

Nov. 19, 1940.

R. K. HERTEL

2,221,797

TUBING CATCHER AND ANCHOR

Filed May 16, 1938

5 Sheets-Sheet 1

Fig. 1

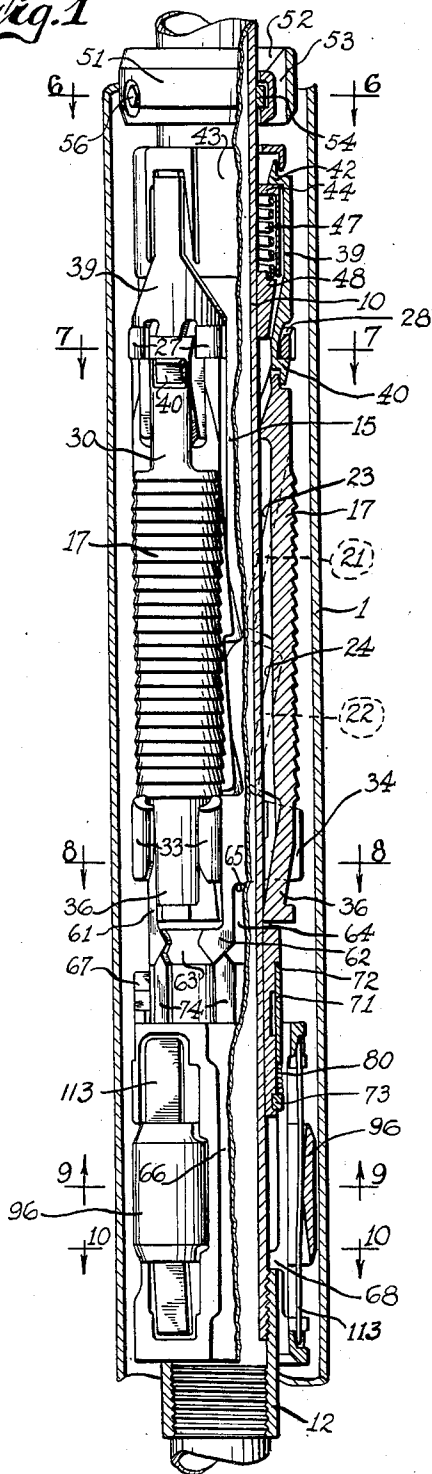
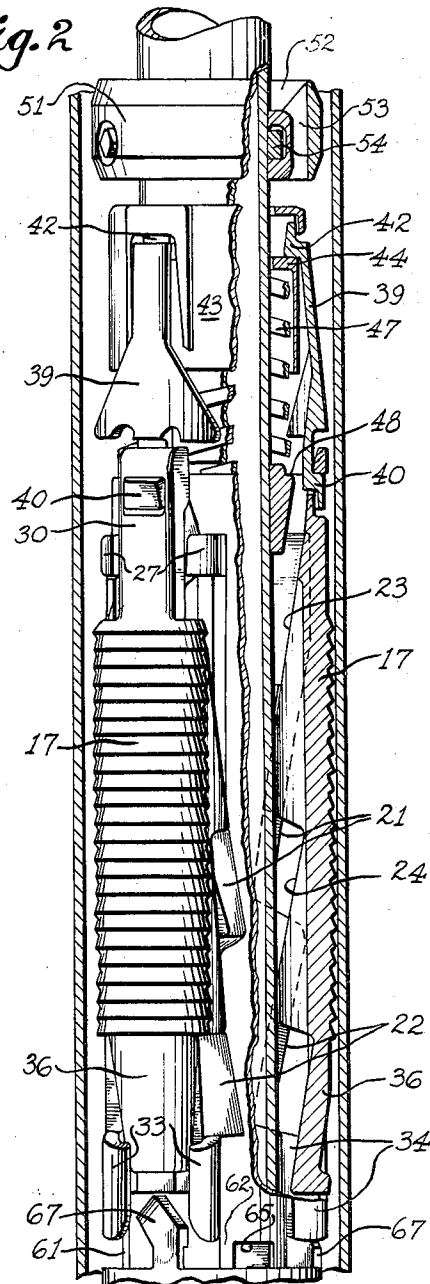


