

July 13, 1937.

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2,086,652

BOWL RELEASING SLIP

Filed March 4, 1935

2 Sheets-Sheet 1

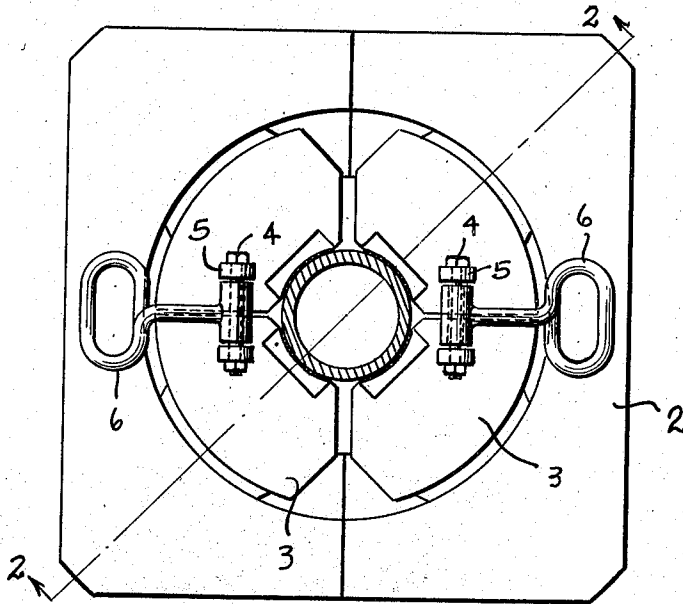


Fig. 1.

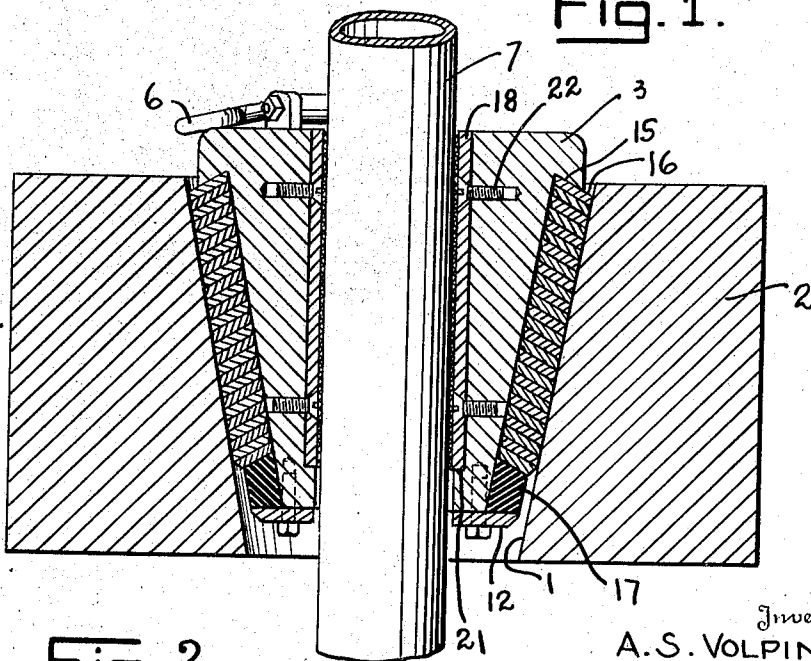


Fig. 2.

