April 11, 1939. W. H. McKISSICK 2,153,934

TUBING CATCHER AND POSITIVE ACTUATING MECHANISM THEREFOR

Filed June 15, 1935

Fig. 1

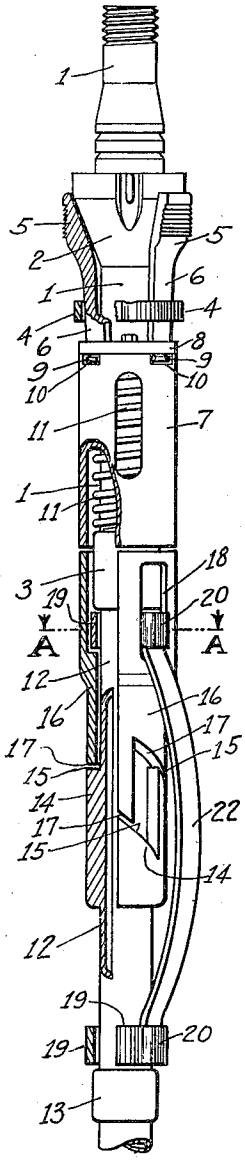


Fig. 2

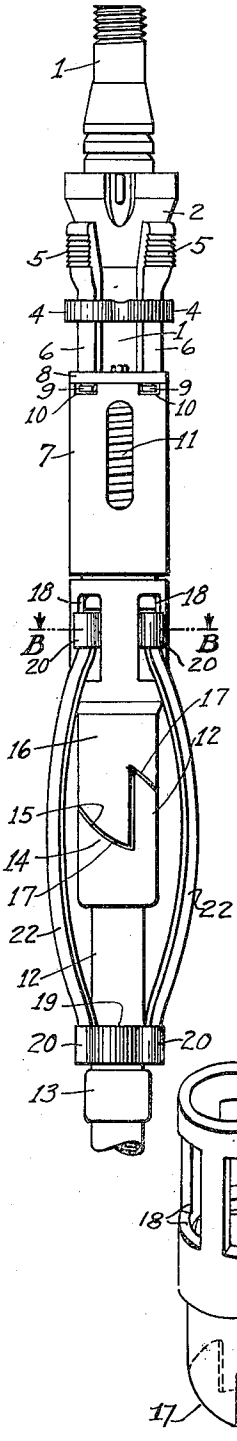


Fig. 4

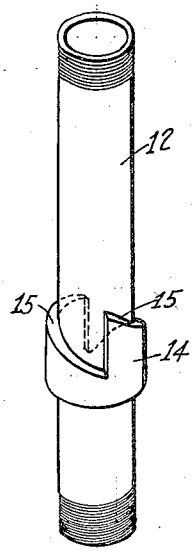


Fig. 6

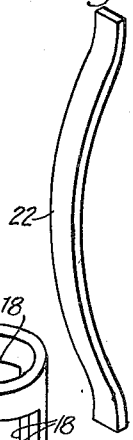


Fig. 8.

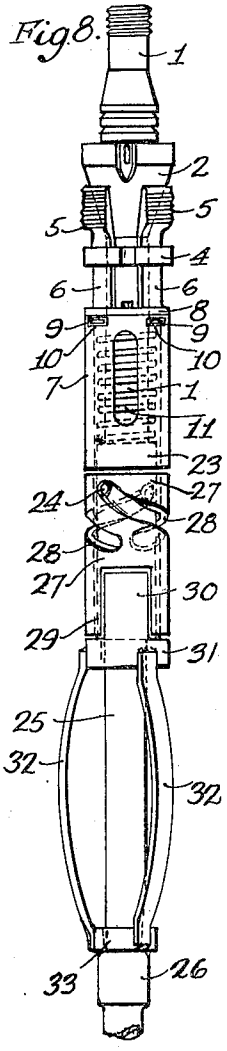


Fig. 3

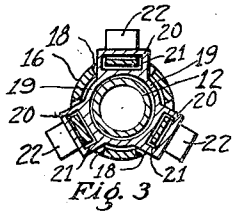
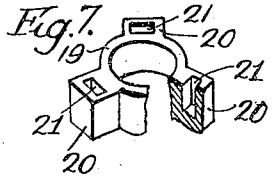


Fig. 5

Fig. 7.