Fig. 2



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5 Sheets-Sheet 2

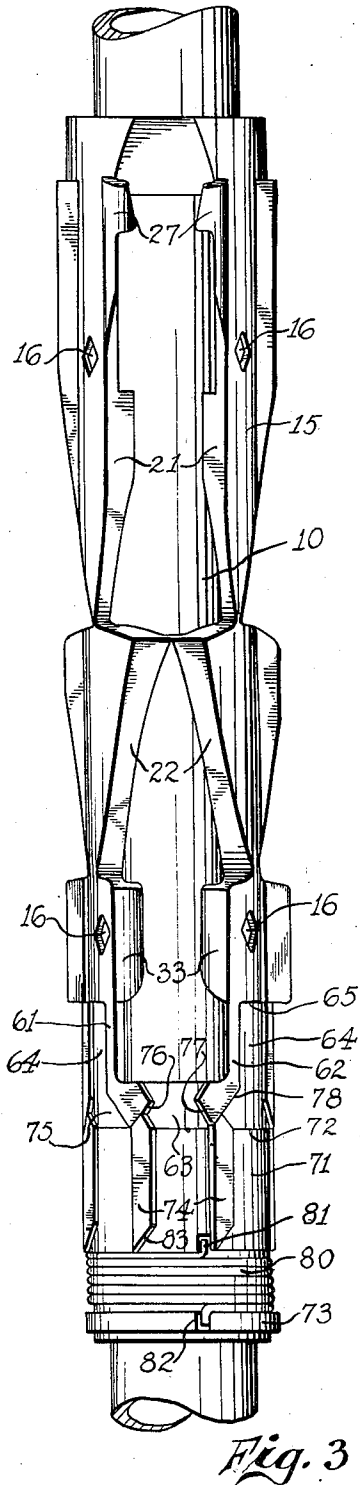


Fig. 3

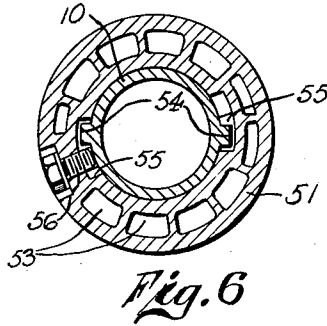


Fig. 6

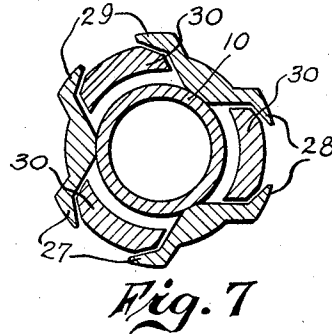


Fig. 7

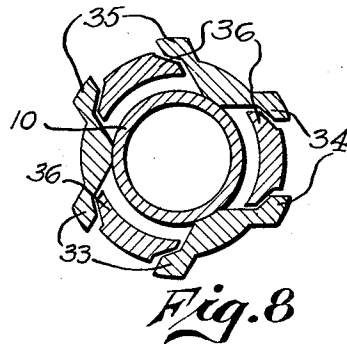


Fig. 8

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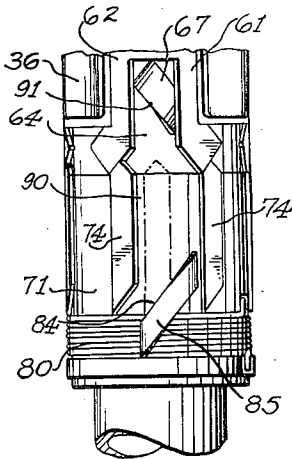


Fig. 4

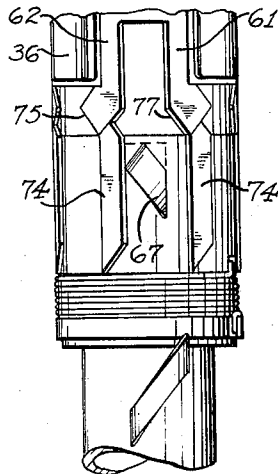


Fig. 4(a)

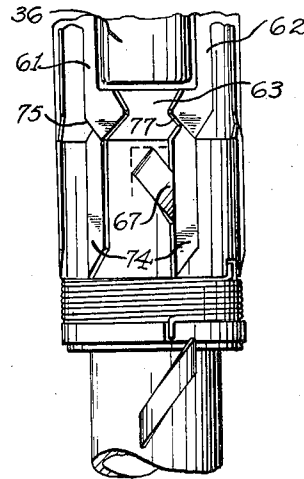


Fig. 4(b)

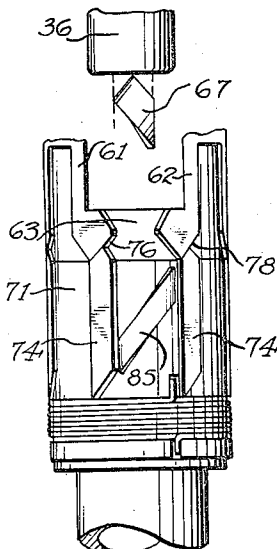


Fig. 5

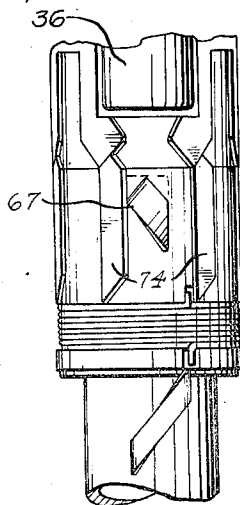


Fig. 5(a)

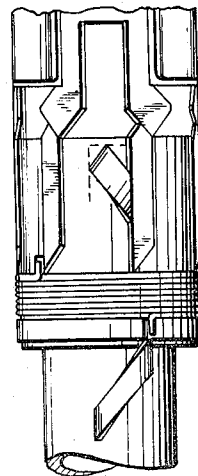


Fig. 5(b)

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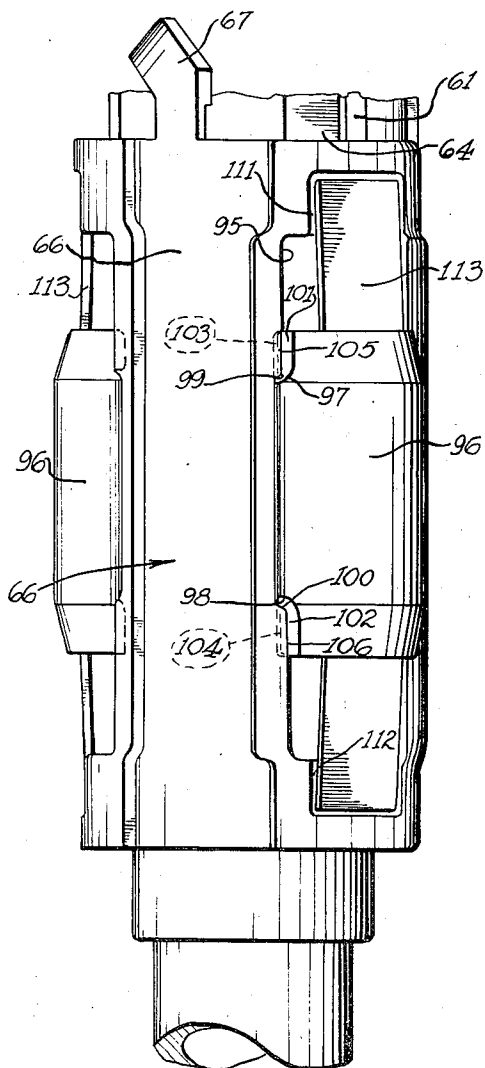


