Oct. 6, 1925. 1,556,094

H. W. FLETCHER

BACK UP SLIP

Filed Nov. 23, 1922

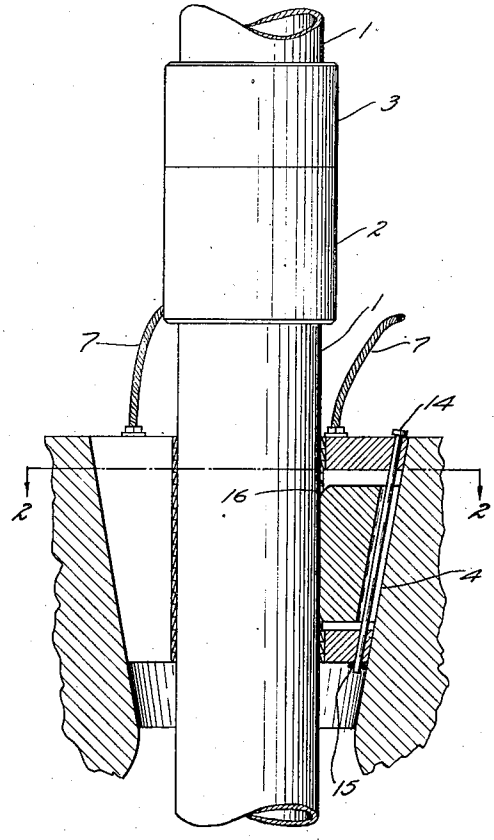


Fig. 1

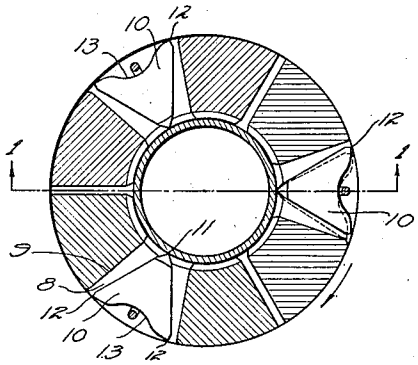


Fig. 2

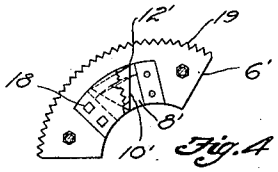


Fig. 4

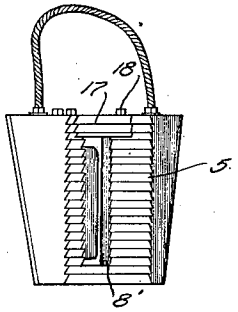


Fig. 5

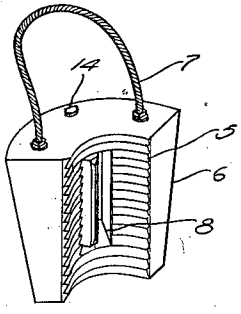


Fig. 3

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Patented Oct. 6, 1925.

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UNITED STATES PATENT OFFICE.

HAROLD W. FLETCHER, OF HOUSTON, TEXAS, ASSIGNOR TO HUGHES TOOL COMPANY, OF HOUSTON, TEXAS, A CORPORATION OF TEXAS.

BACK-UP SLIP.

Application filed November 23, 1922. Serial No. 602,916.

To all whom it may concern:

Be it known that I, HAROLD W. FLETCHER, a citizen of the United States, residing at Houston, Harris County, Texas, have invented a certain new and useful Improvement in Back-Up Slips, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to slips for use in the operation of screwing or unscrewing joints in pipe, tubing, sucker rods, etc. It is particularly adapted for oil field work and has its most common application in holding drill pipe in drilling operations, especially in connecting or disconnecting tool joints when the drill stem is being inserted into or withdrawn from the hole.

