Dec. 1, 1931. G. E. McLAGAN 1,834,316

DRILL PIPE SLIP

Filed Dec. 7, 1929

Fig. 1

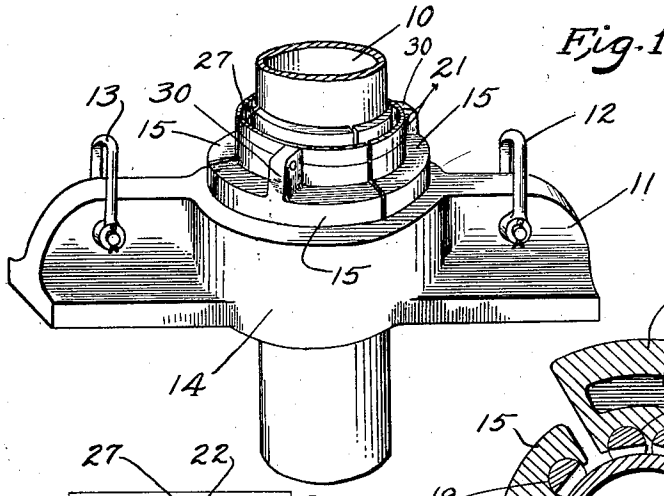
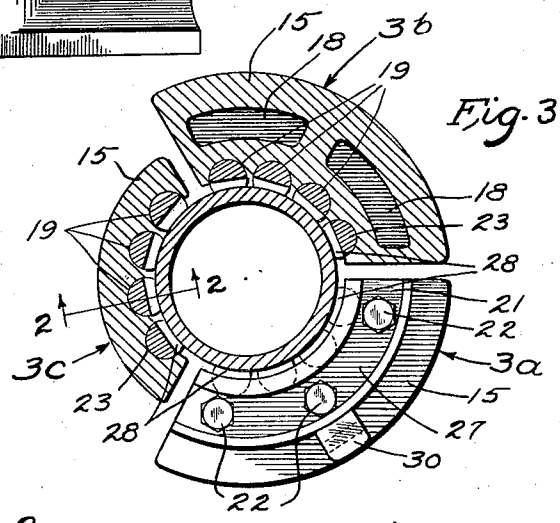


Fig. 3



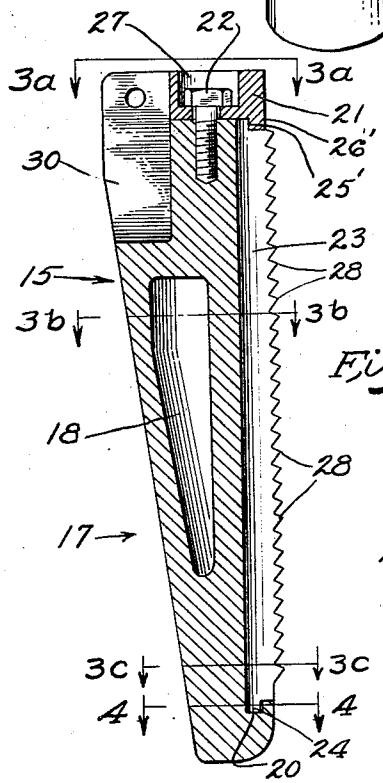


Fig. 2

Fig. 4

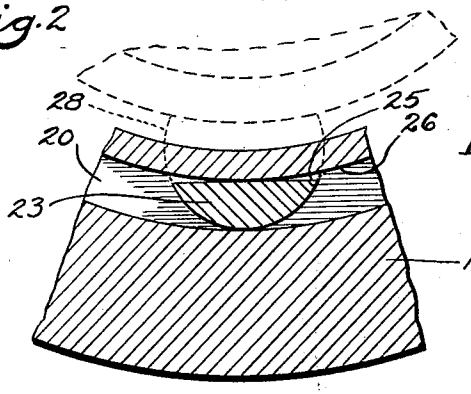
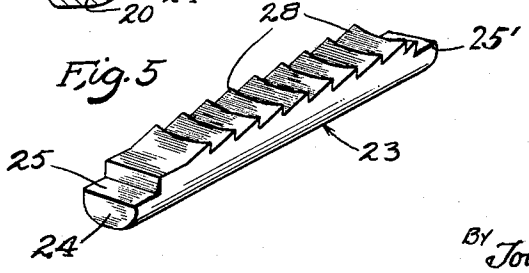


Fig. 5



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UNITED STATES PATENT OFFICE

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DRILL PIPE SLIP

Application filed December 7, 1929. Serial No. 412,520.

This invention relates to well drilling equipment and particularly pertains to drill pipe slips in the manipulation of drill strings and well casings.