Fig. 11

Fig. 10

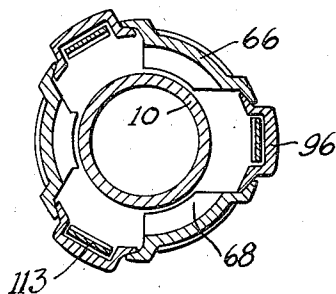
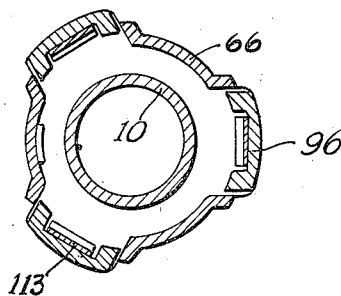


Fig. 9



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TUBING CATCHER AND ANCHOR

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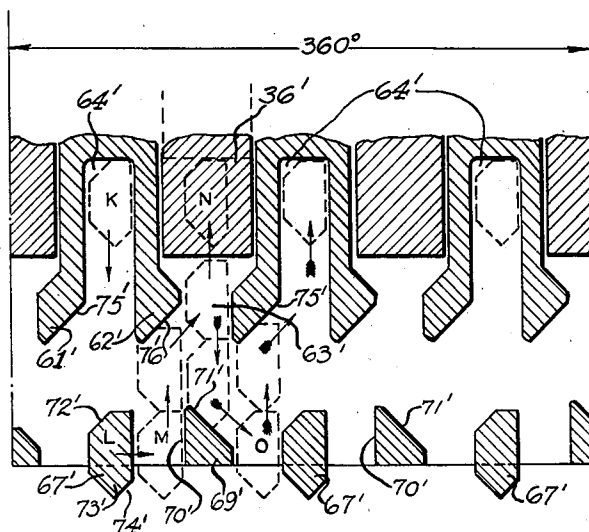


Fig. 13

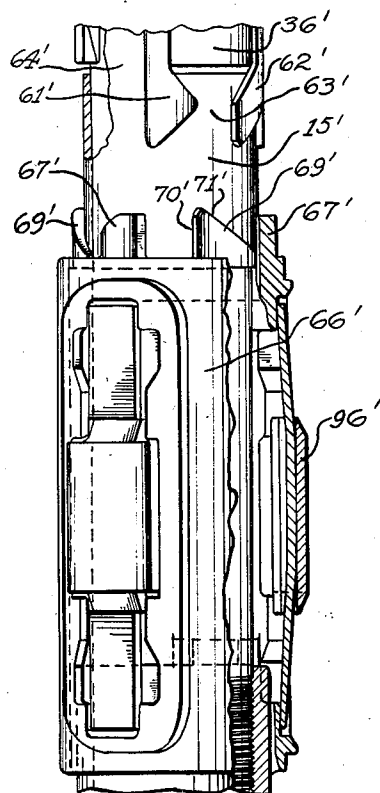


Fig. 12

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UNITED STATES PATENT OFFICE

2,221,797

TUBING CATCHER AND ANCHOR

Richard K. Hertel, Vernon, Calif., assignor to
Byron Jackson Co., Huntington Park, Calif., a
corporation of Delaware

Application May 16, 1938, Serial No. 208,225

24 Claims. (Cl. 103—219)

This invention relates generally to tubing catchers, and is directed particularly to improvements in a tubing catcher of the type embodying wedge slips which are automatically actuated into gripping position in the event the string of pipe in which the catcher is incorporated should drop suddenly.

In the production of oil through a string of tubing, it is common practice to insert a tubing catcher in the tubing string as a safety measure, to catch the string should it part above the catcher or be inadvertently released at the surface. In addition to the provision for automatic setting of the catcher when the tubing is suddenly dropped, it is customary to provide manually operable anchoring means for setting or releasing the slips at will. An objectionable feature of anchors heretofore employed is the necessity of rotating the tubing in opposite directions during the setting and releasing operations. It is obvious that rotation in one direction tends to unscrew the threading tubing couplings, and consequently repeated setting and releasing operations are likely to result in separation of the tubing string.

A principal object of this invention is to provide a tubing catcher having anchoring means cooperating with the slips to set or release the latter at will by successively raising and lowering the tubing and by partially rotating the latter between the raising and lowering operations, the direction of rotation being the same for setting and for releasing the slips. By eliminating the reversal of the direction of rotation, the danger of unscrewing a coupling is avoided.

Tubing anchors now in general use are provided with friction means, usually in the form of outwardly bowed flat steel springs, engaging the outer casing and offering a predetermined resistance to movement of the tubing and the associated anchor through the casing. This type of friction means is not entirely satisfactory, chiefly because of the small contacting area between the springs and the casing. The springs are also liable to distortion through mishandling at the surface. They are usually riveted to upper and lower rings, causing concentrated flexing at these points and premature failure for this reason.

A further object of this invention is to provide a friction shoe for use with tubing anchors, wherein the friction area is greatly increased, enabling a substantial reduction in the pressure required to be exerted by the springs to obtain the necessary frictional resistance. By reduc-

ing the pressure the spring means may be shortened considerably and at the same time the unit stresses may be reduced, resulting in longer life of the springs.

A still further object is to provide friction means including interchangeable wear shoes, whereby a single size of anchor may be used in casings of different diameters simply by the selection of wear shoes of proper thickness.

A still further object is to improve the mounting of the slips on the tubing catcher.

Other objects and advantages will be apparent from the following description, taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is an elevational view, partly in section, showing one form of tubing catcher and anchor constructed in accordance with my invention;

Fig. 2 is a view similar to Fig. 1, showing the tubing catcher anchored in a well;

Fig. 3 is an elevational view of the nipple and head of the tubing catcher of Figs. 1 and 2;

Figs. 4, 4(a), 4(b), 5, 5(a) and 5(b) illustrate the relative positions assumed by the slip-actuating lugs on the anchor during the manual setting and releasing operations;

Figs. 6 to 10 are horizontal sections taken on lines 6—6, 7—7, 8—8, 9—9 and 10—10, respectively, of Fig. 1;

Fig. 11 is an elevational view of the anchor sleeve and shoes;

Fig. 12 is a view in elevation of the lower portion of a tubing catcher, illustrating a modified form of anchor mechanism;

Figure 13 is a sectional development of the anchor mechanism of Fig. 12, taken at diameter J of that figure.