In breaking joints in drill pipe, tubing and the like, it is customarily necessary to use two wrenches; one for the upper part of the coupling or tool joint and one for the lower portion. In drilling operations these wrenches are called breakout and back-up tongs respectively. Thus the breakout tongs are secured to the upper joint of pipe and held against movement by bearing against a break-out pin. The back-up wrench is held to rotate with the table of the rotary which, by rotation, will rotate the tongs and the lower portion of the joint thus unscrewing the joint.

In the use of my slips, I contemplate holding the lower portion of the joint, and the pipe thereon, by means of a slip or slips in the rotary table and thus do away with the necessity of the back-up tongs. The slip fits in a tapered seat in the table about the pipe and not only sustains the weight of the pipe but prevents rotation of the table relative to the pipe.

Another object is to construct a slip which will prevent relative rotation of pipe and rotary and which will be simple and strong of construction so as to stand the rough usage to which it will be subjected.

Another object is to provide a slip of the character stated which will automatically adjust itself for wear and thus remain in operative condition for long periods of time.

Referring to the drawing herewith, wherein like numerals of reference have been applied to like parts in all views; Fig. 1 is a central longitudinal section through a rotary table, taken approximately on the line 1—1 of Fig. 2 and showing my improved back-up slip employed therewith. Fig. 2 is a transverse section on the line 2—2 of Fig. 1 showing the slip and the pipe. Fig. 3 is a perspective view showing one of the jaws. Fig. 4 is a top plan view of a slightly different embodiment of the jaw and Fig. 5 is a front elevation of the jaw shown in Fig. 4.

While it is contemplated that this type of slip may be used in breaking joints in connection with standard rig drilling, or may hold the tubing relative to the casing head in pumping operations, I have shown, and will describe in this specification, the particular application of my device to breaking joints in drill stem while going into and coming out of the hole, as is frequently necessary in rotary drilling operations. In Fig. 1 I have shown a drill stem 1 having thereon a tool joint composed of a lower section 2 and an upper section 3 by means of which the two adjacent sections of the drill stem 1 are coupled together. This drill stem is shown as projecting upwardly through the tapered seat 4 formed in the rotary table or in a spider, set in a rotary table.

To hold the pipe suspended in the tapered seat 4 while the two sections of the tool joint are being uncoupled, I have shown my improved back-up slip. This slip is made up of three separate jaws, this being the preferred number; although, it is obvious that a different number might be employed if desired. Each of these jaws is formed with a forward pipe engaging face 5 having transverse teeth thereon inclined upwardly so as to better engage the pipe and to sustain its weight. The slips are tapered on their outer faces at 6 to fit within the tapered seat 4, it being obvious that when the weight of the pipe is engaged with the teeth on the forward side of the slip, said slip will be moved downwardly in the seat and will be wedged firmly into contact with the pipe so as to sustain its weight. I employ a handle which may be made of cable as shown at 7 to more conveniently operate the slips. This type of handle is old in the art and need not be particularly described.

It is desired to employ this slip not only to sustain the weight of the pipe, but to prevent the rotation of the table and the rotary seat relative to the pipe so that the

rotation of the table will carry the pipe with it, and thus serve to screw up or unscrew the tool joint. To hold the pipe and to prevent relative rotation of the table and the pipe, I form a central recess 8 in the jaw. This recess, as shown particularly in Fig. 2, has the sides 9 thereof approximately radial to the pipe. The recess extends vertically from a point spaced from the lower end of the jaw to a point somewhat below the upper end of the jaw and is approximately two-thirds the length of the jaw itself.