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TUBING CATCHER AND POSITIVE ACTUATING MECHANISM THEREFOR

William H. McKissick, Tulsa, Okla.

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6 Claims. (Cl. 103—219)

My invention relates to new and useful improvements in tubing catchers and in positive anchoring means therefor, for use in wells wherein tubing is run in pipe, to prevent the tubing from dropping and also to hold or anchor the tubing at any desired place in the well. The objects of the invention are as follows; to wit, to provide in a tubing catcher means for positively actuating the same at any point in the well without impairing its usefulness as a tubing catcher which normally is caused to function by dropping; to provide such means in inexpensive and simple form and of a structure such as it may, if desired, be used as an accessory to the tubing catcher proper; and to provide a tubing catcher in form adapted to receive such positive actuating means and to be operable thereby.

With the above and other objects in view which will appear as the description proceeds, my invention consists of the novel features hereinafter set forth in detail, illustrated in the accompanying drawing and more particularly pointed out in the appended claims.

Referring to the drawing in which numerals of like character designate similar parts thruout the several views:

Fig. 1 is a view in elevation with certain portions cut away to more clearly show the device, of my tubing catcher complete with my positive actuating mechanism, showing the same in acting position with the anchoring slips expanded as when the tubing catcher is functioning to hold a string of tubing in a string of pipe.

Fig. 2 is a view of the same in elevation with the mechanism in inoperative position as when the tubing whereon the tubing catcher may be placed is being run in the well.

Fig. 3 is a view of the same in cross section on line A—A of Fig. 1 and line B—B of Fig. 2.

Fig. 4 is a view in perspective of my tubular mandrel with cam follower thereon which is a part of my positive actuating mechanism for the tubing catcher proper.

Fig. 5 is a view in perspective of my sleeve plunger which is adapted to be actuated by said cam follower.

Fig. 6 is a view in perspective of one of my loosely held detachable friction grip springs wherewith the above mentioned sleeve plunger is held against rotation on the mandrel.

Fig. 7 is a view in perspective of one of my pair of spring holding yokes, one of which also functions by means of the lugs thereon as a guide for said sleeve plunger.

Fig. 8 is a view in perspective of a modified form of my tubing catcher and positive actuating mechanism as a complete unit and showing the same in inoperative position as when the tubing whereon it may be placed is being run in the well.

As is well known, tubing catchers are run on tubing or pipe inside of another string of pipe or casing, and the slips of the tubing catcher when operating to hold or support the tubing are in engagement with the string of casing wherein the tubing is run. The casing is not shown in the drawing.

First describing my tubing catcher proper, as shown in Figs. 1 and 2 of the drawing, 1 represents the tubular stem of the catcher the upper end of which is threaded to attach the same to the tubing with which the catcher may be used. On the tubular stem and integral thereof is a conventional cone shaped slip spreader 2 wherewith to force the hereinafter mentioned slips outwardly against the casing when the catcher is operated. A collar 3 is positioned on the lower end of stem 1 and serves as a guide for the hereinafter mentioned slide sleeve, also as a connection for the mandrel of my positive actuating mechanism, and furthermore serves as a guide for the sleeve plunger of said mechanism. The tubing catcher proper may be used without my positive actuating mechanism, and, when so used, tubing below the catcher may, if desired, be screwed into collar 3, which is a conventional practice. When the catcher is thus used it is set or operated by the inertia of the tubing when it is dropping, either automatically as when the tubing parts, or purposely by giving a slight drop to the tubing, the same being the customary manner of operating tubing catchers. Also integral of the stem is a slip retaining guide 4 wherewith the slips are held and guided in longitudinal movement along the stem of the catcher in manner hereinafter explained.

