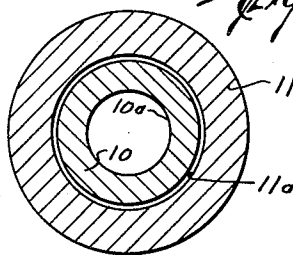


Fig. 5



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JARRING TOOLS

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1 Claim. (Cl. 255—27)

This invention relates to new and useful improvements in jarring tools.

As is well known, jarring tools are used in well drilling operations to recover pipe, well drilling tools, and the like from well bores in which they have become stuck. The jarring tool commonly has a grapple or similar device connected to its lower end for attachment to the stuck pipe or tool to free same from the well bore for removal. In other instances, the jarring tool may be connected in a drill stem to jar loose the drill bit in the event it becomes stuck in the well bore.

In the previously known jarring tools, the jarring surfaces and the splines have been exposed to the abrasive action of the drilling mud with a consequent rapid wearing away and damage to the working surfaces. Although the use of a sealed chamber for providing lubrication for the splines of a tool joint has been proposed by C. C. Brown in U. S. Patent 2,585,995, granted Feb. 19, 1952, none of the prior art teaches a jarring tool construction in which both the upward and downward jarring surfaces, as well as the splines, are enclosed in a sealed chamber having lubricant therein to avoid the abrasive action of the drilling fluid on such parts.

Furthermore, the previously known jarring tools had at least one of the impact or jarring surfaces constructed with sharp edges which tended to scrape formation from the walls of the well bore and accumulated same on the opposed jarring surfaces whereby a cushioning effect resulted during jarring action.

It is therefore an object of this invention to provide a jarring tool wherein the jarring surfaces and the splines are all enclosed within a sealed chamber to prevent the abrasive action of the drilling fluid thereon.

An important object of this invention is to provide a jarring tool in which a sealed chamber having lubricant therein is provided for enclosing the jarring surfaces and splines of said tool, whereby lubrication of such parts is effected and abrasive wear thereof due to the drilling fluid is eliminated.

Another object of this invention is to provide a jarring tool having telescoping members in which the jarring surfaces thereof are confined within a sealed chamber and the exterior shoulders on the telescoping members are tapered or otherwise curved and are prevented from contacting each other during jarring, whereby the impact of the jarring surfaces is not cushioned by the scraping and accumulation of the wall formation from the well bore by said shoulders.

The construction designed to carry out the invention will be hereinafter described, together with other features thereof.

The invention will be more readily understood from a reading of the following specification and by references to the accompanying drawings forming a part thereof, wherein an example of the invention is shown, and wherein:

Figure 1 is a longitudinal sectional view, illustrating the

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jarring tool of this invention with the upstroke jarring surfaces thereof in contact.

Figure 2 is a view similar to Figure 1, but illustrating the tool with the jarring surfaces thereof in the downstroke position.

Figures 3, 3A, 3B are views of the jarring tool of this invention, partly in elevation and partly in section, showing the upper, intermediate, and lower sections of the tool, respectively.

Figure 4 is a horizontal sectional view taken on line 4—4 of Figure 3A.

Figure 5 is a horizontal sectional view taken on line 5—5 of Figure 3B.

In the drawings, the numeral 10 designates the inner tubular barrel of the jarring tool of this invention. Such inner barrel 10 has a hollow bore 10a which extends axially therethrough, and at the upper end of the inner barrel 10 is a tool joint member 10b, which as shown in the drawings is of the box type for connection with the pin of the drill string S which extends to the surface of the well bore in operation. The inner barrel 10 extends into an outer barrel 11 which has a similar axial bore 11a. At the lower end of the outer barrel 11 there is formed a tool joint member 11b which, as shown in the drawings, may take the form of a tool joint pin for connection with a box joint of the lower portion of the drill string S'. The lower end of the drill string S' may be formed of drill collars and have connection with a drill bit, or in some instances it may be connected to a grapple such as are commonly used with jarring tools for the recovery of stuck objects in a well bore. A sealed annular space or chamber 12 is defined between the inner surface of the outer barrel 11 and the outer surface of the inner barrel 10, which chamber 12 is sealed by resilient seal rings 14 and 15 disposed at the upper and lower ends of such chamber 12, respectively. Within the chamber 12, the jarring surfaces and splines are confined so that drilling fluid which passes downwardly from the surface through the bores 10a and 11a will not contact the jarring surfaces and the splines, such construction to be more fully described hereafter.

