Feb. 18, 1936. W. H. McKISSICK 2,031,056

TUBING CATCHER

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Fig. 1.

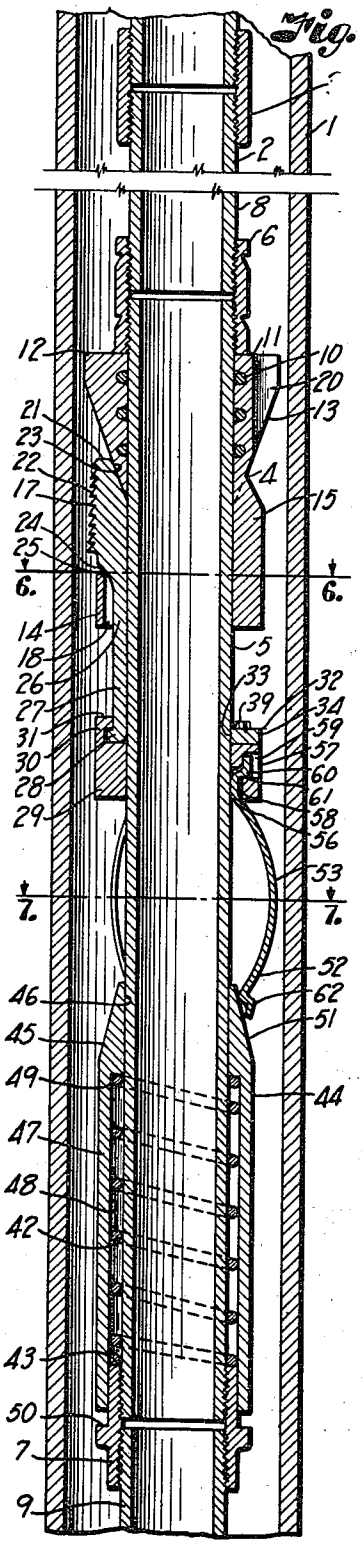


Fig. 2.

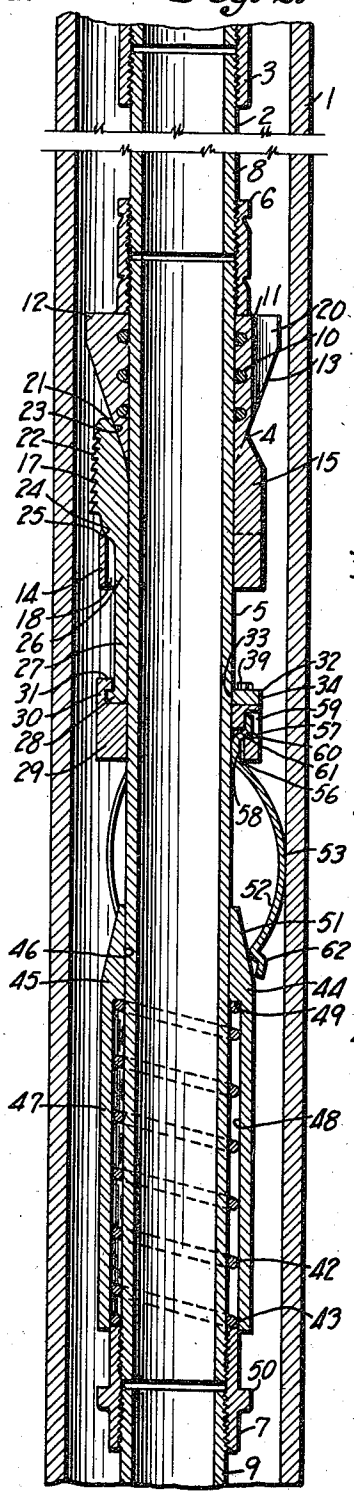
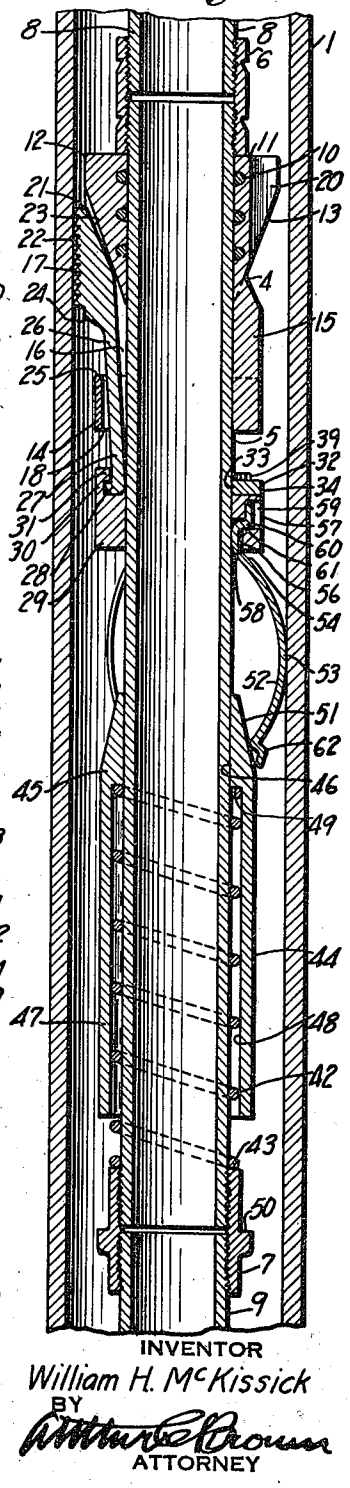