All of the above parts are immovably fixed with relation to each other, and the movable parts are mounted thereon, said parts being represented by the slips 5, usually three in number, slidably retained and loosely held in the slip retaining guide 4 thru which the shanks 6 of the slips are passed, a slide sleeve 7 which acts as a plunger in actuating said slips, and a collar 8 bolted thereon whereby the bent ends 9 of the slip shanks 6 are loosely held in slots 10 of said slide sleeve 7, and a spring 11 bearing on collar 3 and collar 8 to partially support the weight of the slide sleeve and slips on collar 3 thus facilitating the opera-

tion of the slips by the force of inertia above mentioned.

Directing attention to my positive actuating mechanism for said tubing catcher as shown in Figs. 1 to 7 of the drawing, 12 represents a tubular mandrel adapted to be screwed into collar 3 of the tubing catcher proper when it is desired to attach this mechanism to the catcher, 13 a collar which serves to hold parts of the mechanism together as well as to serve as a connection for tubing which may, if desired, be run below the tubing catcher. Mandrel 12 has thereon a cam follower 14 with the face 15 of the cam follower in the form of an inclined plane positioned in a spiral about the mandrel, the drawing disclosing this in the form of twin inclined planes. A sleeve plunger 16 is slidably mounted on said mandrel and has an inclined plane or planes 17 on its lower end with said planes corresponding to and adapted to engagement with the face 15 of the cam follower and co-operative therewith in manner to cause it to be moved longitudinally along said mandrel when said cam follower is operated. The sleeve plunger 16 also overlaps collar 3 when the mechanism is attached to the tubing catcher proper as shown in Figs. 1 and 2, and when so attached is adapted to slide on said collar and is in slidable engagement with slide sleeve 7 of the tubing catcher proper. The sleeve plunger 16 has longitudinally extending slots 18 therein thru which the hereinafter mentioned guide lugs may extend to guide said sleeve plunger in movement as aforesaid and prevent its rotation on the mandrel, and also thru which said guide lugs may protrude to hold the hereinafter mentioned arched springs.

A pair of collars or yokes 19 are slidably and rotatably mounted and loosely held on mandrel 12 and are provided with a plurality of guide lugs 20, above mentioned, each of which has sockets 21 wherein arch springs 22 may be held in manner shown with the ends of each spring loosely fitted into its respective socket. The yokes 19 are held on said mandrel in spaced relationship with collars 3 and 13 so that they may move between the two sufficiently to permit the arched springs 22 to be inwardly compressed against the casing when the mechanism is in use within a string of casing as aforesaid, and also so that altho said movement is provided, the collars will retain said yokes in position to hold said arch springs and prevent their slipping out of their sockets 21. All of the parts of both tubing catcher proper and the positive actuating mechanism are loose fitting to prevent sand or other substance from wedging the working parts or freezing against operation.