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2 Sheets-Sheet 2

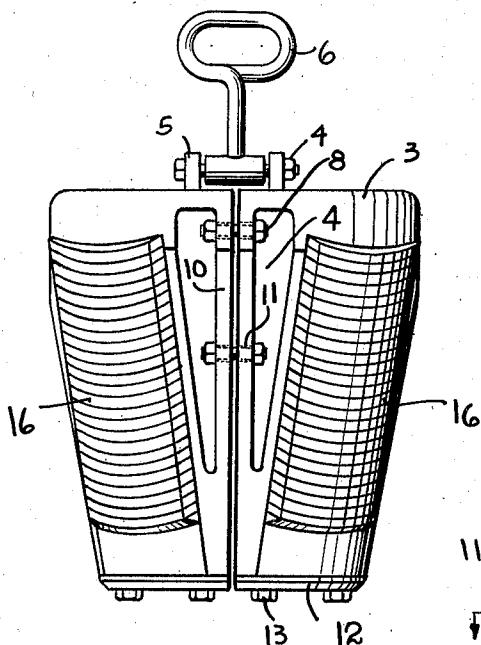


Fig. 3.

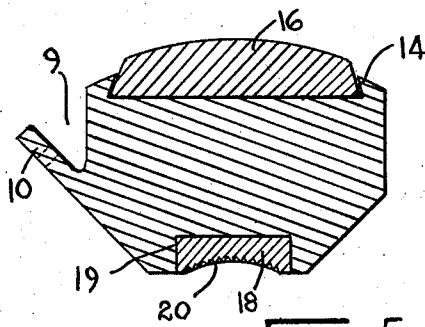


Fig. 5.

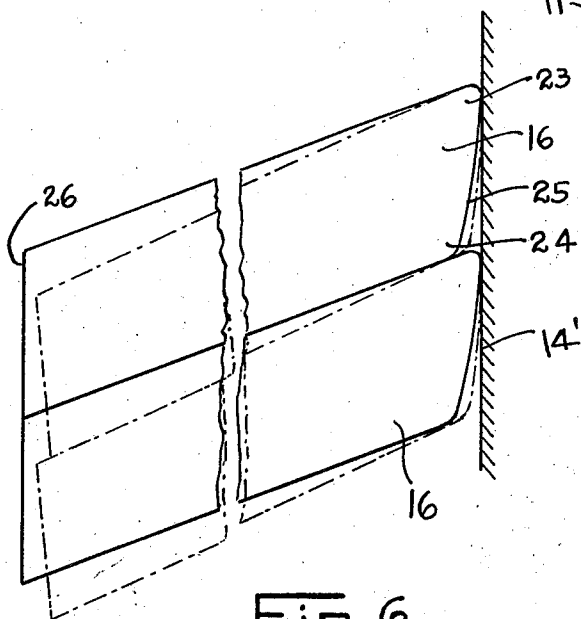


Fig. 6.

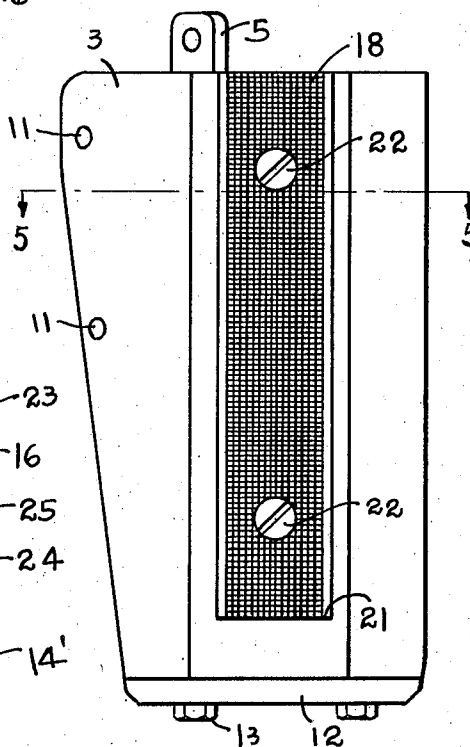


Fig. 4.

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BOWL RELEASING SLIP

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12 Claims. (Cl. 24-263)

The invention relates to slips for supporting pipe in oil well drilling and producing operations.

It is necessary in handling pipe while it is being introduced into and withdrawn from deep wells in oil well operations to support the pipe at the upper end of the well either within a tapered bowl in the casing head or in the platform of the rotary which is employed to rotate the pipe. Slips of this general character are well known in the art.

