Oct. 31, 1961 J. N. GREGORY 3,006,680

PIPE HANDLING APPARATUS FOR USE IN AND ABOUT A DERRICK

Filed Oct. 28, 1957 2 Sheets-Sheet 1

Fig. 1

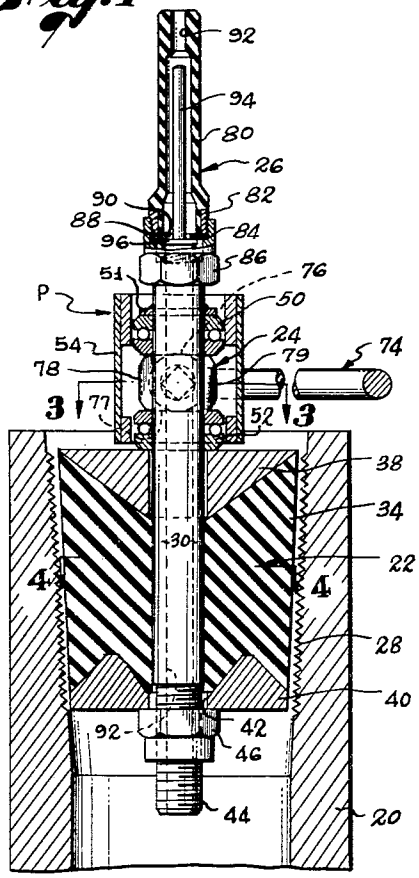
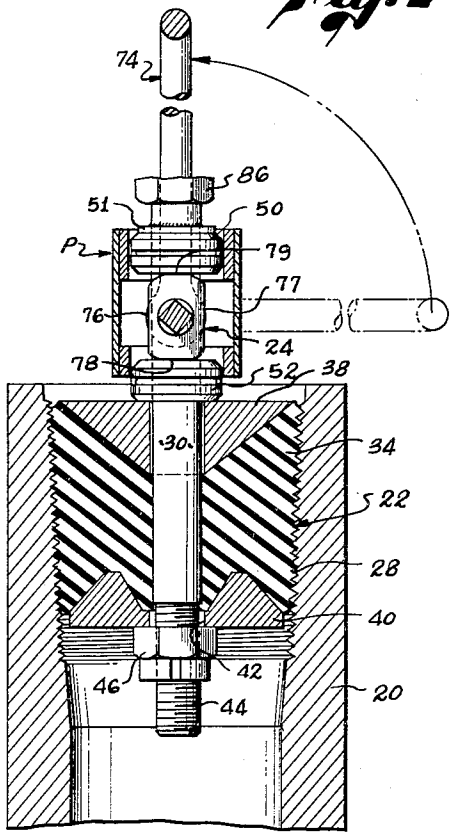


Fig. 2



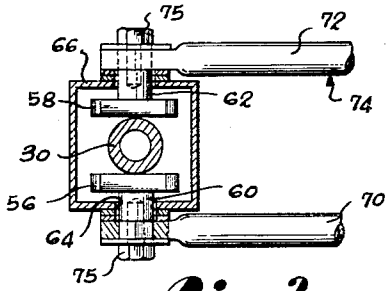


Fig. 3

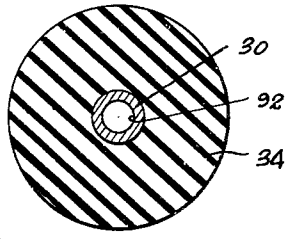


Fig. 4

INVENTOR.
JAMES N. GREGORY
BY Lulcider Mattingly & Huntley
Attorneys

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PIPE HANDLING APPARATUS FOR USE IN AND ABOUT A DERRICK

Filed Oct. 28, 1957 2 Sheets-Sheet 2

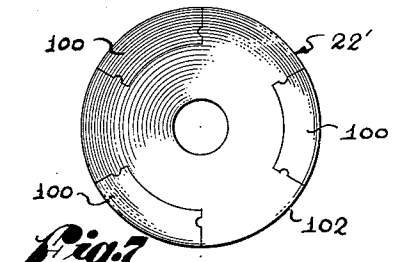
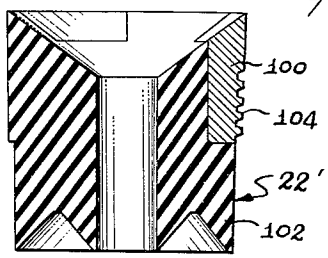


Fig. 7

Fig. 6



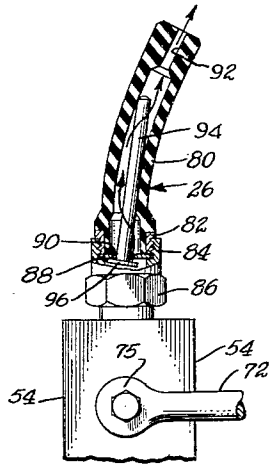


Fig. 5

INVENTOR.
JAMES N. GREGORY
BY Zulwicker Mattingly & Huntley
Attorneys

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PIPE HANDLING APPARATUS FOR USE IN AND ABOUT A DERRICK

James N. Gregory, 5651 Sorrento Drive, Long Beach, Calif.