Referring now to Figures 3, 3A, and 3B, therein it can be seen that the inner barrel 10 may be formed in a plurality of sections which are threadedly connected together, or otherwise secured. Similarly, the outer barrel 11 may be formed in several sections which are threaded or connected together, if desired. As was previously pointed out, the outer barrel 11 and the inner barrel 10 have an annular space or chamber 12 formed therebetween, with seal rings 14 and 15 at the upper and lower ends of the chamber 12, respectively. Although these seal rings 14 and 15 may take any conventional form, it is preferred that the seal rings 14 and 15 be disposed within annular grooves within the inner surface of the outer barrel 11 and said rings may be of the usual well-known O-ring type, as shown in Figures 1 and 2. However if desired, each O-ring may be supplemented by additional seal rings thereabove and therebelow as illustrated in Figures 3 and 3A. The auxiliary seal rings are preferably substantially triangular in cross section and are indicated as 14a and 14b on each side of the ring 14 and as 15a and 15b adjacent the ring 15. The outer barrel 11 has an upper upstroke jarring surface 16 and a lower upstroke jarring surface 17, both of these jarring surfaces on the outer barrel 11 being formed by inwardly radial extending shoulders. Near the lower end of the chamber 12 and above the lower seal 15, the downstroke jarring surface 18 is formed by an inwardly radially extending annular shoulder on the outer barrel 11.

The inner barrel 10 has an annular radial flange 19 which is disposed within the chamber 12 and between the seals 14 and 15. The upper surface 19a of the radial

flange 19 provides the upstroke jarring surface which contacts the upstroke jarring surface 17 on the outer barrel 11. Similarly, the lower radial surface 19b of the flange 19 forms the downstroke jarring surface on the inner barrel 10 for jarring impact with the downstroke jarring surface 18 on the outer barrel 11.

Above the radial flange 19 on the inner barrel 10 is another shoulder 20 which serves as an additional upstroke jarring surface on the inner barrel 10 and which contacts the upper upstroke jarring surface 16 of the outer barrel 11. Thus it can be seen that all of the jarring surfaces of the tool of this invention are confined between the seals 14 and 15 which define the upper and lower ends of the annular chamber 12.

To provide for relative longitudinal or axial movement between the inner barrel 10 and the outer barrel 11, splines 21 are provided on the outer barrel 11 which interfit and co-act with the splines 22 on the exterior of the inner barrel 10. It will be appreciated, of course, that these longitudinal splines 21 and 22 permit relative longitudinal or axial movement between the tubular barrels 10 and 11 but prevent rotational movement therebetween. As can be seen from the drawings, the splines 21 on the outer barrel 11 are disposed between the upper upstroke jarring surface 16 and the lower upstroke jarring surface 17, while the splines 22 on the inner barrel 10 are disposed between the upper upstroke jarring surface 20 and the radial flange 19. As can best be seen in Figure 4, each of the longitudinal splines 21 on the outer barrel 11 has a longitudinal groove 21a extending the full axial or longitudinal length thereof, and similarly, each of the longitudinal splines 22 has a longitudinal or axial groove 22a extending the full length thereof, whereby fluid such as a lubricant within the annular chamber 12 may flow through such longitudinal grooves 21a and 22a, as will be explained more in detail hereinafter.

Since the wearing parts of the jarring tool of this invention, namely, the jarring surfaces and the splines, are all confined within the sealed chamber 12, the abrasive effect of the drilling mud or fluid circulating within the well bore and within the inner bores of the tool, is avoided with respect to such wearing parts. To additionally enhance the life of the wearing parts of this jarring tool, a lubricant such as a light lubricating oil may be confined between the seals 14 and 15 to thereby lubricate the wearing parts of the tool during jarring action. To prevent the lubricant from escaping from the chamber 12, the additional seal rings 14b and 15a may be provided adjacent the seal rings 14 and 15, as previously pointed out. The lubricant may be admitted or removed from the chamber 12 through radial openings such as those designated by the numerals 25 and 26 in the outer barrel 11. Suitable plugs 25a and 26a may be employed to close such openings 25 and 26, respectively. Since the splines 21 and 22 thereby will work in the lubricant in the chamber 12, the longitudinal grooves 21a and 22a must be of sufficient size so that no restriction for the flow of the lubricant is provided during the relative longitudinal or axial movement of the barrels 10 and 11 during jarring action.