During the drilling and operating periods of wells, such as oil wells, it is necessary to provide means which may be readily set in position to engage and grip a section of the drill string pipe, or a section of a well casing, and which will make it possible for the pipe section to be readily manipulated and to be easily released. It is usual practice to provide a spider which embraces the pipe length, and within which removable gripping jaws, commonly known as slips, may be placed to firmly grip the pipe and to make it possible to raise and lower the pipe by movement of the spider. It will also be understood that in some instances such slips may be used in connection with rotary drill tables, but in all events they will act to grip the pipe around which they are arranged. It sometimes occurs that the pipes are eccentric in cross-section rather than concentric, and that in some instances the pipes are otherwise "out of round".

It is the principal object of the present invention to provide a set of pipe slips which will automatically and incidentally adapt themselves to the contour of the pipe around which they are grouped, and will positively engage the contacting surface of the pipe, irrespective of the configuration of the pipe section.

The present invention contemplates the provision of tapered slips, having insert jaws extending longitudinally of the slips, and capable of lateral rotation, whereby the individual jaws may adjust themselves to the particular area of the pipe surface with which they come in contact.

The invention is illustrated by way of example in the accompanying drawings, in which:

Figure 1 is a view in perspective showing the improved slips as applied to a spider of common construction.

Fig. 2 is a view in longitudinal vertical section through one of the slips, showing its jaw insert, and the manner in which the insert is detachably held in position.

Fig. 3 is a composite view in transverse section through a series of slips grouped around a casing, and as seen on the lines 3*a*—3*a*, 3*b*—3*b*, and 3*c*—3*c*, as indicated in Fig. 2 of the drawings.

Fig. 4 is an enlarged fragmentary view in section, as seen on the line 4—4 of Fig. 2.

Fig. 5 is a view in perspective showing a portion of one of the insert jaws with which the present invention is concerned.

Referring more particularly to the drawings, 10 indicates a pipe such as forms a part of a drill string or well casing. Embracing this pipe is a spider 11, which is provided with clevis connections 12 and 13, by which the spider may be lifted and lowered. The spider is formed with a central cylindrical portion 14, through which the casing 10 extends. This cylindrical portion has a bore through it which is considerably greater in diameter than the outside diameter of the casing 10. Extending into this bore and inserted between it and the side wall of the casing, are a plurality of slips 15, with which the present invention is particularly concerned. These slips are here shown as being three in number. It will be understood, however, that any number of slips may be used, without departing from the spirit of the invention.

The slips as particularly shown in Figs. 2 and 3 of the drawings, are arcuate in cross-section, throughout their length. The upper portions of the outer walls of the slips are substantially parallel to the inner walls thereof. Below said upper portion each of the slips is formed with an outside tapered wall 17, as clearly shown in Fig. 2.

Attention is directed to the fact that for the sake of strength and lightness of weight, core pockets 18 are formed within the body of the slip. The inner arcuate face of the slip is formed with a plurality of parallel arcuate corrugations 19. These corrugations terminate at the lower end of the slip in an arcuate groove 20, and at the upper end of the slip they are intended to be covered by a bolting plate 21, which is secured by cap

screws 22. The corrugations when considered in section, described each an arc of greater length than 180°. Into these corrugations insert jaws 23 may be placed by being forced downwardly in the corrugations from the top thereof. These insert jaws when considered in cross-sections agree in arc with the longitudinal corrugations 19, thus insuring that after the insert has been slipped into its corrugation, it may rotate laterally without becoming displaced with relation to the corrugation. The inserts are retained within their arcuate seats due to the fact that the lower ends of the inserts are cut away to form a projecting sector 24, which is of a width agreeing with the width of the groove 20 and having an inner flat face 25 which will at all times stand tangent to the wall 26 of the groove 20, as clearly shown in Fig. 4. Due to this arrangement the slip may rotate upon its longitudinal axis a distance determined by the angle of tangent between the circular face of the wall 26 and the full face of the projecting sector 24. The upper ends of the inserts are similarly formed with projections 25′, over which the downwardly projecting flange 26′ of the plate 21 extends. This flange is arcuate and does not therefor interfere with rotation of the slip within its corrugation and upon its longitudinal axis.

The bolting plate 21 is formed with a channel groove 27, which accommodates the heads of the cap screws 22 and prevents them from becoming multilated during the operation of the device. It is to be understood that insert jaws 23 are preferably formed from cylindrical stock, and that in each of them one of the sides is cut away to form a plurality of jaw teeth 28, which will forcibly bite into the metal of the casing when the weight of the casing is imposed thereupon, or when the spider with its jaws is lifted. The character of the metal from which the insert jaws are formed is optional with the manufacturer, but it is desirable that it shall be a good grade of tool steel, which will retain the sharp edged teeth and will insure against the breakage of those teeth against ordinary strain.