Referring to the drawings, and particularly to Fig. 1 thereof, a tubing catcher is shown suspended within a well casing 1, being interposed between adjacent sections of a string of tubing. In the present instance the tubing catcher and anchor are mounted on a single nipple 10 extending between the adjacent ends of the tubing sections and connected thereto by the usual couplings, the lower coupling being indicated at 12. It will be apparent, however, that the nipple may comprise upper and lower sections detachably secured together to permit the removal of the lower nipple section and the anchor in case it is desired to dispense with the anchor.

A tubing catcher head 15 is formed on the nipple 10, either as an integral part thereof or as a separate member rigidly secured thereto. In Fig. 3 the head 15 is shown as a separate mem-

ber, secured to the nipple by spot welding through a plurality of openings 16 formed in the head. The head 15 slidably supports a plurality of anchoring slips 17, having arcuate outer faces provided with downwardly directed serrations for engaging the inner surface of the casing. In the present instance the slips are three in number, equally spaced about the head. The slips are normally disposed with their serrated faces spaced inwardly of the surrounding casing, and are adapted to be moved upwardly and outwardly into engagement with the casing. For this purpose the inner surfaces of the slips and the outer surface of the head 15 are provided with complementary wedging surfaces directed upwardly and outwardly at a slight angle of inclination to the axis of the head.

As illustrated most clearly in Fig. 3, the head 15 has formed thereon an upper pair of wedging surfaces 21 and a lower pair of wedging surfaces 22 for each slip. Each slip has an upper pair 23 and a lower pair 24 of surfaces corresponding to the surfaces 21 and 22. These wedging surfaces are preferably formed on inclined planes which diverge downwardly around the outer surface of the nipple 10, to provide relatively long bearing surfaces at the required steep inclination, within the small radial clearance afforded between the tubing and the casing. This construction is similar to that described in the patent to Nelson K. Smith and Richard K. Hertel, No. 1,921,547, Aug. 8, 1933, reference being had thereto for a more detailed description of this feature. In the aforementioned patent each slip and its cooperating seat on the head has a pair of continuous wedge surfaces. In the present instance, however, a series of superposed stepped surfaces is provided, as shown, to increase the overall length of the wedge surfaces and thereby provide slips having substantially twice the gripping area on the casing, without increasing the extent of radial movement of the slips.

The slips are maintained in sliding contact with the head 15 throughout their range of setting and releasing movement by a tongue and groove connection with the head. In the present instance the tongue and groove connection is provided at the upper and lower ends of the slips, above and below the serrated portions thereof, as distinguished from the construction shown in the aforementioned patent to Nelson K. Smith and Richard K. Hertel, wherein the tongue and groove connection is formed at the lateral edges of the wedge surfaces. The head 15 is provided adjacent its upper end with three pairs of opposed lugs 27, 28, and 29 (Fig. 7), forming an undercut recess for the reception of tail-pieces 30 extending upwardly from the slips. As shown at the right of Fig. 1, the inner wall of each lug is inclined to permit upward and outward movement of the tail-pieces during the setting movement of the slips. Adjacent the lower end of the head 15 are similar pairs of lugs 33, 34, and 35 (Fig. 8) cooperating with depending tail-pieces 36 formed on the lower ends of the slips. By this arrangement the slips are confined against outward movement away from the wedge surfaces on the head.

When in their retracted positions the slips are suspended at their upper ends from reins 39, each of the latter being provided at its lower end with a hook portion 40 projecting through an eye 41 formed in the upper end of each tail-piece 30. An inwardly and upwardly projecting hook portion 42 formed on the upper extremity of each

rein 39 projects through a slot in the wall of an actuator 43 and is supported on the upper surface of an inwardly extending annular flange 44 formed on the inner periphery of the actuator.

To provide for automatic setting of the slips in the event the string of tubing should part above the catcher or were inadvertently released at the surface of the well, the actuator 43 is supported on a helical spring 47 interposed between the flange 44 and a shoulder 48 at the upper end of the head 15. The spring is of such strength that it is compressed, as shown in Fig. 1, by the weight of the actuator and slips, but will expand quickly to the position shown in Fig. 2 when relieved of the weight of the slips. Thus it will be seen that in the event the tubing string and catcher falls freely, the acceleration of the catcher head 15 due to gravity will relieve the spring 47 of the weight of the slips, causing it to expand and raise the actuator 43, reins 39, and the slips relative to the head 15 into the relative positions shown in Fig. 2. The slips are forced outwardly against the casing, the serrations on the slips gripping the casing and arresting the fall.

A "basket-type" collar 51 is secured to the nipple 10 a predetermined distance above the actuator, serving the dual purpose of limiting the upward movement of the actuator and catching any article which might be accidentally dropped down into the well. For the latter purpose the upper surface of the collar is downwardly and inwardly beveled at 52, to provide a pocket for retaining dropped articles. As illustrated in Fig. 6, a circumferential series of openings 53 extend through the collar to provide ample fluid passage area.

The collar is secured to the nipple at the predetermined point by a pair of lugs 54 projecting from opposite sides of the nipple and engaging downwardly opening bayonet slots 55 in the collar. A set screw 56 retains the lugs in the horizontal legs of the slots.

It is believed that from the foregoing description of the tubing catcher the mode of operation and the method of assembly are apparent. Particular attention is directed, however, to the manner in which the slips 17, reins 39, and actuator 43 are assembled. The reins 39 must be swung outwardly into horizontal position to insert the hooks 42 in the slots in the actuator, and when in this position the hooks 40 at the lower ends of the reins are also insertible in the eyes in the upper ends of the slip tail-pieces 30. When the reins are swung downwardly against the outer wall of the actuator the three parts are securely locked together, without the use of bolts or other fastening means.