It will be observed that all of the jarring surfaces are confined within the annular chamber 12 between the seals 14 and 15. In previously known jarring tools, one of the jarring surfaces was generally disposed externally on the inner and outer tubular barrels. The jarring tool of this invention specifically eliminates and avoids the use of external shoulders for a jarring surface because the jarring surfaces which are thus exposed are rapidly worn away by the abrasive drilling mud or fluid. Additionally it has been found that such external jarring surfaces scrape formation from the walls of the well bore and cause the accumulation of such formation between the opposed jarring surfaces, with a consequent cushioning effect during the jarring action by reason of the formation being forced in between the jarring surfaces. It will

be observed that in the jarring tool of this invention, any tendency to scrape formation from the walls of the well bore and to accumulate same between opposed jarring surfaces is avoided by having shoulders 28 and 29 on the inner barrel 10 and the outer barrel 11 respectively, of a tapered or curved construction, whereby any slight amount of formation which might be scraped would readily slide or be dislodged therefrom. Furthermore, the shoulders 28 and 29 do not at any time abut each other to act as a jarring surface, since when the inner barrel 10 is fully telescoped within the outer barrel 11 the radial flange 19 contacts the shoulder 18 of the outer barrel 11 and the shoulder 28 is so spaced from the shoulder 29 that there is a radial or annular space 30 left between such tapered shoulders 28 and 29. No cushioning effect on the impact of the jarring surfaces within the chamber 12 is effected therefore.

The operation of the jarring tool of this invention is believed evident from the foregoing description. Thus, the jarring tool of this invention can either be disposed in a drill string with the lower end thereof connected to a section S' of drill collars which have connection with a drill bit (not shown) so that in the event that the drill bit becomes stuck within the well bore, the jarring action of the jarring tool may be utilized to free same. Also, it will be appreciated that the jarring tool of this invention could have connection to its lower end a grapple of conventional construction for connection to its lower end a section of drill pipe or a drill tool for the removal thereof from its stuck position within the well bore. To provide an upward jar, the drill string S is raised upwardly, thereby raising the inner barrel 10 from the position shown in Figure 2 to that shown in Figure 1 to provide an upstroke jarring by the impact of the jarring surfaces 19a and 20 on the inner barrel 10 with the surfaces 16 and 17 on the outer barrel 11. Since the outer barrel 11 has direct connection with the stuck object in the well bore, such upward jarring will be transmitted to the stuck object. A downward jar can be provided by moving the inner barrel 10 downwardly by the lowering of the drill string S and the application of its weight thereto so that the jarring surface 19b contacts the jarring surface 18 on the outer barrel 11. The splines 21 and 22 serve to guide the inner barrel 10 within the outer barrel 11 in the relative axial or longitudinal movement therebetween during such jarring action. It will be appreciated that the upward and downward jars may be repeated so long as necessary to free the stuck object from the well bore. Additionally, it may be desired to rotate the stuck object and such can be accomplished by the rotation of the drill stem which through the spline connection of the inter-engaging splines 21 and 22 will impart rotation to the stuck object.

As will be appreciated from the above description, the jarring surfaces and the splines are constantly working in the lubricant in the chamber 12 so that the wear thereon is considerably reduced. As has also been pointed out the drilling mud or fluid may be continually circulated during the jarring action without the abrasive damage to the jarring surfaces due to the particular construction of this invention.

It is believed apparent from the foregoing description that a jarring tool has been provided in which the wearing parts thereof, namely, the jarring surfaces and the splines, are confined within a sealed chamber to prevent the abrasive wear thereof by the drilling fluid and to further prevent the accumulation of formation between the jarring surfaces.

The foregoing disclosure and description is illustrative and explanatory of the invention and various changes in the size, shape and materials, as well as in the details of the illustrated construction may be made, within the scope of the appended claim without departing from the spirit of the invention.

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What is claimed is:

A jarring tool including, an outer barrel having a bore extending therethrough, a downwardly-facing abutment within the bore and an upwardly-facing abutment also within the bore and spaced therefrom, an inner barrel slidable within limits within the bore of the outer barrel, an upwardly-facing abutment on the exterior of the inner barrel adapted to engage the downwardly-facing abutment within the bore whereby an upward jar may be imposed on the outer barrel, a downwardly-facing abutment on the exterior of the inner barrel adapted to engage the upwardly-facing abutment within the outer barrel whereby a downward jar may be imposed on the outer barrel, a sealing ring between the inner and outer barrels at a point above the downwardly-facing abutment within the outer barrel, a second sealing ring between the inner and outer barrels at a point below the upwardly-facing abutment within the outer barrel, means in the outer barrel for introducing a lubricant into the annular space between the barrels which lubricant is confined by said sealing rings, a second downwardly-facing

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abutment within the bore of the outer barrel which abutment is disposed between the first downwardly-facing abutment and the upwardly-facing abutment within the bore, and a second upwardly-facing abutment on the exterior of the inner barrel engageable with said second downwardly-facing abutment, the abutments being positioned so that both upwardly-facing abutments on the inner barrel simultaneously engage the downwardly-facing abutments within the bore of the outer barrel.

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