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4 Claims. (Cl. 294—93)

The present invention relates generally to the art of drilling and producing petroleum products and more particularly to novel apparatus for use in handling pipe within a derrick.

When removing a pipe string from a well bore, well liquids are often blown upwardly out of the upper end of the pipe string. The escape of such well liquids is not only annoying to derrick personnel, but additionally it increases the hazards connected with the operation of derrick equipment. Moreover, where the derrick is located in a residential area, expensive damage may be inflicted upon surrounding property. In order to prevent such escape of well liquids it has been heretofore proposed to temporarily seal the upper end of the pipe string with a so-called wet plug. The heretofore-proposed wet plugs are generally manually threaded into the upper end of the top stand in the drilling pipe. When the stand has been lifted from the hole, the wet plug is then manually unthreaded and lowered to the derrick floor for re-use. The use of such heretofore-proposed wet plugs is both time-consuming and hazardous, inasmuch as such a plug must be handled by a derrick man over the heads of the floor crew.

It is a major object of the present invention to provide a novel and improved wet plug.

An additional object is to provide a wet plug which may be readily and rapidly applied to and removed from the upper end of a pipe stand.

Another object is to provide a wet plug which incorporates a selectively actuable valve for releasing fluids trapped within the pipe stand under the control of a derrick man.

A further object is to provide a wet plug of the aforedescribed nature which is simple in design and rugged of construction whereby it may afford a long, useful and trouble-free service life.

Yet another object of the invention is to provide a wet plug of the aforedescribed nature which is foolproof in operation utilizing a minimum number of working parts.

These and other objects and advantages of the present invention will become apparent from the following detailed description when taken in conjunction with the appended drawings wherein:

FIGURE 1 is a side view in central vertical section showing a preferred form of wet plug embodying the present invention;

FIGURE 2 is a view similar to FIGURE 1 but showing the parts of the wet plug disposed in a pipe sealing position;

FIGURE 3 is a fragmentary horizontal sectional view taken along line 3—3 of FIGURE 1;

FIGURE 4 is a horizontal sectional view taken along line 4—4 of FIGURE 1;

FIGURE 5 is a fragmentary view showing the operation of a fluid release valve that forms a part of said wet plug;

FIGURE 6 is a side view taken in central vertical elevation showing a modified form of packer member which may be employed with said wet plug; and

FIGURE 7 is a top plan view of the packer member of FIGURE 6.

Referring to the drawings and particularly FIGURES 1 through 5 thereof, the preferred form of wet plug P

embodying the present invention is utilized in conjunction with a stand of well pipe or tubing 20. The wet plug P includes a packer member, generally designated 22, a cam mechanism, generally designated 24, disposed above the packer member 22, and a valve member, generally designated 26, arranged above the cam mechanism 24. The packer member 22 is formed of resilient material and in use it is inserted within the upper end of the pipe stand 20 in its retracted position of FIGURE 1. Thereafter, the cam mechanism 24 is employed to expand the packer member 22 radially outwardly to its pipe sealing position of FIGURE 2. In this pipe sealing position the packer member 22 serves to prevent communication between the interior of the pipe stand 20 and the atmosphere except through the valve 26. This valve 26 is normally arranged in its closed position of FIGURE 1. It may be moved to its open position of FIGURE 5, however, under the control of a derrick man so as to release the contents of the pipe stand 20.

With continued reference to FIGURES 1 through 5, the packer member 22 is of generally frusto-conical configuration having its upper and lower ends truncated. The taper of the packer member corresponds generally to the taper of the internal threads 28 formed at the upper end of the pipe stand 20. The packer member 22 is coaxially carried upon an axially extending tubular stem 30 and includes packer sleeve 34 formed of a rubber-like or resilient material. A downwardly tapering generally frusto-conical pusher disk 38 abuts the upper ends of the sleeve 34. This pusher disk 38 is preferably of metallic construction and is axially slidably carried by the intermediate portion of the stem 30. The lower end of the sleeve 34 abuts an annular retainer 40. This retainer 40 is centrally formed with a bore 42 that receives the lower portion of the stem 30. The lower portion of the stem 30 is formed with threads 44, and the retainer 40 is locked against downward axial movement relative to the stem 30 by means of a castellated nut 46.