The upper and lower tail-pieces 30 and 36 on the slips are simultaneously inserted in the undercut recesses in the lugs 27 and 33 respectively, and the slips drop into place, the back of the slip clearing the outer faces of the upper lugs 27. The collar 51 is then secured to the nipple on the lugs 54, the spacing of the collar above the actuator being such as to permit the maximum upward movement of the actuator required to set the slips, but insufficient to permit the flared tongues on the tail-pieces 30 and 36 to be raised above the lugs 27 and 33. The collar 51, when in place, thus insures that the parts will remain in assembled relation. As stated previously, the collar also functions as a basket to catch any article, such as a tool or a slip, which might be accidentally dropped down the well, thus pro-

protecting the tubing catcher against damage or fouling by such articles.

An important feature of this invention is the novel anchoring means for effecting manual setting of the slips at will. I have illustrated in the accompanying drawings two forms embodying the novel features, and it will be appreciated that still other forms may be employed.

Referring to the embodiment illustrated in Figs. 1 to 11, formed on the head 15 below and on each side of each pair of lugs 33, 34, and 35, is a pair of longitudinally extending ribs 61 and 62, there being three pairs of such ribs in the embodiment shown. The ribs of each pair define a channel 63 communicating at its upper end with the lower extremity of the tail-pieces 36 of each of the slips. Alternating with the channels 63 are pockets 64 which terminate at their upper ends in downwardly facing shoulders 65 on the head 15.

An anchor sleeve 66 is slidably mounted on the nipple 10 below the head 15, and projecting upwardly from the upper end of the sleeve is a plurality of anchor fingers 67, one for each slip 17. The anchor sleeve is mounted for limited axial movement relative to the head 15, between an upper position wherein the fingers 67 engage the tail-pieces of the slips and force them upwardly into gripping engagement with the casing, as shown in Fig. 2, and a lower position wherein the fingers 67 are below the lower extremities of the ribs 61, 62, as shown in Fig. 1. An inwardly projecting annular flange 68 formed on the inner periphery of the sleeve 66 limits the downward movement of the sleeve relative to the head 15 by engaging the upper end of the coupling 12.

A plurality of anchor shoes project outwardly of the sleeve 66 into frictional engagement with the well casing. The preferred form of shoes and the manner of mounting them will be described hereinafter. During the lowering of the string of tubing into the well, the frictional engagement of the shoes with the well casing tends to move the anchor sleeve upwardly relative to the head, and to prevent actuation of the slips by the anchor fingers 67 at this time the fingers are inserted in the closed pockets 64 to bear against the shoulders 65.

As stated previously, in prior devices of this type it is necessary to rotate the tubing and catcher head in one direction during the setting operation and in the opposing direction during the releasing operation, thus tending to unscrew the tubing couplings during one of these operations. I have overcome this objection in the present invention by providing a construction wherein the catcher head is partially rotated in the same direction for both the setting and releasing operations. Whereas in prior tubing catchers each anchor finger alternates between the same set of channels and pockets, such as channels 63 and pockets 64, being shifted from the pocket to the channel to effect setting of the slips and shifted back to the same pocket when it is subsequently desired to release the slips and move the tubing to a lower position in the well, in the present case the anchor fingers are shifted successively in the same direction around the catcher head, engaging a different slip on each successive setting operation. The construction enabling this mode of manipulation will now be described.

Rotatably mounted on the head 15 below the ribs 61, 62 is a guide sleeve 71, confined between a downwardly facing shoulder 72 on the head (Fig. 1) and a lock ring 73 detachably secured to the head. Equally spaced about the periphery

of the sleeve 71 are a plurality of guide ribs 74, one for each of the ribs 61 and 62. In the embodiment disclosed there are six such ribs. The lower ends of the ribs 61 and 62 are beveled to provide inclined abutment surfaces 75, 76, 77, 78 engageable by similarly inclined surfaces on upwardly beveled projections on the ribs 74. Each rib 74 is oscillatable between two of the ribs 61 and 62. A torsion spring 80 is wrapped about the head 15 between the sleeve 71 and the lock ring 73, one end of the spring being inserted in a slot 81 in the sleeve 71 and the other end in a slot 82 in the lock ring 73, whereby the sleeve 71 is urged to the left as viewed in Fig. 3.

The lower ends of the guide ribs 74 are beveled on one side at 83, and are engageable by a cam surface 84 on one or more lugs 85 formed on the inner periphery of the anchor sleeve 66. In the event of failure of the spring 80 the cam surfaces 84 engage the lower beveled faces 83 on the guide ribs 74 during relative upward movement of the anchor, to move the guide ring to the left.

The mode of operation of the anchoring means is as follows, reference being had particularly to Figs. 4, 4(a), 4(b), 5, 5(a), and 5(b): while the tubing string and catcher are being lowered into the well, the head 15 and anchor sleeve are in maximum telescoping relation, with the anchor fingers 67 inserted in the pockets 64, as shown in Fig. 4. When the tubing reaches the position in which it is desired to be anchored, the tubing is raised slightly. The anchor sleeve is held stationary by the frictional engagement of the shoes with the casing, and the catcher head is raised to position the anchor fingers below the ribs 61, 62 and between a pair of guide ribs 74, as indicated in Fig. 4(a). The tubing is then rotated through a partial revolution in a clockwise direction as viewed from above, or to the left, as viewed in the drawings. During this rotation the guide sleeve is caused to rotate with the head by the spring 80 until one rib 74 of each pair engages the corresponding anchor finger. Continued rotation of the head results in the ribs 61, 62 spanning the spaces between the guide ribs 74, the beveled faces 75, 77 on the ribs 61, 62 contacting the beveled projections on the guide ribs to limit the relative rotation of the head, and sleeve. The parts are then in the relative positions shown in Fig. 4(b), with the anchor fingers directly below the open channels 63 leading to the tail-pieces 36 on the slips.

