April 30, 1935. E. BURNS ET AL 1,999,279

SLIP

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Fig. 1.

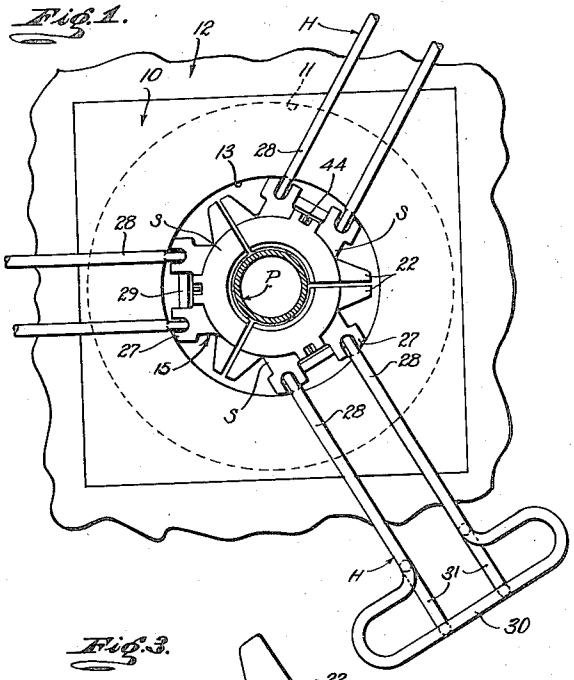


Fig. 2.

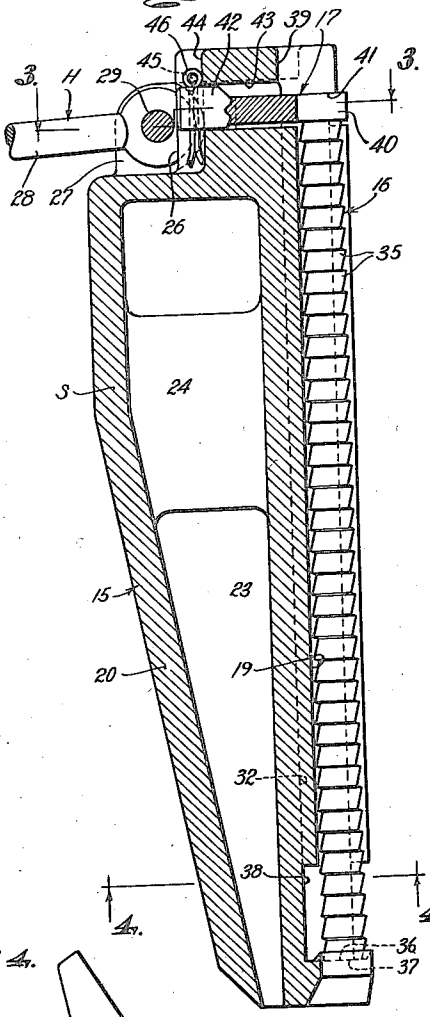


Fig. 3.

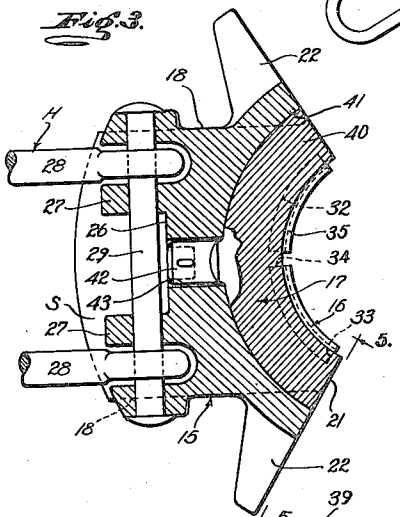


Fig. 4.