It is an object of the invention to provide a slip for supporting pipe in a tapered seat which is constructed so that it will easily release when the pipe is drawn upwardly relative to the support.

I desire to provide a releasing surface on the outer diameter of the slip which will engage the tapered bowl in supporting the pipe, but which will easily release when the pipe is elevated.

It is another object of my invention to form the bowl-engaging portion of the slip so that its outer diameter will be reduced as the slip is moved upwardly during the releasing operation.

It is also an object to provide a flexible releasing surface for the outer portions of the slip which is so mounted relative to the body of the slip that it furnishes a substantial support for the pipe.

I further desire to provide a removable pipe-engaging portion for the slip which will be removable and renewable and will form a frictional engagement with the pipe of comparatively large area.

It is a further object of the invention to make up a bowl-engaging structure for the slips which has a substantial area of engagement with the seat bowl and will not be easily broken or worn in use.

Referring to the drawings herewith, Fig. 1 is a top plan view of a bushing or adapter for use on rotaries and showing the use of slips of my improved form.

Fig. 2 is a central vertical section through the slip and bushing.

Fig. 3 is a side elevation of a slip incorporating the invention.

Fig. 4 is a front elevation of a slip jaw on which my invention is employed.

Fig. 5 is a transverse section on the plane 5-5 of Fig. 4.

Fig. 6 is an enlarged detail of a diagrammatic nature showing the way in which the releasing plates engage the bowl of the bushing.

I have shown the slip as being supported in a tapered seat 1 upon a polygonal bushing or

adapter 2 to be seated within a seat in a rotary platform, used in drilling operations. This is simply illustrative, it being common to provide a tapered seat, such as 1, for supporting slips of this character.

The slips are two in number, each of the slips having two jaws 3 connected together at their upper ends by a transverse bolt 4 extending through eyelets 5 upon each of the jaws, said bolts acting as a connection for a handle 6.

The jaws are of the usual downwardly tapered contour being wedge-shaped in transverse section, the outer surface being tapered downwardly and the inner face being substantially vertical to engage the pipe 7. Each set of two jaws is connected at the upper end by the handle as shown and said jaws are further connected by through bolts 8 shown in Fig. 3. To accommodate these bolts the outer faces of the jaws 3 are recessed at 9, thus providing an outwardly extending wall 10, which is formed with openings to allow the passage of the bolts 8, one bolt being toward the upper end of the jaw and the other intermediate the ends thereof. These bolts fit loosely through the openings indicated at 11 in Fig. 3 so that the jaws will have a relative play or movement.

Each of the two jaws is equipped with a lower plate 12 arcuate in shape, fitting against the lower ends of the jaws and held in position by set screws 13 extending upward from the plate into the jaw.

The construction of the bowl-engaging surface of the slip is one of the principal features of novelty in the invention. To form this outer bowl-engaging surface I recess the outer curved face of the jaw with a dove-tailed mortise shown at 14 in Fig. 5. This mortise extends short of the upper end and the downwardly inclined shoulder 15 forms the upper wall of the recess. The lower end of the mortised recess is open except for the closure plate 12 previously noted.

Within this mortised recess I have placed a series of superposed flattened plates 16, which are downwardly inclined in their position in the recess, as shown best in Fig. 2. The upper face of the upper plate has a firm support against the inclined shoulder 15 of the mortise. Said plates are introduced upwardly from the lower end into position in the mortise and the lowermost plate is held in position resiliently by a pad of rubber 17 or other resilient material. I contemplate holding the plates generally in contact with each other by so supporting them that when the slip is moved upwardly the plates may be pivoted at

their inner ends to swing downwardly at their outer ends, thus permitting ready release.