The tubing is then lowered, as indicated in Fig. 5, causing the anchor fingers to engage the tail-pieces 36 and move the slips upwardly relative to the head. The wedge surfaces on the head and slips force the latter outwardly during their upward movement, into gripping engagement with the casing. The weight of the string of tubing causes the slips to be firmly wedged between the head 15 and the casing, securely anchoring the tubing.

Attention is particularly directed to the relative positions of the guide sleeve 71 and ribs 74 in Figs. 4(b) and 5. In the former position the sleeve is held against rotation to the left by the anchor fingers 67. The lowering of the tubing into the position shown in Fig. 5, resulting in relative upward movement of the fingers 67 into the channels 63, releases the sleeve 71 and it then snaps over to the left under the action of the spring, until the beveled projections on the ribs 74 engage the inclined faces 76, 78 on the ribs 61, 62. It will thus be seen that the guide sleeve is returned to its initial position, in readiness

for a repetition of the above described operations.

The tubing catcher may be released simply by raising the tubing, the anchor fingers being held stationary as before. The head moves upwardly into the relative position shown in Fig. 5(a) with the anchor fingers positioned between the lugs 74 on the guide sleeve, but directly below the tail-pieces 36.

It is frequently desired to reset the tubing catcher at a lower point in the well, and in order to do this it is necessary to return the anchor fingers to the pockets 64 to prevent actuation of the slips by the anchor when the tubing is lowered. In prior tubing catchers this is usually accomplished by returning the anchor fingers to the pockets from which they were removed during the preceding setting operation, requiring rotation of the tubing in a direction tending to unscrew the threaded tubing couplings.

By virtue of the guide means previously described, my invention makes possible rotation in the same direction for returning the anchor fingers to inactive position in the pockets 64. After the tubing has been raised to the position shown in Fig. 5(c) to release the slips from engagement with the casing, it is rotated to the left (in a clock-wise direction as viewed from above) into the position shown in Fig. 5(b). During this rotation the guide sleeve moves with the head until stopped by engagement of the ribs 74 with the anchor fingers, and relative rotation then occurs between the head and the guide sleeve, similar to that which occurred during the change from the position shown in Fig. 4(a) to that shown in Fig. 4(b). The anchor fingers are now positioned directly below the pockets 64, and lowering the tubing causes the fingers to be moved into the pockets. Immediately following the entry of the fingers into the pockets, the spring 80 causes the guide sleeve to snap to the left, the parts then assuming the relative positions shown in Fig. 4. The tubing string may then be lowered as before and reset by repeating the sequence of operations described above.

Referring again to Figs. 4 and 5, the function of the lug 85 on the anchor sleeve 66 will be apparent. If for any reason the torsion spring should fail to return the guide sleeve to its initial position shown in Figs. 4 and 5, the cam surface 84 on the lug 85 engages a guide rib 74 and moves it to the dot-and-dash position indicated at 90 in Fig. 4, whereupon subsequent relative downward movement of the anchor fingers causes a cam surface 91 on the lower face of each anchor finger to engage the guide rib and complete the movement thereof to the left. In Fig. 5 the lug 85 has moved completely into the space between the guide ribs and moved them to their initial position, the extent of relative longitudinal movement between the anchor and the head being much greater during the setting of the slips than when the anchor fingers are moved into the pockets 64.

Referring to the anchor mechanism illustrated in Figs. 12 and 13, it will be observed that the anchor sleeve 66' and the anchor shoes 96' are substantially identical with that shown in Figs. 1 and 11, and therefore a description thereof is deemed unnecessary. Formed on the head 15' are guide ribs 61', 62' defining channels 63' communicating with the tail-pieces 36' of the slips. Alternating with the channels 63' are pockets 64' closed at their upper ends. Directly below each channel 63' is a stop lug 69' formed integral with the head 15' and

having a vertical face 70' and an inclined face 71'.

A plurality of anchor fingers 67', one for each slip, project upwardly from the anchor sleeve and are adapted to be selectively inserted in the pockets 64' or the channels 63', as in the previously described form. It will be observed with reference to Fig. 12 that the anchor fingers 67' are provided with cam surfaces 72', 73', 74' adapted to cooperate with cam surfaces 71' on the lugs 69' and with cam surfaces 75' and 76' on the guide ribs 61', 62'.

The mode of operation of this form of the invention will be understood from Fig. 13, which is a sectional development. For the purpose of illustration, in this figure the successive relative positions of only a single anchor finger are shown in dotted lines, but it will be understood that all of the fingers assume identical positions. Also, to simplify the description, the anchor fingers appear to move vertically and laterally. It will be understood, however, that the fingers are held stationary by the anchor shoes 96', and the head, including ribs 61', 62', and the stop lugs 69' are moved. While the tubing string is being lowered into the well the anchor fingers are disposed within the pockets 64', as indicated in dotted lines at K. When the catcher reaches the point at which it is to be anchored the tubing is raised a short distance, causing the anchor fingers to assume the relative position indicated at L. The tubing is then rotated clockwise, moving the fingers to the position M, the stop lugs 69' limiting the relative rotation between the tubing and the anchor sleeve. The tubing is then lowered, whereupon the cam surfaces 72' on the fingers engage the cam surfaces 76' on the ribs 62' causing further rotation of the tubing and head to position the fingers in the channels 63' leading to the slip tail-pieces. Continued lowering of the tubing causes the anchor fingers to move to the position N, forcing the slips upwardly and outwardly into gripping engagement with the well casing. The path of travel of the fingers during the setting operation is indicated by plain arrows, and that during the releasing operation by feathered arrows.