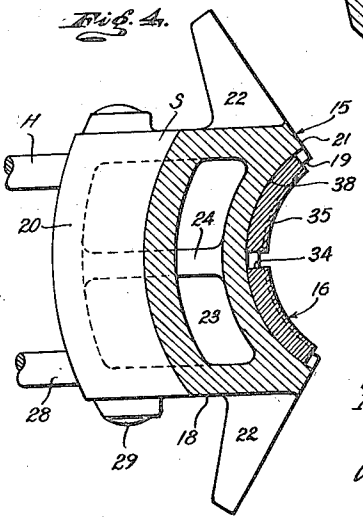
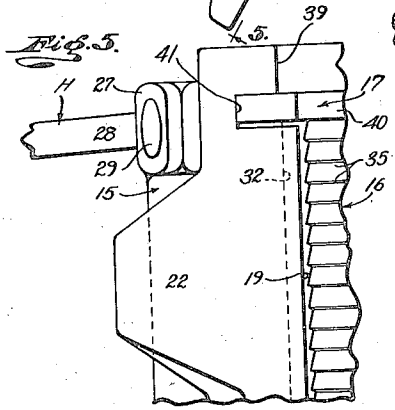


Fig. 5.



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SLIP

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15 Claims. (Cl. 24—263)

This invention relates to slips and relates more particularly to slips for arrangement in a rotary table bushing. It is a general object of this invention to provide improved rotary drill pipe slips having effective and readily replaceable pipe engaging liners.

Another object of the invention is to provide a slip having two or more liners for engaging the pipe and a simple dependable means for retaining the removable liners in their proper operative positions.

Another object of the invention is to provide a slip of the character mentioned in which the means for retaining the removable liners in the body is simple and inexpensive and does not involve screws or similar parts.

Another object of the invention is to provide a rotary drill pipe slip of the character mentioned involving replaceable liners which cannot become wedged or tightly set in the body of the slip and, therefore, may be easily and quickly replaced.

Another object of the invention is to provide a slip of the character mentioned in which a single plate is arranged in a groove in the body of the slip to hold the removable liners against displacement, which plate is held in place by a simple, practical means which is not subjected to any breaking strains or forces.

A further object of the invention is to provide a slip of the character mentioned that is light in weight and that is inexpensive of manufacture.

Other objects and features of the invention will be better and more fully understood from the following detailed description of a typical preferred form and application of the invention, throughout which description reference may be had to the accompanying drawing, in which:

Fig. 1 is a plan elevation of a set of slips of the present invention arranged in the master bushing of a rotary table. Fig. 2 is an enlarged longitudinal detailed sectional view of one of the slips removed from the master bushing. Figs. 3 and 4 are transverse detailed sectional views taken as indicated by lines 3—3 and 4—4, respectively, on Fig. 2 and Fig. 5 is a fragmentary elevation view taken as indicated by line 5—5 on Fig. 3.

The slips of the present invention are adapted to be arranged in the master bushing of a rotary table to engage and support a drill pipe extending into the well. In the drawing we have illustrated a typical master bushing 10 arranged in the central opening 11 of a typical rotary table 12. The bushing 10 has a central opening 13 with downwardly and inwardly inclined walls. In the typical assembly illustrated in Fig. 1 of the drawing there are three like slips S arranged in the opening 13 of the bushing 10. It is to be understood that the slips may be designed and proportioned for use in sets of three or more. As the several slips S may be identical we will proceed with a detailed description of a single slip, it being understood that such description may apply equally well to the other slips of the series or set illustrated in Fig. 1.

The slip S includes, generally, a body 15 for arrangement in the opening of a master bushing, replaceable liners 16 on the body for engaging the drill pipe P and means 17 for removably retaining the liners 16 on the body.