Fig. 3.



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Fig. 4.

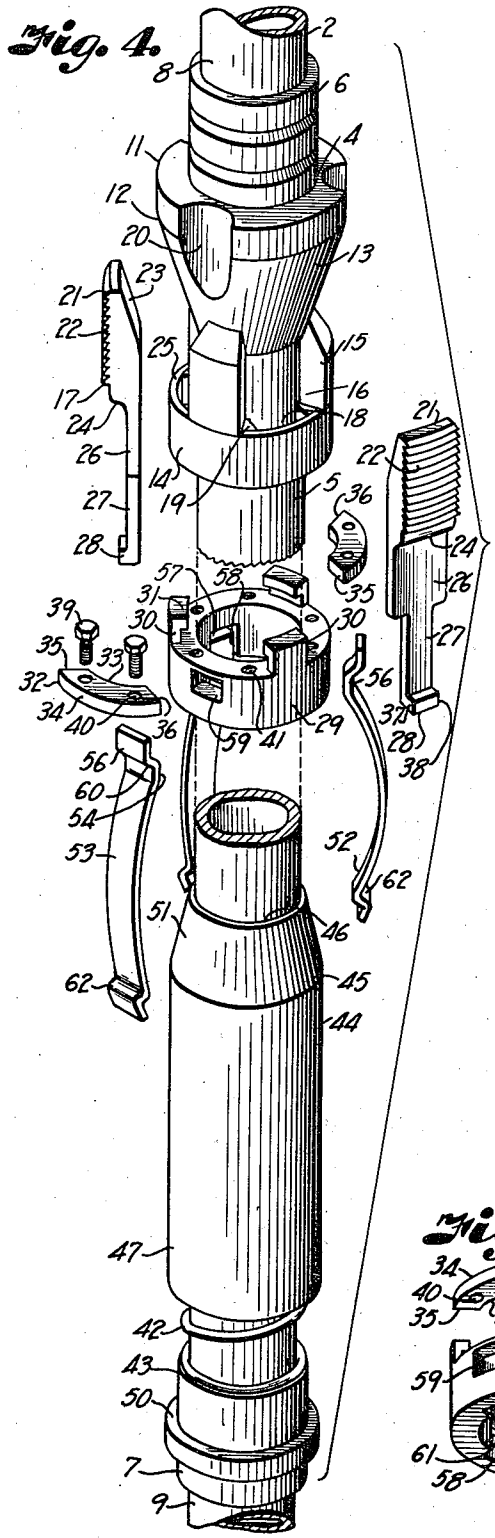


Fig. 5.

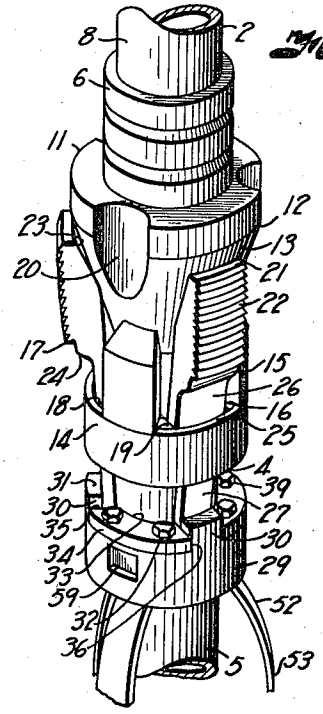


Fig. 6.

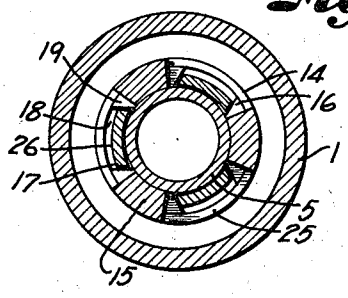


Fig. 7.