The cam mechanism 24 includes an upper ball bearing assembly 50 having its upper portion abutting the underside of a washer 51 which is fixed against axial movement relative to the stem 30, as by welding. A similar lower ball bearing assembly 52 is axially slidably carried by the stem 30. A hollow carrier 54 encompasses the upper and lower ball bearing assemblies 50 and 52. The upper and lower ends of this carrier 54 are open. A pair of horizontally aligned cam plates 56 and 58 are interposed between the underside of the upper bearing assembly 50 and the upper surface of the lower bearing assembly 52 on opposite sides of the stem 30, as indicated in FIGURE 3. These cams 56 and 58 are rigidly connected to a pair of horizontally aligned shafts 60 and 62, respectively. These shafts 60 and 62 extend through bores 64 and 66, respectively, formed in the intermediate portion of the housing 54. The outer ends of these shafts 60 and 62 are rigidly affixed to the legs 70 and 72, respectively, of a generally U-shaped handle that is generally designated 74 by bolts 75. The cam plates 56 and 58 are each formed with a first pair of diametrically opposed flats 76 and 77 and a second pair of diametrically opposed flats 78 and 79 that are displaced at right angles relative to the first pair of flats. It should be noted that the carrier 54, cam plates 56 and 58 and the handle 74 are free to rotate relative to the stem 30 and packer member 22.

As indicated in FIGURE 1, when the handle 74 is generally horizontally disposed relative to the stem 30, the first pair of flats 76 and 77 will be horizontally disposed relative to the upper and lower bearing assemblies 50 and 52. When, however, the handle is pivoted

to its vertically extending position of FIGURE 3, the second pair of flats 78 and 79 will be rotated so as to engage the proximate surfaces of the upper and lower bearing assemblies. Since the second pair of flats 78 and 79 are spaced further apart than the first pair of flats 76 and 77, the lower bearing assembly 52 will be forced axially downwardly along the stem 30 relative to its position of FIGURE 1. As shown in FIGURE 2, such axial downward movement of the lower bearing assembly 52 effects concurrent downward axial movement of the upper retainer 38. Since the lower retainer 40 is fixed against downward axial movement, the packer sleeve 34 will be expanded outwardly so as to move into sealing engagement with the threads 28 of the pipe stand 20.

The valve 26 includes a generally tubular body 80 that is coaxially aligned with the hollow stem 30. The body 80 is formed of a resilient material, such as rubber. The lower end of the body 80 is bonded to a metallic externally threaded mounting ring 82. The threads of this mounting ring 82 are received by a complementary internally threaded receiving ring 84. The receiving ring 84 is removably affixed to the upper end of the stem 30 by means of a nut 86. A washer 88 is interposed between the rings 82 and 84. The washer 88 is coaxially formed with a bore 90 that is in communication with the upper end of the bore 92 of the hollow stem 30. The upper end of the body is open to the atmosphere through a discharge passage 92. A valve stem 94 is interposed within the confines of the valve body 80. The lower end of this valve stem 94 extends through the bore 90 of the washer 88 and is integrally affixed to a disc 96. The upper surface of this disc 96 normally seats against the underside of the washer 88 so as to prevent the escape of pressurized fluids through the upper end of the stem bore 92.

In the operation of the aforedescribed preferred form of wet plug P, the packer member 22 is inserted into the upper end of the pipe stand 20 to be removed from the well bore in a retracted condition, as indicated in FIGURE 1. Next, the handle 74 is pivoted from its horizontally extending position of FIGURE 1 to its generally vertically extending position of FIGURE 2. As the handle 74 undergoes such pivotal movement, the cam plates 56 and 58 will effect downward movement of the lower bearing assembly 52 and hence of the pusher disk 38. In this manner, the sleeve 34 of the packer member 22 is expanded radially outwardly into sealing relationship with the upper end of the pipe stand 20. The cam plates 56 and 58 will be retained in their position of FIGURE 2 by the abutment of the second pair of flats 78 and 79 with the proximate sides of the upper and lower bearing assemblies 50 and 52. Hence, the packer member 22 will be caused to remain in its expanded position of FIGURE 2.