The body 15 is arcuate in its general plan configuration having curved inner and outer sides and flat vertical sides 18. The inner surface or side 19 of the body 15 is vertical and is shaped or channeled to receive the liners 16 as will be subsequently described. The outer side of the body 15 has its major portion 20 inclined downwardly and inwardly to fit on or cooperate with the wall of the bushing opening 11. The upper outer surface of the body 10 may be cylindrically curved about the same axis of curvature as the inner side 19. Where there are three slips S arranged in the master bushing the body 15 is slightly less than 120° extent. The opposite sides 18 of the body 15 may be parallel as illustrated in Figs. 3 and 4 of the drawing. Vertical and radial faces 21 are provided on the opposite sides of the body 15 to cooperate with the opposing corresponding faces 21 on the adjacent slips. Horizontal wings 22 are provided on the upper end of the body 15. The wings 22 project outwardly adjacent the upper end of the body and their outer sides form continuations of the radial end faces 21. The wings 22 facilitate the equal spacing of the slips S in the bushing opening 13. The wings 22 extend only a short distance vertically of the body 15 and the body in being provided with the parallel sides 18 is light in weight. In practice the wings 22 may be spaced from the upper end of the body and may have curved or inclined upper and lower ends as illustrated.

In accordance with the invention the body 15 is hollow or provided with an internal space or chamber 23. The chamber 23 may be open at the reduced lower end of the body 15 and one or more radial webs 24 extend through the chamber to reinforce the body. The body 15 is being hollow as just described, is light in weight and easy to lift. A handle H is provided for facilitating the lifting and handling of the slip. The top or upper end of the slip body 15 has a vertical shoulder 26 and two pairs of spaced lugs 27 project outwardly from this shoulder. The handle H includes spaced substantially parallel arms 28 whose ends are received between the lugs 27. A pin 29 extends through openings in the lugs 27 and the arms 28 to pivotally attach the handle to the slip body. The handle H has a grip portion or head 30 projecting laterally from the outer ends of the arms 28. Downwardly curved members 31 connect the arms 28 with the head 30

to strengthen the handle structure. The members 31 project downwardly to form stops to space the handle above the surface of the rotary table 10 to facilitate the easy grasping and lifting of the handle.

The liners 16 are arranged on the inner side 19 of the slip body 15 to engage and grip the drill pipe P and in accordance with the invention are readily replaceable. In the preferred form of the invention illustrated in the drawing there are two spaced independent liners 16 on each slip body 15. The liners 16 constitute the wear taking elements of the slip and are preferably hardened. The two liners 16 of the slip S may be alike or identical and are arranged in longitudinally extending grooves or channels 32 in the curved inner side 19 of the body 15. The liner carrying channels 32 are preferably of uniform depth and width throughout their lengths and have their inner walls concentric with the inner side 19 of the body. The vertical side walls 33 of the channels 32 are radial with respect to the axis of curvature of the side 19 and the inner walls of the channels. The two channels 32 are spaced a short distance apart and are suitably spaced from the radial end faces 21 of the body.

The liners 16 are shaped and proportioned to fit the channels 32 having curved inner sides for bearing against the curved inner walls of the channels and having flat radial vertical ends 34 for cooperating with the end walls 33 of the channels. This cooperation of the radial ends 34 with the walls 33 is in effect a dove-tailed fitting or engagement of the liners in the channels which operates to hold the liners against lateral or inward displacement from the channels. The liners 16 are of uniform thickness except for the gripping ribs or teeth 35 on their exposed sides which project inwardly beyond the inner surfaces 19 of the body. The teeth 35 extend circumferentially or horizontally and present upwardly facing points or edges for engaging the drill pipe P. The lower walls of the channels 32 are formed by an upwardly facing shoulder 36. The shoulder 36 has its major portion inclined upwardly and outwardly and the lower ends of the liners 16 are correspondingly inclined to cooperate with this shoulder. It will be seen that the cooperation of the lower ends 37 of the liners 16 with the shoulder 36 further retains the liners against displacement from the channels. In practice a transverse or circumferential groove 38 may be provided in the inner side 19 of the body to facilitate the subsequent forming or cutting of the channels 32 and to provide the inclined shoulder 36. The upper inner corner of the slip body 15 is cut back at the surface 39 to permit the liners 16 to be slid or passed downwardly into the channels 32. It is believed that it will be apparent how the liners 16 may be readily passed downwardly or longitudinally into the channels 32 to positions where their lower ends 37 seat on the shoulder 36.