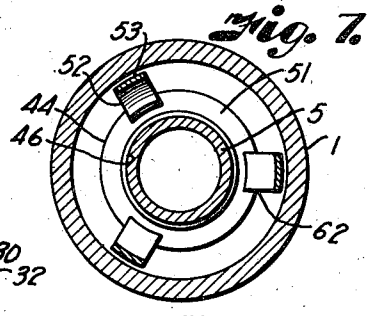
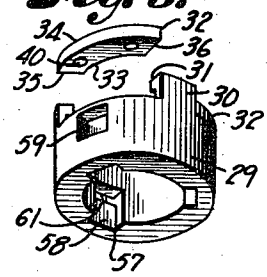


Fig. 8.



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TUBING CATCHER

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Application April 16, 1934, Serial No. 720,834

3 Claims. (Cl. 103—219)

This invention relates to tubing catchers of the type employed in wells for automatically effecting support of the well tubing in case the tubing should start to fall in the well and has for its principal object to provide a device of this character which is of quicker action and of positive operation so that it functions without slippage upon relatively slight dropping movement of the tubing.

It is also an important object of the invention to provide a construction which facilitates assembly and mounting of the catcher in a string of tubing.

In accomplishing these and other objects of the invention, as hereinafter described, I have provided improved details of structure, the preferred form of which is illustrated in the accompanying drawings, wherein:

Fig. 1 is a vertical sectional view through a well casing and tubing showing a tubing catcher embodying the features of my invention and illustrating the catcher in position ready to engage the casing should the tubing begin to drop in the well casing.

Fig. 2 is a similar sectional view showing functioning of the wedge lock mechanism which action occurs immediately upon initial dropping movement of the tubing to support the slips while the wedge controlling the slips is made effective in driving the slips into gripping engagement with the casing.

Fig. 3 is a similar view showing the slips after they have been moved into gripping engagement with the casing.

Fig. 4 is a detail perspective view of the tubing catcher with the slips and wedge lock springs in disassembled spaced relation to better illustrate their construction.

Fig. 5 is a detail perspective view of the slip assembly and the upper portion of the wedge lock springs.

Fig. 6 is a cross sectional view on the line 6—6, Fig. 1.

Fig. 7 is a cross sectional view on the line 7—7, Fig. 1.

Fig. 8 is a detail perspective view of the collar which connects the slips and wedge lock springs and showing one of the keeper plates removed.

1 designates a string of well casing in which is suspended a string of tubing 2 composed of sections of pipe connected together by couplings 3 as in conventional practice.

Such strings of tubing are subject to parting, particularly when they are being placed in the well and often the recovery of the parted section becomes involved, particularly where the tubing drops for a considerable distance. In such an event, the broken, crooked, collapsed, and telescoped portions of the string renders such operations extremely tedious and difficult.

The hazard of parted tubing has been overcome to a great extent by inserting a tubing catcher in the string, usually just above the working barrel and which is adapted to function to grip the casing incidental to inertia so that the tubing is prevented from falling great distances.

In tubing catchers as heretofore employed, however, the inertia is not sufficient to effect positive gripping action of the slips and the tubing drops a greater distance than is desired.

As above pointed out, it is the object of the present invention to provide a tubing catcher which is positive in operation and which engages the casing to set the slips almost at the instant the tubing is parted.

The tubing catcher in the illustrated instance is designated 4 and includes a section of pipe 5 having substantially the same diameter as the tubing and is connected between selected sections by couplings 6 and 7, the couplings 6 and 7 having internal threads for engaging external threads on the respective ends of the pipe section 5 and on the ends of the adjacent pipe sections 8 and 9 of the tubing.

Welded to the periphery of the tubing section 5 at a point adjacent its upper end is a spaced series of circular bands or ribs 10 forming keys for anchoring a slip supporting member 11 that is cast about the pipe section 5 and includes an upper cone-shaped head 12 having slip engaging surfaces 13 sloping downwardly toward the periphery of the pipe sections 5.

Formed integrally with the head portion is an annular ring 14 that is connected to the lower end thereof by circumferentially spaced ribs 15 forming recesses 16 therebetween to mount the slips 17 later described.

Extending through the ring portion 14 in alignment with the recesses 16 are guideways 18 forming shoulders 19 with the sides of the ribs 15 as clearly shown in Fig. 4. The head 12 is provided above the ribs 15 with grooves 20 for passage of fluid such as gas which may flow to the top of the well.

