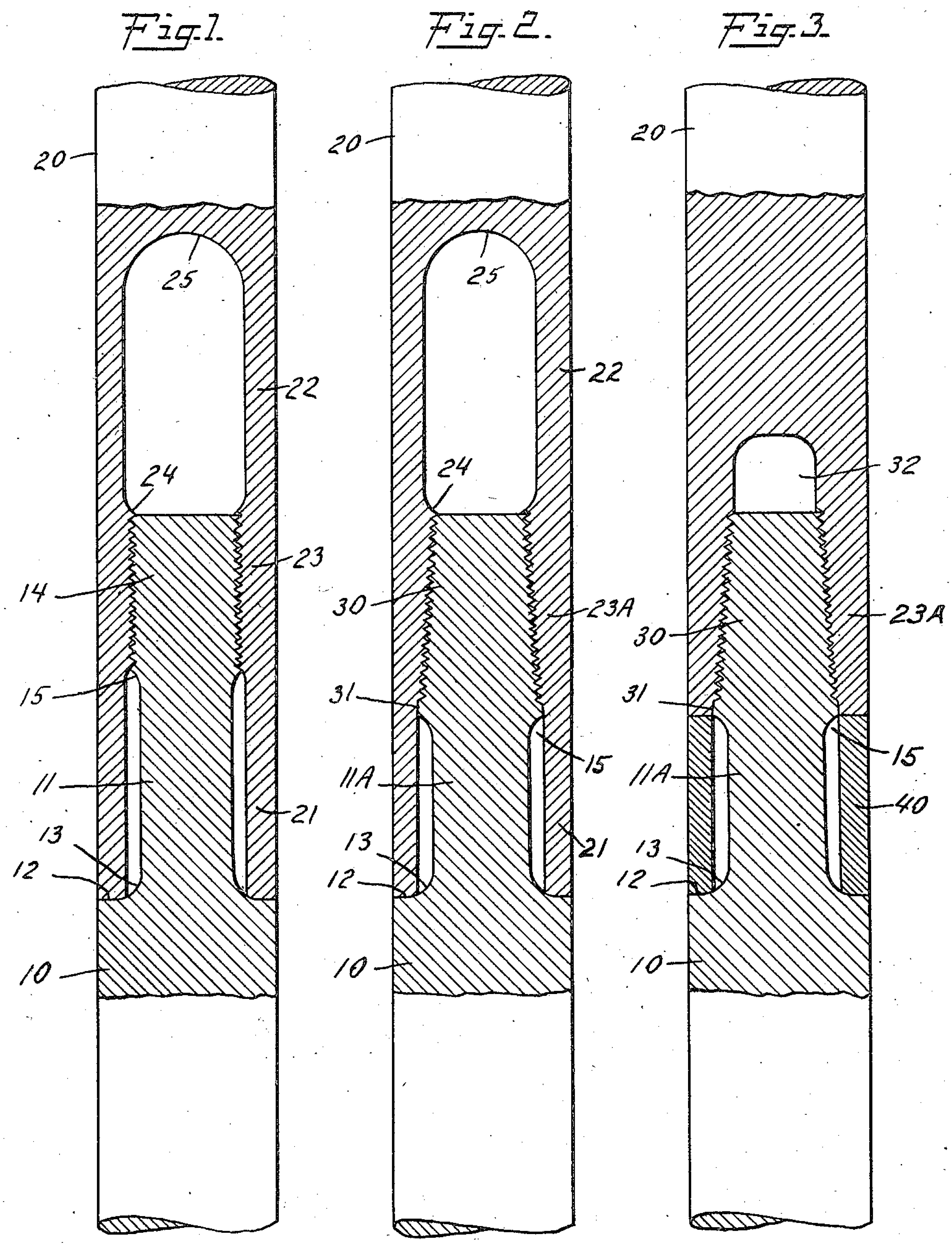
June 23, 1936. G. C. DAVISON 2,045,520

CABLE TOOL JOINT

Filed April 8, 1931



INVENTOR
Gregory C. Davison
BY Marshall & Hawley
ATTORNEYS

Patented June 23, 1936

2,045,520

UNITED STATES PATENT OFFICE

2,045,520

CABLE TOOL JOINT

Gregory Caldwell Davison, New London, Conn.; Alice Lydia Shepard Davison executrix of said Gregory Caldwell Davison, deceased

Application April 8, 1931, Serial No. 528,577

2 Claims. (Cl. 287—125)

This invention relates to improvements in cable tool joints and particularly to such as are used for connecting percussion drilling tools.

Its object is to provide a simple construction of greater strength than those available heretofore.

Other objects will appear in the following specification in which I will describe several constructions which embody this invention, the novel features of which will be pointed out in appended claims.

In drilling oil or gas wells by percussion drilling tools, breaking is of frequent occurrence and is the cause of great expense and loss of time. These breaks are usually at the joints. Many efforts have been made to overcome this difficulty by the use of high grade heat treated steels and the petroleum industry has adopted a standard joint which represents the best practice developed up to this time. A study of the breakage of these standard joints and of other tool joints has led to the present invention. It has been found that such breaks occur most frequently at points where there is a sudden reduction of cross sectional area with sharp corners, which in use, are subjected to instantaneous stresses which are greater than the true elastic limit of the metal, due to the fact that the tools do not work under a static load, but under a live alternating load. It has also been found that in joints as previously made there are sections of comparatively short length wherein the molecular deformation of the metal caused by percussive blows and its elastic recovery, are concentrated. Moreover, these sections are at or near the screw threads by which adjacent rods are held together.