To release the slips and return the anchor fingers to inactive position within the pockets 64', the tubing is raised, causing relative downward movement of the fingers until their lower cam surfaces 73' engage the cam surfaces 71' on the stop lugs 69'. Since the fingers are anchored against rotation by the anchor shoes 96', the head 15' is cammed to the left, as viewed in Fig. 12, the fingers assuming the position O. The tubing is then lowered, causing the fingers to engage the cam surfaces 75' on the ribs 61' to produce further rotation of the head. Continued lowering of the head and tubing moves the fingers into the pockets 64'.

It will be observed in connection with Fig. 13 that, as in the form previously described, the anchor fingers move progressively around the head on each setting or releasing operation, instead of alternating between the same pair of pockets and channels, as in prior anchor mechanisms. In this form the tubing and head are rotated from the surface only during the setting operation, rotation being effected by cam action during the releasing operation.

It will be observed that in each of the forms described the anchor fingers move progressively around the head, resulting in rotation of the head always in the same direction. There is, there-

fore, no danger of the tubing sections being separated by unscrewing the couplings, regardless of the number of successive setting and releasing operations.

Referring now to the novel anchor, one embodiment of which is shown in Figs. 1, 9, 10, and 11, the anchor sleeve 66 has formed therein a plurality of openings 95, herein three in number. In each opening an anchor shoe 96 is loosely mounted for limited radial movement. The shoes are of substantially less length than the openings 95, and are confined against vertical movement relative to the sleeve by shoulders 97 and 98 on the shoes abutting shoulders 99 and 100 formed at the juncture of the enlarged central portion and the slightly reduced end portions of the openings 95 in the sleeve. The ends of the shoes are cut away at each side at 101 and 102 to form abutment faces 103 and 104 engageable with complementary abutment faces 105 and 106 (Fig. 11) above and below the shoulders 99 and 100, respectively, to limit the outward movement of the shoes.

Formed at the upper and lower ends of the openings 95 are sunken recesses 111, 112 defining pockets for the reception of the ends of bowed springs 113 which engage the inner surfaces of the shoes and urge them outwardly. It will be observed that both ends of the springs have sliding engagement with the sleeve in the recesses 111 and 112, and consequently there is no concentrated flexing of the springs at one point, such as is experienced when a bowed spring is fixedly secured at one end to an abutment, as by riveting. By the use of the shoes 96 having an outer contour conforming to the inner contour of the casing, a large friction area is provided. With this large friction area the outward pressure required to exert the necessary braking action is exceedingly low, and consequently the springs 113 may be relatively light and flexible. As compared to the length and stiffness required in the springs when they contact the casing directly, the use of the shoes as described permits the employment of relatively short, flexible springs. When flat springs are used, to contact the casing directly, it is apparent that full surface contact is not obtained, the springs contacting only at the outer edges and providing exceedingly small friction area.

I claim:

1. In a pipe anchor, the combination of: a head, pipe-engaging jaws mounted on said head and movable from a contracted position to an expanded, pipe-engaging position, and means for expanding said jaws, said means being movable from inactive position to active position by axial and rotative movements of said head and movable to inactive position by axial and rotative movements of said head in the same directions as said first-mentioned movements.

2. In a pipe anchor, the combination of: a head adapted to be secured to a pipe, pipe-engaging jaws mounted on said head and movable from a contracted position to an expanded position, means for expanding said jaws, means for retaining said expanding means in inactive position during movement of said pipe, said expanding means being movable from said inactive position into operative engagement with said jaws by axial and rotative movements of said head, and movable to inactive position by axial and rotative movements of said head in the same directions as said first mentioned movements.

3. A pipe anchor comprising: a head adapted

to be secured to an inner pipe, gripping elements mounted on said head for movement relative thereto from a contracted position to an expanded position wherein they engage an outer pipe, anchor means slidably and rotatably connected to said head, said anchor means being adapted to frictionally engage said outer pipe, actuating means on said anchor means adapted to engage and expand said gripping elements, said actuating means being movable successively from inactive position to active position and from active position to inactive position by successive axial and rotary movements of said head relative to said anchor means, said rotary movements being in one direction only.

4. A pipe anchor as set forth in claim 3, including guide means associated with said actuating means, a plurality of passage means associated with said head and into which said guide means is adapted to be selectively moved to afford access of said actuating means into operative engagement with said gripping elements, and other passage means associated with said head and interposed between said first passage means and into which said guide means is adapted to be selectively moved, said actuating means being held in inactive position when said guide means is disposed in said last-named passage means.

5. A pipe anchor as set forth in claim 3, including guide means associated with said actuating means, passage means associated with said head and into which said guide means is adapted to be moved to afford access of said actuating means into operative engagement with said gripping elements, and recesses associated with said head and interposed between said passage means, said guide means being selectively disposable in said passage means or said recesses.

6. A pipe anchor comprising: a head, jaws mounted on said head and movable relative thereto from a contracted position to an expanded position, actuating elements slidably and rotatably connected to said head and adapted to selectively engage and expand said jaws or be held in inactive positions angularly spaced between said jaws, said actuating elements being movable progressively about said head into successive jaw-expanding and inactive positions.

7. In a pipe anchor, the combination of a body member having slip seats thereon extending upwardly and outwardly, slips mounted on said seats for movement between an upper expanded position and a lower contracted position, said slips having outwardly directed gripping portions thereon, and means for retaining said slips in substantial engagement with their respective seats in all positions thereof, said means comprising a tongue extending upwardly and a second tongue extending downwardly from the gripping portion of each slip, said body member having a pair of opposed lugs slidably embracing each of said tongues and thereby confining the slips against outward movement while permitting movement of the slips along their respective seats on the body member.

8. A pipe anchor as defined in claim 7, in which each of said tongues comprises a central portion and a laterally projecting rib on each side thereof, and in which each of said lugs on said body member comprises a hook-shaped projection forming an undercut channel for slidably receiving an associated rib.