The slips 17 include casing gripping portions 21 having a series of transversely extending teeth 22 on the outer faces thereof and upwardly inclined cam portions 23 on their inner faces conforming to the taper of the cone-shaped head

12. The gripping portions 21 are of sufficient width to pass freely between the ribs 15, but are of greater thickness than the depth of the guideway 18 so that the bottom edges 24 are supported upon the rim 25 of the ring 14 when the inner face 23 of the slips are in contact with the periphery of the pipe section 5, as best shown in Fig. 1.

Extending downwardly from the gripping portions are flat body portions 26 having substantially the same width as the guide openings 18, but of less thickness so that they are freely slidable therein and have substantial play in a radial direction relative to the axis of the pipe section 5. Extending downwardly from the flat body portion 26 is a reduced leg portion 27 terminating in an outwardly extending foot 28 whereby the slips are anchored to a collar 29.

The collar 29 includes a ring freely slidable upon the pipe section at a point below the head 12 and is provided with upwardly extending lugs 30 having inwardly facing flanges 31 adapted to engage over the foot portions 28 of the slips as best shown in Figs. 1, 2 and 3, the flanges 31 being spaced a sufficient distance from the tubing section 5 to permit free passage of the leg portion 27 of the slips therebetween.

When the foot portions 27 are engaged by the flanges 31 on the collar 29, the slips are retained in engaging position therewith by keeper plates 32. The keeper plates 32 are of substantially arcuate shape and are of substantially the same width as the collar 29 so that the inner arcuate edge 33 thereof aligns with the inner periphery of the collar when the outer arcuate edge 34 aligns with its outer periphery. The keeper plates are of sufficient length to fill the space between adjacent lugs 30 so that the ends 35 and 36 thereof engage against the side faces 37 and 38 of the foot portions of the slips to lock them against lateral movement when they are engaged with the flanges 31. The keeper plates are secured in position by fastening devices such as cap screws 39 extending through openings 40 in the keeper plates and into threaded openings 41 in the collar 29.

It is thus apparent that the slips are anchored to the collar so that when the collar is moved upwardly, the slips are slid through the guideways 18 to cause the cam portions 23 thereof to engage against the cone-shaped portion of the head whereby they effect outward movement of the slips into gripping engagement with the inner face of the casing as later described.

The weight of the collar, however, acting on the foot portions 28 of the slips retains the slips in retracted position in the recess 17 with the shoulders 24 supported on the ring 14 and the inner face 23 thereof lying closely against the periphery of the pipe section 5 as shown in Figs. 1 and 2.

In order to effect movement of the collar under inertia of the falling tubing, the pipe section 5 carries a coiled spring 42 having its lower end resting on the upper end 43 of the lower coupling 7 and its upper end slidingly engaged with the pipe section 5.

Sleeved on the pipe section 5 and supported on the upper end of the spring 42 is a weight 44 for normally retaining the spring 42 in compressed condition. The weight 44 includes a head portion 45 having an axial opening 46 therein slidably engaging the pipe section 5 and a depending skirt portion 47 of larger diameter than the pipe section to form an annular recess 48 to house the spring 42. The skirt portion 47 cooperates with the head 45 to form an internal annular shoulder 49 to seat the upper end of the spring, as clearly shown in Figs. 1, 2 and 3 of the drawings.

The skirt portion of the weight 44 is adapted to slide freely over the coupling 7 as shown in Fig. 1 and is limited against downward movement on the pipe section by an annular rib 50 provided on the coupling 7 which also serves as a fluid seal or guard for preventing accidental upward movement of the weight when running the tubing catcher into the hole at a high rate of speed, and prevents the weight from contacting the casing or other obstruction in the well.

The tension of the spring, however, is such as to normally retain the lower end of the weight slightly spaced from the rib 50 so that it is entirely supported by the spring.

The head portion 45 of the weight is cone-shaped to provide an annular wedge 51 for engaging wedge lock springs 52 which form an important part of the present invention, as now to be described.

The wedge lock springs include arcuate spring leaves having their upper ends anchored to the collar 29 and their lower ends normally engaging the upper end of the wedge portion of the weight. In this position the intermediate bowed portions 53 are in slightly spaced relation to the inner face of the casing, as shown in Fig. 1. The upper ends 54 of the springs tangentially engage the outer face of the pipe section and terminate in outwardly and upwardly offset portions 56 engaged in recesses 57 provided in the collar 28.

The recesses 57 include grooved portions 58 to accommodate the tangential portions of the wedge lock springs and outwardly opening recesses 59 to seat the offset ends 55 of the springs, the offsets 60 of the springs being mounted in openings 61 connecting the upper and lower ends of the grooves 58 and recess 59, respectively.