According to my invention, a joint is provided in which there are no points of sudden reduction of cross sectional area and no sharp corners and in which the stresses are not concentrated at the screw threads, but the energy absorbed and the stresses produced are evenly distributed over spaced portions of slightly reduced cross sectional areas of appreciable length.

I will describe the invention in the following specification and point out its novel features in claims.

Referring to the drawing,—

Fig. 1 is a sectional elevation of a tool joint which is made according to and embodies the present invention;

Fig. 2 is a similar view illustrating a modified construction which also embodies this invention; and

Fig. 3 is a sectional elevation showing the way drill stems, bits, jars etc., which are provided with standard joints, may be altered to utilize my invention.

10 designates a bit on the upper end of which is a stem 11 of reduced diameter. A shoulder 12 is at right angles to the axis of the bit, between which and the stem is a generous fillet 13. 14 is a threaded enlargement or extension of the stem 11, preferably of a diameter greater than the diameter of the bottoms of the threads. The pitch circle of the threads is such that its area is approximately one-half of the area of a cross section of the bit. The upper end of the bit is curved outwardly, as at 15, to the diameter of the tops of the threads.

20 is a drill stem, the lower end of which is cut out to form a lower collar 21, a hollow annular part 22 and an intermediate threaded portion 23. The internal diameter of the collar 21 is such as to form a clearance for the threaded extension 14. The internal diameter of the recess within the part 22 is somewhat greater than that of the bottoms of the screw threads on the portion 23, and is rounded out, as at 24, to the internal diameter of these threads. The upper end of the upper recess is gradually reduced, as shown at 25.

Before describing specifically the construction shown in the other figures of the drawing, I will point out the advantages in operation of the device shown in Fig. 1. There are no abrupt changes of cross-sectional areas. Wherever changes in cross-sectional area occur there are fillets or curves, so that there are no sharp corners to produce a notch effect which would be likely to start a fracture. The parts 21 and 22 are of material length extending below and above the screw threads and are thinner than the intermediate portions in which the internal screw threads are cut. The stem 11 which is of less diameter than the threaded enlargement 14, also extends for a material distance below the screw threads.

Because of these characteristics, the parts of the joint which absorb the energy and stresses produced by longitudinal shocks, are of considerable length. They are of ample size to withstand the compressive forces to which they are subjected and are proportioned to distribute the absorption of energy so that no part is strained beyond a safe working limit. Furthermore, there are greater cross-sectional areas of both members at the parts thereof which are threaded, than there are above and below the threads, so that the molecular deformation where the threads are located is minimized. The absence of sharp corners is of obvious advantage.

In the structure shown in Fig. 2, the bit has the tapered threaded pin **30** with its tapered collar **31**, of the American Petroleum Institute standard joint, but in this case it differs from the standard construction in that these parts extend upwardly from a stem **11A**. The construction of the drill stem is the same as that previously described except that the intermediate threaded portion **23A** is made to fit the tapered pin and collar **30**, **31**.

Fig. 3 is added to show how drill parts with standard joint ends may be modified to utilize this invention. The upper end of a bit **10**, for example, will have the pin **30** and collar **31** on it. The metal below the collar **31** may be cut away to form the stem **11A**, the shoulder **12** and the fillet **13**. The drill stem **20** has the internal thread which fits the pin **30** and the standard cavity **32** above it. **40** is a piece of metal which may or may not be welded onto the end of the drill stem and turned to form a collar similar to that shown at **21** in Figs. 1 and 2.

Other structural modifications may be made without departing from the spirit and scope of the invention and I intend no limitations other than those imposed by the appended claims. The joint between a drill stem and a bit has been described as illustrated, and not in a limiting sense, for the same kind of a joint may be used between other parts of drilling tools or between any adjacent rod-like members.

What I claim is:

1. A pair of drilling tool members, a stem of reduced diameter extending from one end of one of the members forming a shoulder with the body of the member, an externally threaded pin above the stem of larger diameter at its base that that of the stem, a part of the other of said members being internally threaded to cooperate with said pin, and a collar extending from said threaded part to said shoulder, the internal diameter of said collar being of greater diameter than the external diameter of the stem, said internally threaded member being constructed with an elongated recess of greater diameter than that of the pitch circle of the threads adjacent the recess and the end of said recess being gradually reduced in section.

2. In a well drilling coupling, a pair of members, one of said members comprising a cylindrical body having an integral extension at one end, an end-facing shoulder at the inner end of said extension, and a screw thread on said extension, means to distribute the breaking strain previously localized at the last turn of said thread, along extended portions of the coupling, said means comprising a zone beyond one end of said thread of substantial width between said shoulder and said thread, said zone being of a diameter no greater than that of the valley of said last turn of the thread, and comprising another zone of substantial width beyond the other end of the thread formed by a thin wall of the other member, the inner surface of which is of larger internal diameter than the outer diameter of the thread.

GREGORY CALDWELL DAVISON.