The means 17 for releasably locking or retaining the liners 16 against displacement from the channels 32 includes a plate 40 for cooperating with the upper ends of the liners. A circumferentially extending recess or groove 41 of rectangular cross section is provided in the inner side of the slip body 15 at the lower end of the surface 39 to receive the retaining plate 40. The plate 40 is arcuate in plan elevation and may have its radial ends at or adjacent the radial ends of the wings 22. The plate 40 fits the groove 41 with suitable clearance and its lower side is adapted to cooperate with the upper ends of the liners 16 to prevent the liners from passing upwardly or longitudinally from the channels 32. As clearly illustrated in Fig. 5 of the drawing the curved exposed edge of the liner retaining plate 40 is spaced inwardly with respect to the teeth 35 so that it does not contact with the drill pipe P.

A central rearwardly projecting tongue 42 is provided on the plate 40 and extends through an opening 43 in the body 15. The opening 43 extends from the groove 41 to a vertical notch 44 in the shoulder 26. The tongue 42 is cylindrical and projects into the notch 44. The opening 43 is of round cross section and intersects the upper wall of the slot 41 to readily receive the cylindrical tongue. A transverse or vertical opening 45 is provided in the tongue 42 to receive a cotter key 46. The cotter key 46 cooperates with the wall of the notch 44 to lock the plate 40 against displacement from the groove 41. The key 46 may be entirely received within the notch 44 so that it is not liable to injury or displacement. The plate 40 is held in the groove 41 and cooperates with the upper ends of the slips 16 to positively prevent upward shifting or displacement of the liners 16. The cotter key 46 in turn prevents unintentional shifting or displacement of the plate 40. The upper end of the cotter key 46 is readily engageable from the upper end of the slip body 15 whereby the plate 40 and liners 16 may be readily removed from the body.

It is believed that the utility and practicability of the slips provided by this invention will be readily apparent from the foregoing detailed description. As illustrated in Fig. 1 of the drawing the set or plurality of slips S is arranged in the opening 13 of the master bushing 10 to engage or grip the drill pipe P. The teeth 35 of the liners 16 project from the curved inner sides of the slip bodies to effectively contact and grip the pipe. The slip bodies 15 in being made hollow as above described, and in having the parallel sides 18, are light in weight so that the slips are easy to handle. The wings 22 insure the proper spacing of the set of slips about the pipe P but do not materially increase the weight of the slips. The cooperation of the flat radial ends 34 of the liners 16 with the vertical walls 33 of the channels 32 hold the liners against outward or forward displacement from the channels. The shoulder 36 limits the downward movement of the liners and aids in retaining the liners. The plate 40 is held against upward movement through its cooperation with the groove 41 and cooperates with the upper ends of the liners to prevent upward or longitudinal displacement of the liners from the channels. The cotter keys 46 which removably hold the plates 40 against displacement are not subjected to any severe usage. The cotter keys 46 are easily engageable and removable to allow the plates 40 to be withdrawn forwardly out of the grooves 41. The liner assembly and the liner retaining means of the invention are simple and dependable and are inexpensive of manufacture.

Having described only a typical form and application of our invention, we do not wish to limit ourselves to the specific details set forth, but wish to reserve to ourselves any changes or variations that may appear to those skilled in the art or that fall within the scope of the following claims:

Having described our invention, we claim:

1. A slip of the character described including a body having spaced longitudinal channels in its inner side, a liner in each of the channels engaging the side walls thereof to be held against lat-

eral displacement therefrom, and a single means removably securing the liners in the channels.

2. A slip of the character described including a body having spaced longitudinal channels, a removable liner in each of the channels cooperating with the walls thereof to be held against outward displacement therefrom, and a detachable plate holding the liners against longitudinal displacement from the channels.

3. In a slip of the character described, a body having spaced longitudinal channels, a removable liner in each channel cooperating with the walls thereof to be held against outward displacement and longitudinal displacement in one direction, and a detachable plate holding the liners against longitudinal displacement from the channels in the other direction.