9. A pipe anchor as defined in claim 7, in which each of said tongues comprises a central portion extending substantially parallel to the

longitudinal axis of said body member and a rib projecting laterally from each side thereof, the outer faces of said ribs being inclined upwardly and outwardly, and in which each of

5. said lugs on the body member comprises a hook-shaped projection forming an undercut channel for slidably receiving an associated rib, the inwardly facing wall of said projection having an inclination complementary to that of the outer face of the associated rib.

10. A pipe anchor comprising a body member, pipe gripping jaws slidably mounted thereon and movable between contracted and expanded, pipe-gripping positions, extensions on said jaws above and below the pipe-gripping portions thereof, pairs of spaced lugs on said body member coacting with said extensions to retain said jaws in assembled relation to the body member, and links pivotally connected at their lower ends to said upper extensions and pivotally connected at their upper ends to said body member.

11. A pipe anchor as defined in claim 10, in which said body member includes an actuator resiliently supported on said body member and movable upwardly relative to said body member due to its own inertia on free fall of said pipe, said links being supported by said actuator.

12. A pipe anchor comprising a head, pipe-gripping jaws mounted thereon and movable relative thereto between contracted and expanded positions, a tail-piece on each jaw, a pair of guide ribs on the head on opposite sides of each tail-piece and defining open-ended channels in axial alignment with said tail-pieces, recesses in said head between said pairs of ribs, said recesses being closed at their upper ends and in open communication at their lower ends with the adjacent channels on each side thereof, anchor means slidably and rotatably connected to said head below said jaws, said anchor means comprising a sleeve, and jaw-actuating fingers projecting upwardly from said sleeve, each of said fingers being movable in one of said channels to engage a jaw extension during relative axial movement between said head and anchor means, said fingers being shiftable progressively into axial alignment with said channels and said recesses by successive increments of rotation of said head relative to said anchor means in one direction.

13. A pipe anchor as defined in claim 12, including stops on said head engageable by said fingers during said relative rotation for positioning said fingers in predetermined angular relation to said channels.

14. A pipe anchor as defined in claim 12, including cam surfaces on certain of said ribs and on said fingers, for effecting said rotation as an incident to relative axial movement between said head and anchor means.

15. A pipe anchor as defined in claim 12, in which said anchor means comprises friction shoes resiliently mounted on said sleeve for limited radial movement relative thereto, cooperating surfaces on said shoes and sleeve for limiting the outward movement of the shoes, and spring means between said sleeve and shoes for yieldably urging the latter radially outwardly.

16. A pipe anchor comprising a head, pipe-gripping jaws mounted thereon for movement relative thereto between contracted and expanded positions, and jaw actuating means comprising an anchor sleeve slidably and rotatably connected to said head, actuating means on said sleeve engageable with said jaws, angularly

spaced openings in the wall of said sleeve, friction shoes movable radially in said openings, and spring means between the sleeve and said shoes for yieldably urging said shoes radially outwardly.

17. A friction device adapted to slidably engage the inner surface of a pipe, comprising: a sleeve, a plurality of friction shoes spaced circumferentially about said sleeve, and spring means abutting outwardly facing surfaces on said sleeve at spaced points and abutting inwardly facing surfaces on said shoes at points on said spring means intermediate said spaced points.

18. A friction device comprising: a sleeve, a friction shoe supported by said sleeve and having a friction face normally disposed radially outwardly of said sleeve, and spring means yieldingly urging said shoe outwardly, said spring means comprising a bowed spring abutting spaced outwardly facing surfaces on said sleeves and abutting an inwardly facing surface on said shoe at a point on said spring intermediate said points of abutment with said sleeve.

19. A friction device comprising a supporting member, a friction shoe mounted on said support for lateral movement relative thereto but confined against longitudinal movement relative thereto, and spring means yieldably urging said shoe outwardly, said spring means comprising a bowed spring having slidable abutment adjacent its ends with said supporting member and having slidable abutment with said shoe intermediate said spring ends.

20. In a friction device for frictionally engaging the inner surface of a tubular member, the combination of: a support, a friction shoe mounted on said support for lateral movement relative thereto, said shoe having an outer face adapted to frictionally engage the inner surface of said tubular member, and a bowed spring slidably abutting an inner surface on said shoe.

21. A pipe anchor comprising, in combination: a tubular support adapted to be interposed between adjacent sections of a sectional pipe, pipe-engaging jaws mounted on said support for radial displacement relative thereto, means for effecting said radial displacement of said jaws, said means being operable by manipulation of the pipe including rotation thereof in the same angular direction to effect both inward and outward radial displacement of said jaws.

22. A pipe anchor for supporting a pipe within an outer casing comprising, in combination: a tubular support adapted to be connected in the pipe, casing-engaging jaws mounted on said support for radial displacement relative thereto, an anchor sleeve slidably and rotatably mounted on said support and adapted to frictionally engage the outer casing, and means operable upon relative axial and rotative movements between said anchor sleeve and said support for displacing said jaws radially, said rotative movements being in the same angular direction to effect both inward and outward radial displacement of said jaws.

23. A pipe anchor comprising, in combination: a tubular support adapted to be connected in a sectional pipe, pipe-engaging jaws mounted on said support for movement relative thereto between contracted and expanded positions, means for expanding and contracting said jaws, said means being operable to expand said jaws upon manual manipulation of said pipe to effect axial and rotative movements thereof, and op-

erable to contract said jaws by manual manipulation of said pipe in an axial direction only.

24. In a pipe anchor, the combination of a body member having slip seats thereon extending at an oblique angle to the longitudinal axis of said body member, slips slidably mounted on said seats for movement therealong between expanded and contracted positions, said slips having outwardly directed gripping portions, and means for retaining said slips substantially in engagement with their respective seats in all positions of said slips, said means comprising a tongue extending upwardly and a second tongue extending downwardly from the gripping portion of each slip, means slidably mounted on said body above said slips and operatively connected with said upwardly extending tongues, and stationary guide surfaces on said body extending parallel to said slip seats but oppositely directed with respect to said slip seats, said guide surfaces being disposed in overlapping relation to said downwardly extending tongues in all positions of said slips.
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