The forward vertical face of each jaw is provided with a removable pipe-engaging surface. This is provided upon the plate 18, which, as seen in Fig. 5, is set within a recess or groove 19 formed in the forward face of the jaw. The pipe-engaging portion of the plate is arcuate at 20 and toothed to form a frictional face to engage with the pipe and frictionally support the same. These plates are introduced into the recess at the upper end, the plate resting at its lower end upon a shoulder 21 in the groove or recess. The plates are further held in position by set screws 22 inserted from the forward side into the body of the jaw.

For the effective operation of releasing the slip from the bowl, the plates 16, which form the releasing surface, are rounded at the upper and lower edges on the side of the plate directed toward the inner wall of the seat or mortise in the slip. Thus with reference to Fig. 6 it will be seen that the upper edge at 23 is rounded and the lower inclined edge is rounded at 24 and the lower portion of the inner face of the plate is also somewhat curved as shown at 25.

In the operation of the slip it will be understood that when the pipe 7 is supported within the tapered seat by means of the slip member the weight of the pipe will exert a strong downward pull upon the slips, wedging them into the seat and forcing them strongly into frictional engagement with the pipe. In deep well drilling, the weight of the drill stem may exert many tons of downward pull upon the slips. The result is that the slips tend to wedge tightly between the tapered seat and the pipe. When the pipe is thereafter to be released the pipe 7 is pulled upwardly by the draw works and cable connected therewith and the slips then tend to move upwardly with the pipe and release from the bowl so that the slips may be removed from their position, allowing the further handling of the pipe.

In order that the slips do not wedge and fail to release when the pipe is drawn upwardly, my plates 16, which form the contacting surface with the bowl, are arranged to have a rocking motion on the outer surface of the slip which tends to easily release from the bowl. This will be understood from Fig. 6. The inner surface of the mortise 14 in the slip is indicated at 14' in Fig. 6. The body of the slip including this inner wall 14' tends to move upwardly with the pipe. As it moves upwardly the plates 16 are moved upwardly at their inner ends first, and the plates will rock somewhat, moving downwardly on their outer surfaces 26 into the dotted line position there indicated. It will be seen, therefore, that the effective outer diameter of the slip has been decreased, thus allowing the slip to move freely in an upward direction out of the seat 1 of the bowl. The rounded edges upon the plate 16 enable this rocking motion without difficulty and contribute to the release of the slips.

It will thus be seen that my improved slip releases first at the outer diameter. This is of some importance in that there is a longer lever arm between the pipe which moves upwardly and the releasing surface than would be the case if the releasing surface were at the pipe. Furthermore, this reduction in the diameter of the slip, due to the rocking motion of the plates in their recesses, also enables the slip to release more easily. On the other hand, where the weight of the pipe is supported upon the slip it will be seen that the

tendency will be for the outer edges of the plates 16 to move upwardly. They are prevented from this movement by contact with each other and with the upper shoulder 15 of the recess. The tendency to rock upwardly, however, tends to force the slip inward toward the pipe and increase the frictional engagement with the pipe, thus obtaining a firm hold thereon, which will not allow the pipe to drop. The further advantages of this device will be obvious to those skilled in the art.

What I claim as new is:

1. A pipe-engaging slip including a plurality of jaws the outer surfaces of which are tapered downwardly to engage within a downwardly tapered slip bowl, an inner pipe-engaging face on each jaw, there being a mortised recess on the outer tapered surface of each of said jaws, said recess having an upper shoulder, superposed plates in said recess, and means to yieldably hold said plates upwardly toward said shoulder.

2. A pipe engaging slip including a plurality of jaws the outer surfaces of which are tapered downwardly to engage within a downwardly tapered slip bowl, an inner pipe engaging face on each jaw, there being a mortised recess on the outer tapered surface of each of said jaws, said recess having an upper downwardly and outwardly tapered shoulder, superposed plates in said recess, and means to yieldably hold said plates upwardly toward said shoulder.