Within this recess 8 is placed an approximately triangular tooth 10. One point of the triangle is presented toward the pipe for engagement therewith, as shown at 11. The two remaining corners of the triangular tooth are presented toward the tapered seat as shown at 12 and the side of the tooth opposite the point 11 is tapered downwardly to conform with the taper in the seat 4. This side is also hollowed out somewhat at 13, to provide space for a longitudinally extending pin or rod 14 which is extended downwardly through the upper and lower ends of the recess 8 and is secured in position by means of a cotter pin 15 at the lower end thereof. It will be noted that the recess 8 is smaller at its forward side and will thus not permit the tooth 10 to move from the recess on that side; and the rod or pin 14 will limit its movement outwardly away from the pipe. Thus the tooth has a limited range of movement in all directions but may freely adjust itself to the pipe. The size of the tooth is such that when the rearward points 12 bear against the walls of the seat 4, the forward face will engage the pipe with the tooth spaced upwardly from the lower end of the recess. This will allow the tooth to adjust itself vertically within the recess to conform with the shape and the size of the pipe, and also to take up for wear on the tooth, due to use. The upper and lower ends of the point 11 upon the tooth are rounded off somewhat as shown at 16 so that the pipe may move slightly in a vertical direction relative to the tooth without undue strain upon the said tooth. It is not contemplated that the weight of the pipe will be sustained by the tooth 10, but that it will tend to prevent relative rotation of the pipe and the tapered seat.

In the operation of this slip, when the drill stem 1 is being taken out of the hole, the said drill stem will be elevated until the tool joint is at a position spaced upwardly away from the rotary table so that the breakout tongs may engage the upper portion 3 of the joint. The lower portion 2 is screwed firmly on the drill stem 1, and if the drill stem is held securely in the rotary, the upper portion 3 of the joint may be unscrewed from the lower section 2 thereof. I therefore use my slips in the usual manner about the pipe to sustain the weight thereof, and when the table of the rotary is rotated, the teeth 10 on each of the jaws of the slip will engage the pipe and the seat of the rotary to resist relative rotation between the two. The action of the tooth will be a sort of tipping or cam action between the pipe and the rotary seat as shown in dotted lines in Fig. 2. The rotary will be rotated in the direction of the arrow in that figure and will tend to carry the rearward side of the tooth in the direction of the rotating table. The forward point 11 of the tooth will engage the pipe and as the rearward tooth 12 is moved slightly it will cause the forward point 11 to bite into the pipe and firmly clamp the pipe within the slip, and further rotation of the table will carry the pipe with it in an obvious manner.

In the embodiment of my invention shown in Figs. 4 and 5, the principle of the invention is the same as in the embodiment just described. The body of the jaw 6′ is formed with horizontal teeth 5 upon the forward face as shown in the previous embodiment. The upper end of the recess 8′ formed in the jaw is closed by means of a removable countersunk plate 17 held in place by means of set screws 18. The recess 8′ in this modification does not extend completely through the jaw, but only a part of the way therethrough so that the rearward corners of the tooth 10′ will bear against the walls of the recess, rather than against the walls of the tapered seat 4. The tooth 10′ is therefore held in position entirely by the walls of the recess 8′ in which it loosely fits. The outer wall of the recess 8′ is tapered to conform with the taper of the seat 4, the tooth being also tapered on its adjacent side to conform thereto, thereby giving the tooth 10′ the same amount of vertical adjustment along the pipe as in the previous embodiment. As will be apparent, the rotation of the jaw relative to the pipe in this embodiment will cause the rearward angles 12′ of the tooth to bear against the rear walls of the recess, and will force the jaw against the tapered seat 4. To prevent slipping between the jaw and the seat 4, I therefore form longitudinal teeth 19 on the outer surface of the slip.

In this form of slip the action of the jaw upon the pipe is practically the same as that described relative to the first embodiment. The rotation of the table will carry the jaw with it and will cause the tooth 10′ to bite into the pipe firmly and tend to force the jaw more firmly in the tapered seat so that the rotation of the seat and the jaw will set up a clamping force to resist rotation relative to the pipe and the rotation of the rotary seat will thus carry the pipe with it.