4. In a slip of the character described, a body having spaced longitudinal channels and a transverse groove, a removable liner in each channel cooperating with the walls thereof to be held against outward displacement and longitudinal displacement in one direction, and a removable plate in the groove for holding the liners against longitudinal displacement in the other direction.

5. In a slip of the character described, a body having spaced longitudinal channels and a groove intersecting the upper portions of the channels, a removable liner in each channel cooperating with the walls thereof to be held against outward displacement and downward displacement, a plate in the groove for preventing upward displacement of the liners, and means for removably retaining the plate in the groove.

6. In a slip of the character described, a body having spaced longitudinal channels adapted to retain removable liners against outward displacement and downward displacement and having a groove intersecting the upper portions of the channels, a removable plate in the groove for preventing upward displacement of the liners, a tongue on the plate extending through an opening in the body, and a removable key on the tongue for holding the plate in the groove.

7. A slip of the character described including a body having a channel in its inner side, a transverse groove in said side intersecting the upper portion of the channel and an outwardly extending opening joining the groove, a liner in the channel retained against outward and downward displacement therefrom through contact with its walls, a removable plate in the groove for preventing upward displacement of the liner, a tongue on the plate projecting through said opening, and a removable key on the tongue cooperating with the body to retain the plate in the groove.

8. A slip including an arcuate body having a longitudinal channel in its inner side and a transverse groove in its inner side intersecting the upper portion of the channel, the channel having radial side walls, a liner in the channel, the liner having radial sides cooperating with said walls whereby it is held against outward displacement, a removable plate in the groove retaining the liner in the channel, and removable means for holding the plate in the groove.

9. A slip including an arcuate body having spaced longitudinal channels in its inner side with radial side walls and having a groove intersecting the channels and an opening joining the groove, removable liners in the channels having radial sides cooperating with said radial walls whereby they are held against outward displacement from the channels, a removable plate in the groove preventing longitudinal displacement of the liners, a tongue on the plate extending through said opening, and a removable key on the tongue retaining the plate in the groove.

10. In a slip of the character described a body for arrangement in the opening of a rotary table, the body having a curved convex outer surface for seating in the opening, a curved concave inner surface for carrying pipe engaging means, substantially parallel opposite sides, and radial surfaces on said sides adjacent the inner surface for cooperating with adjacent slips.

11. A slip including an arcuate body having spaced longitudinal channels in its inner side with radial side walls and having a groove intersecting the channels and an opening joining the groove, removable liners in the channels having radial sides cooperating with said radial walls whereby they are held against outward displacement from the channels, a removable plate in the groove preventing longitudinal displacement of the liners, a tongue on the plate extending through said opening, the body having an open recess into which the end portion of the tongue projects, and a removable key arranged in an opening in said portion of the tongue and adapted to cooperate with the wall of the recess to hold the plate in the groove.

12. In a slip of the character described a body for arrangement in the opening of a rotary table, the body having a curved convex outer surface for seating in the opening, a curved concave inner surface for carrying pipe engaging means, substantially parallel opposite sides, and wings projecting from the said opposite sides and having surfaces for cooperating with the corresponding surfaces of adjacent slips.

13. In a slip of the character described a body for arrangement in the opening of a rotary table, the body having a curved convex outer surface for seating in the opening, a curved concave inner surface for carrying pipe engaging means, substantially parallel opposite sides, and wings projecting from the said opposite sides and having surfaces for cooperating with the corresponding surfaces of adjacent slips, the wings being of relatively small extent longitudinally of the body.

14. In a slip of the character described, a body having a channel in its inner side, and a transverse groove adjacent its upper end intersecting the channel, a removable liner in the channel held against lateral displacement therefrom through cooperation with its walls, and a plate in the groove preventing longitudinal displacement of the liner from the channel.

15. In a slip of the character described, a body for arrangement in the opening of a rotary table, the body having an outer surface for seating in the opening of the table and having pipe engaging means on its inner surface, the opposite sides of the body being substantially parallel, and wings projecting from the said opposite sides and having surfaces for cooperating with the corresponding surfaces of adjacent slips.

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