The lower ends of the wedge lock springs terminate in offset foot portions 62 engaging against the wedge shaped head of the weight so that when the weight is moved upwardly through inertia, the lower ends of the wedge lock springs will be moved outwardly from the axis of the pipe section 5 with the upper anchored ends 56 acting as fulcrums to cause the central bowed portions 53 of the springs 52 to move into gripping engagement with the inner face of the casing, thereby supporting the collar 29 against downward movement with the pipe section 5 in case the pipe section should fall, as later described.

Due to the fact that the wedge lock springs are forced into engagement with the inner wall of the casing, downward movement of the head 12 will cause movement of the slips 17 outwardly into gripping engagement with the inner face of the casing and to support the tubing against further downward movement.

It is thus apparent that the wedge lock springs provide a footing for positively supporting the slips against downward movement to permit the wedge shaped head 12 to drive the slips outwardly into gripping engagement with the casing.

In assembling a tubing catcher constructed as described, the ribs 10 are welded to the upper end of the pipe section 5, after which the head 12 is cast about the pipe section as if the pipe section were a core.

The slips 17 are then inserted with their body portions 26 slidably engaged in the guide ways

18 and the shoulders 24 supported on the ring portion 14 of the head. The collar 29 is then sleeved over the lower end of the pipe section so that the foot portions 28 of the slips enter the spaces between the lugs 30. The collar is then rotated to move the flanges 31 on the collar to engage over the foot portion 28 on the slips after which the keeper plates are secured in position between the lugs, to anchor the collar to the slips.

The wedge lock springs, however, have been previously inserted in the recesses in the ring so that they become anchored therein when the collar is slid onto the pipe section 5.

The weight 44 and spring 42 are then sleeved on the lower end of the pipe section, after which the coupling 7 is applied to support the spring and weight in functional position.

The tubing catcher is then inserted in the string of tubing and run into the well as in conventional practice.

Should the tubing part, and begin to fall, the inertia will retard movement of the weight under support of the spring to expand the wedge lock springs into engagement with the inner face of the casing to support the collar and slips against downward movement as soon as the weight of the wedge springs and the movable parts connected therewith are partly supported by frictional engagement of the wedge springs with the casing there is an added relief of the spring 42 to cause it to expand upwardly and lift the weight into better wedging relation with the wedge springs. The wedge shaped head portion 12, however, being an integral part of the tubing will drive the slips into wedging engagement with the casing to stop the fall of the tubing.

From the foregoing, it is apparent that I have provided a tubing catcher which is of quicker action and more positive operation so that it functions without slippage upon relatively slight dropping movement of the tubing.

It is also apparent that the parts of the tubing catcher are readily assembled and adapted to be connected at any desired point in the string of tubing.

What I claim and desire to secure by Letters Patent is:

1. A tubing catcher including a tubular body member, a set of slips carried on the body member to engage a casing in which the tubing catcher is inserted and having depending foot portions, a collar slidable on the body member and having flange portions engaging the foot portions of the slips, lock springs having offset ends fulcrumed in the collar and having casing gripping portions, a spring coiled about the body member, a weight member loading the spring and having a wedge portion engaging the lock springs to effect movement of the lock springs into gripping engagement with the casing upon movement of said weight member in response to inertia and the action of the coiled spring upon dropping movement of the body member whereby the slips are supported from the casing, stop means on the body member engaging one end of the spring and having an annular flange to protect the weight from accidental movement, and wedge means on the body member for driving the slips into gripping engagement with the casing.

2. A tubing catcher including a tubular body member, slips carried on the body member to engage a casing in which the tubing catcher is inserted and having foot portions, a collar slidable on the body member and having flanges engaging the foot portions, keeper plates on the collar for anchoring the foot portions in engagement with the flanges, lock springs fulcrumed in the collar and having casing gripping portions, inertia responsive means for actuating the lock springs to render the slips effective in engaging the casing, and wedge means on the body member for driving the slips into gripping engagement with the casing.

3. A tubing catcher including a tubular body member, a set of slips carried on the body member, a collar slidable on the body member below the slips, means connecting the collar with the slips, a spring sleeved on the body member below the collar, a weight loading the spring and having a tapered spring contact portion at its upper end, spring leaves having one end fulcrumed in the collar and having their opposite ends bearing against the tapered portion of the weight and provided with portions adapted to engage the wall of the casing incidental to inertia of the weight and expanding of the spring upon dropping of the tubular body in the casing, and wedge means on the body member for driving the slips into gripping engagement with the casing.

WILLIAM H. McKISSICK.