Attention is also directed to the fact that there are four of the insert jaws shown as being a part of each of the slips. It will be understood that any number of such jaws may be provided, as desired.

In operation of the present invention, the jaw inserts 23 are disposed with their lower projecting ends 24 positioned in the arcuate groove 20, and with their upper projecting ends 25′ held in position by the overhanging flange 26′ of the plate 21. After the slips and their inserts have been thus assembled they may be manipulated by any suitable handling means which will engage the opening in the handle lug 30 so that the slips may be inserted within a required structure, such as a spider 11. When the slips move downwardly so that their tapered faces 17 engage the tapered internal faces of the portion 14 of the spider, they will be wedged inwardly against the outer face of the pipe 10, or other longitudinally extending member which is embraced by the spider. At such a time the teeth 28 of the inserts 23 will be forced against the surface of the member 10 and will be caused to bite thereinto. In the event that the contour of the surface of the pipe 10 does not agree with the circle along which the edges of the teeth of the inserts lie, it is evident that the individual inserts may rotate around their vertical axes and adapt themselves to the contour of that portion of the pipe 10 with which they engage.

It will thus be seen that by this construction, the gripping face of each slip will be sub-divided into a plurality of separate gripping areas, which may individually adapt themselves to the contour of that portion of the pipe with which they engage, thereby insuring that the full width of each of the inserts will positively engage the pipe and that the pipe will be uniformly gripped at spaced intervals around its circumference, irrespective of the sectional contour of the pipe.

When it appears necessary to remove or replace the inserts 23 for any reason, the plate 21 may be unbolted and inserts 23 withdrawn longitudinally from their seats. These seats represent an arc greater than 180° and thus it is impossible to withdraw them by lateral movement. Other inserts may then be inserted and the plate 21 bolted into position.

While I have shown the preferred form of my invention as now known to me, it will be understood that various changes may be made in the combination, construction and arrangement of parts by those skilled in the art, without departing from the spirit of the invention as claimed.

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

1. In a pipe handling structure, a slip describing an arc of a circle and having a substantially longitudinally straight inner face and a longitudinally tapered outer face, and a plurality of separate parallel longitudinally extending arcuate grooves occurring along the straight inner face of the slip, longitudinally extending gripping elements agreeing in section with the arcuate grooves and seated therein, whereby the individual gripping elements may move to adapt themselves to the external configuration of a pipe, or the like, with which they engage.

2. In a pipe handling organization, a slip of arcuate section, the inner face of said member being longitudinally straight, and the outer face of said member being longitudinally tapered, a plurality of parallel longi-

tudinally extending grooves of arcuate section formed in said inner face, and a series of gripping inserts of similar section, one of which is adapted to be disposed within each of said grooves, the gripping faces of which project from the inner surface of the slip to engage the surface of an object with which they come in contact, and means for retaining said inserts within said grooves while permitting lateral rotation thereof.

3. In a device of the character described, a pipe slip being of arcuate section, the inner face being longitudinally straight and the outer face being longitudinally tapered, a plurality of arcuate grooves extending parallel to each other and formed on the inner face of the slip, the arcuate sections of said grooves representing more than 180°, a plurality of cylindrical slips, one of which is adapted to extend longitudinally in each of said grooves, and is formed with an abradant surface, projecting beyond the surface of the inner face of the slip, whereby it may frictionally engage an object to be lifted thereby.

4. In a device of the character described, a pipe slip being of arcuate section, the inner face being longitudinally straight and the outer face being longitudinally tapered, a plurality of arcuate grooves extending parallel to each other and formed on the inner face of the slip, the arcuate sections of said grooves representing more than 180°, a plurality of cylindrical slips, one of which is adapted to extend longitudinally in each of said grooves, and is formed with an abradant surface, projecting beyond the surface of the inner face of the slip, whereby it may frictionally engage an object to be lifted thereby, and means for holding said longitudinally extending members within their grooves, whereby they may rotate around their longitudinal axes within the grooves to individually adapt themselves to the contour of an object to be gripped thereby.

5. In a pipe handling structure, a slip of arcuate section having a substantially, longitudinally straight inner face and a downwardly and inwardly longitudinally tapered outer face, and a plurality of individual gripping elements extending parallel and longitudinally of the inner face, said gripping elements being mounted in a manner to permit them to automatically and individually move to adjust themselves to the contour of the surface being gripped.

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