3. A pipe-engaging slip including a plurality of jaws, means to handle said jaws as a unit, an inner pipe-engaging face on each jaw, an outer arcuate surface on each jaw tapered to engage a downwardly tapered slip bowl, said outer surface including the outer edges of a plurality of superposed plates supported by each of said jaws in a downwardly and outwardly inclined position and a support for said plates yieldable to permit said plates to incline still further in a downward direction at their outer margins when the body of said slip is moved upwardly out of bowl-engaging position.

4. A pipe engaging slip including a plurality of jaws, an inner pipe engaging face on each jaw, an outer arcuate surface on each jaw tapered to engage a downwardly tapered slip bowl, said outer surface including the outer edges of a plurality of superposed plates supported by each of said jaws in a downwardly and outwardly inclined position, means to hold said plates resiliently in said inclined position but adapted to yield to allow said plates to move relatively downward adjacent said bowl to release from bowl-engaging position.

5. A pipe-engaging slip including a plurality of jaws, an inner pipe engaging face on each jaw, an outer arcuate surface on each jaw tapered to engage a downwardly tapered slip bowl, said outer surface including the outer edges of a plurality of superposed plates mounted in a mortised recess in said jaw, an upper shoulder for said recess and means to hold said plates resiliently against said shoulder.

6. A pipe engaging slip including a plurality of jaws, means to handle said jaws as a unit, an inner pipe engaging face on each jaw, an outer arcuate surface on each jaw tapered to engage a downwardly tapered slip bowl, said outer surface including the outer edges of a plurality of superposed plates mounted in a mortised recess in said jaw, an upper shoulder for said recess and means to hold said plates resiliently against said shoulder, the inner edges of said plates having rounded corners to permit rocking of said plates

and allow the bowl-engaging edge of each plate to move relatively downward during release from said bowl.

7. In a pipe engaging slip, an arcuate jaw tapered downwardly on its outer face to engage a tapered slip bowl, a longitudinal recess in the outer tapered surface of said jaw having an upper shoulder, a plurality of superposed plates in each recess, a pad of rubber below said plates in said recess, means to close the lower end of said recess, and a pipe-engaging inner face on said jaw.

8. In a pipe-engaging slip, an arcuate jaw tapered downwardly on its outer face to engage a tapered slip bowl, a longitudinal recess in the outer face of said jaw having an upper shoulder, a plurality of superposed plates in each recess, a pad of rubber below said plates in said recess, means to close the lower end of said recess, a pipe-engaging inner face on said jaw, said plates having their inner edges rounded to allow said plates to rock relative to the inner side of said recess.

9. In a pipe-engaging slip, an arcuate jaw tapered downwardly on its outer face to engage a tapered slip bowl, a longitudinal recess in said jaw having an upper shoulder, a plurality of superposed plates in each recess, a support for said plates yieldable to permit said plates to rock and incline downwardly at their outer margins to reduce the outer diameter of said slip.

10. A pipe-engaging slip, a jaw, means on its inner surface adapted to engage a pipe, said slip being formed to engage within a downwardly tapered slip bowl, and releasable means on each jaw to contact with said slip-bowl, comprising a series of superposed plates, resiliently supported so that the outer edges of said plates may rock downwardly to decrease the outer dimension thereof when said slip is moved relatively upward.

11. The combination of a slip bowl and a slip therein, a tapered surface in said bowl to receive the load of said slip, and movable means on the outer surface of the slip to contact said tapered surface, said means being movable downwardly relative to said slip so as to vary the diameter of the slip as the load is removed therefrom and the slip is raised upwardly.

12. In a pipe engaging slip, a jaw, a pipe engaging surface on the inner side thereof, the outer portion of said jaw being downwardly tapered, flexible means associated with the outer face of each jaw to engage with a downwardly tapered slip bowl, said means including plates yieldable downwardly to decrease the outer diameter of said slip as said slip is moved relatively upward.

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