The advantages of my improved form of slip lie in the fact that the usual back-up tongs and back-up posts upon the rotary may be dispensed with. The addition of the vertical tooth within each of the jaws will prevent rotation of the pipe relative to the rotary or of the rotary relative to the pipe, thus performing the function of the back-up tongs. It will therefore accomplish a saving of labor and of tools and will be of obvious advantage in drilling operations.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent is:

1. In a device of the character described, a plurality of pipe-engaging slips, transversely arranged teeth on the inner faces thereof, a single vertical tooth loosely mounted in a central recess in each slip, said tooth being formed to grip the pipe when said slip is rotated relative to said pipe.

2. In a device of the character described, a plurality of pipe engaging slips, transversely arranged teeth on the inner faces thereof, a single upright tooth loosely mounted in a recess in one of said slips, said tooth being triangular in transversal section and adapted to be forced into contact with said pipe when relative rotation of said pipe and slip is attempted.

3. In a device of the character described, a downwardly tapered seat, a plurality of pipe engaging slips in said seat having transverse teeth to engage said pipe, a single angular tooth mounted loosely in a recess in each of said slips and adapted to bear against said pipe, said tooth being so shaped and mounted that relative rotation of said pipe and slip will cause said tooth to grip said pipe and said seat.

4. In a device of the character described, a downwardly tapered seat, adapted to receive a pipe therethrough, a plurality of pipe engaging slips having means to engage and sustain the weight of said pipe, a tooth having a sharp angle presented longitudinally to said pipe, said tooth being loosely mounted in said slip and tapered on the side toward said seat whereby said tooth may adjust itself to said pipe and said seat independently of said slip.

5. In a device of the character described, a downwardly tapered seat, adapted to receive a pipe therethrough, pipe engaging slips between said pipe and said seat, a longitudinal angular tooth mounted movably relative to said slips and having engagement with said pipe and said seat and adapted to clamp said pipe in said seat when rotation of one relative to the other is attempted.

6. In a device of the character described, a pipe engaging slip for rotaries having transverse teeth presented toward the pipe and an additional upright tooth loosely mounted relative to said slip and adapted to clamp against said pipe and said seat when relative rotation of said slip and pipe is attempted.

7. In a device of the character described, a pipe engaging slip having a transversely toothed forward face toward the pipe and a tapered face on its outer side, in combination with an approximately triangular tooth loosely mounted in a recess in said slip, one angle of said tooth being presented toward the pipe and the other angles bearing outwardly and means to hold said tooth in position.

8. In a device of the character described, a tapered seat adapted to receive a pipe, a pipe engaging slip, tapered on its outer face to fit said seat, a vertically extending movable pipe-gripping tooth on said slip adapted to seize said pipe and said seat as said slip is rotated with said seat relative to the pipe and thus act to resist said relative rotation.

9. In a device of the character described, a downwardly tapered seat having a jointed member extending longitudinally through the same, a slip having its inner face transversely toothed to engage said member and its outer face tapered to fit said seat, and a movably mounted member on said slip adapted to resist rotation of said jointed member relative to said seat.

10. In a device of the character described, a downwardly tapered seat having a jointed member extending longitudinally through the same, a slip having its inner face transversely toothed to engage said member and its outer face tapered to fit said seat, and a member movable relative to said slip and adapted to set up a clamping force to resist relative rotation of said jointed member and said seat.

11. In a device of the character described, a downwardly tapered seat having a jointed member extending longitudinally through the same, a slip in said seat having its outer face tapered to fit said seat and its inner face formed to engage said member, in combination with means separately movable and adjustable relative to said slip, whereby rotation of said seat operating through said means sets up a clamping force to resist relative rotation of said member and said seat.

12. In a device of the character described, a pipe engaging slip, an upright separately adjustable tooth connected therewith, said tooth having sharp edges thereon adapted to engage the work and set up a force tending to resist rotation of the slip relative to the work.

In testimony whereof, I hereunto affix my signature, this the 20th day of November, A. D., 1922.

HAROLD W. FLETCHER.