As the pipe 20 is rotated so as to unthread its lower end from the pipe string, the handle 74, cam plates 56 and 58 and the carrier 54 may remain stationary. After the pipe stand 20 has been lifted out of the well bore, the valve 26 will be actuated so as to release any pressurized fluid contained within this pipe 20. Thus, referring to FIGURE 5, the derrick man will bend the resilient body 80 away from the vertical. Such bending will cause the valve stem 94 to be tilted out of the vertical to its position of FIGURE 5. This tilting of the valve stem 94 away from the vertical will unseat the disk 96 relative to the washer 88. In this manner, the interior of the pipe stand 20 will be opened to the atmosphere, the interior of this pipe stand being in communication with the hollow interior of the stem 30. After the pressurized fluid contents of the pipe stand 20 have been released, the derrick man merely releases the valve body 80 and it will automatically return to its original configuration so as to reseat the valve disk 96 relative to the washer 88.

Referring now to FIGURES 6 and 7 there is shown

a modified form of packer member 22' which may be employed with the aforedescribed wet plug P. This second form of packer member 22' is especially adapted for use where high fluid pressures or heavy loads are encountered. The modified packer member 22' is generally similar to the aforedescribed packer member 22 with the exception that a plurality (preferably three) of metallic inserts 100 are molded into the upper portion of the outer sleeve 102. The radially outer portion of the metallic inserts 100 are formed with external threads 104 that are complementary to and adapted to be engaged with the threaded portion 28 of the pipe stand 20.

Various modifications and changes may be made with respect to the foregoing description without departing from the spirit of the invention or the scope of the following claims.

I claim:

1. Pipe handling apparatus, comprising: a vertically extending hollow stem; a packer member carried by said stem and including a retainer disposed at the lower portion of said stem, a pusher disc axially slidably carried by said stem above said retainer, and a resilient member interposed between said retainer and said pusher disc; cam means supported by said stem for urging said pusher disc downwardly so as to squeeze said resilient member into sealing engagement with the upper end of a pipe to be handled; a handle operatively attached to said cam means for effecting the operation thereof, said handle being movable between a generally horizontal position to a generally vertical position to squeeze said resilient member into sealing engagement with the upper end of said pipe; bearing means interposed between said handle and said resilient member whereby the latter may undergo relative rotation; and valve means mounted on the upper end of said stem for controlling the flow of fluid therethrough.

2. Pipe handling apparatus, comprising: a vertically extending stem; a packer member carried by said stem and including a retainer disposed at the lower portion of said stem, a pusher element coaxially slidably supported upon said stem above said retainer, and a sleeve-like member formed of resilient material interposed between said retainer and said pusher element, the relaxed outer diameter of said sleeve-like member being less than the inner diameter of the pipe to be handled; a plurality of metallic inserts formed on the outer face portion of said sleeve-like member, the radially outer surface of each of said inserts being formed with teeth for engaging the upper exterior portion of a pipe to be handled; cam means supported by said stem for urging said pusher disk downwardly so as to squeeze said sleeve-like member into sealing engagement with the upper end of said pipe; a handle operatively attached to said cam means for effecting the operation thereof; and bearing means interposed between said handle and said resilient member whereby the latter may undergo relative rotation.

3. Pipe handling apparatus, comprising: a vertically extending hollow stem; a packer member carried by said stem and including a retainer fixedly mounted at the lower portion of said stem, a pusher disc axially slidably carried by said stem above said retainer, and a resilient sleeve-like member carried by said stem between said retainer and said pusher disc, the relaxed outer diameter of said sleeve-like member being less than the inner diameter of the pipe to be handled; a lower bearing assembly axially slidably carried by said stem with its underside abutting the upper surface of said pusher disc; an upper bearing assembly carried by said stem at a point spaced above said lower bearing assembly; means on said stem restraining said upper bearing assembly from upward movement relative to said stem; a carrier encompassing said bearing assemblies; a handle pivotally supported by said carrier for movement between a generally horizontal position towards a generally vertical position; cam means interposed between said upper and lower bearing assem-

blies, said cam means being secured to said handle whereby pivotal movement of said handle from its horizontal position towards a vertical position will cause said cam means to effect downward axial movement of said lower bearing assembly so as to urge said pusher disc downwardly and thereby squeeze said sleeve-like member into sealing engagement with the upper end of said pipe; and valve means mounted on the upper end of said stem for controlling the flow of fluid therethrough.

4. Pipe handling apparatus as set forth in claim 3 wherein a plurality of metallic inserts are formed on the outer face portion of said sleeve-like member, the radially

outer surface of each of said inserts being formed with teeth for engaging the upper exterior portion of said pipe.

References Cited in the file of this patent

UNITED STATES PATENTS

1,864,978	Cottrell	June 28, 1932
2,299,116	Svirsky	Oct. 20, 1942
2,374,947	Nicholson	May 1, 1945
2,538,693	Maisch	Jan. 16, 1951
2,670,799	Dobbs	Mar. 2, 1954
2,820,481	Hix	Jan. 21, 1958