As previously explained, the tubing catcher proper may be used without the positive actuating mechanism in which case it operates in manner above stated. When the tubing catcher proper is used with the positive actuating mechanism, it also may be used and operated in the same manner as without said mechanism. However, when the complete tubing catcher and positive actuating mechanism is used, the apparatus as shown assembled in Figs. 1 and 2 of the drawing is run on a string of tubing inside of a string of casing and the arched springs 22 grip the inner face of the casing and provide a frictional grip thereon to the effect that while the whole apparatus is free to move longitudinally in the casing, the upper yoke 19 is sufficiently anchored against rotation to permit the guide lugs 20 thereon to act as guides for the sleeve plunger 16 and prevent its rotating when said positive actuating mechanism is operated as will later be explained. When it is desired to set the tubing, that is to anchor it in place in the casing by means of my positive actuating mechanism, the tubing to which the tubing catcher is attached is given a turn, the rotation being anti-clockwise or to the left with the cam faced as shown in the drawing, whereupon cam follower 14 lifts sleeve plunger 16, sliding it upwardly along the mandrel 12 and causing it in turn to engage and lift slide sleeve 7 in the same direction, which in turn causes slips 5 to be lifted upwardly and spread outwardly against the cone shaped slip spreader 2, thus causing slips 5 to be forced against the inner periphery of the casing and to become wedged between said casing and cone shaped spreader, and locking said tubing catcher with said casing. When thus used, the tubular stem 2 of the tubing catcher proper, and the tubing to which it is connected, both become a part of mandrel 12 and are in effect one mandrel wherewith to actuate the cam follower 14. When it is desired to release the tubing catcher from engagement with said casing as above set forth, a reverse turn of the tubing will permit sleeve plunger 16 to drop to the position shown in Fig. 2 of the drawing, whereupon slide sleeve 7 will in its turn be free to drop together with the slips 5 with which it is connected, thus releasing the slips from engagement with the casing. A slight jar may be imparted to the tubing to free the slips from the casing, and as previously mentioned the coil spring 11 is not sufficiently strong to prevent the slide sleeve 7 and the slips 5 from dropping, but only strong enough to partially carry the weight of the same on collar 3 of the stem 1 for the purpose previously stated.

Considering now the modified form of the device as disclosed in Fig. 8 it is seen that while the general scheme of the two devices is the same, the structure shown in Fig. 8 is that of a complete tubing catcher unit with the positive actuating mechanism not designed to be detachable from the tubing catcher proper and having a longer assembly than that of the structure shown in Figs. 1 and 2, which last mentioned structure is my preferred form of the device. Instead of a collar such as collar 3, a collar 23 having a cam follower 24 thereon integral thereof is attached to the tubular stem 1. The cam follower 24 may be a round lug or a pin inserted in and welded to said collar 23 as is shown in the drawing. Spring 11 bears on collar 23 the same as it does on collar 3, and the slide sleeve 7 slides on collar 23 the same as it does on collar 3. A short joint of tubing 25 is screwed into collar 23 and has a collar 26 at its lower end for the purpose hereafter explained. The tubular stem 1 and the collar 23 thereon and the joint of tubing 25 constitute a tubular mandrel the same as stem 1 and collar 3 and mandrel 12 shown in Figs. 1 and 2, and serve the same purpose. A sleeve plunger 27 is slidably mounted on collar 23 and has a spiral slot or cam 28 therein in which cam follower 24 is positioned. The upper surface or wall of slot 28 forms an inclined plane or cam engageable with said cam follower whereby the cam follower moves the sleeve plunger 27 upwardly when actuated. In the drawing a plurality of cam followers 24 and cams 28 are shown, one set on either side of the device, the cam follower and cam on the far side being outlined by dotted lines. The upper end of sleeve plunger 27 is in engagement with slide sleeve 7 and the lower end of the sleeve

plunger is provided with a longitudinally extending slot or slots 29 adapted to receive a guide lug or lugs 30 which project from and are a part of a collar or yoke 31 which is loosely fitted around the joint of tubing 25 and to which collar a number of arched springs 32 are attached as by welding at one of their ends, and with their other ends likewise attached to another collar or yoke 33 which is also loosely fitted around said joint of tubing. Collar 26 serves to hold the assembly of yokes 31 and 33 and springs 32 on the device and also provides means for attaching the tubing catcher to a string of tubing run below it if the tubing catcher is to be run with tubing depending from it.

In operation this structure functions in the same as does that disclosed in Figs. 1 and 2, and the tubing catcher may be set by dropping the tubing or by turning the tubing in the same manner as with the other form of device. The cam follower 24, the sleeve plunger 27, the slots 29, the guide lugs 30 and the arched springs 32, work in the same manner as do their equivalents appearing in the other form of positive actuating mechanism, the working of which has previously been explained.

Having thus fully disclosed my invention, what I claim and desire to secure by Letters Patent is:

1. In combination, a tubing catcher including a mandrel formed with a spreader and a cam follower, slips cooperating with said spreader, a tubular plunger on said mandrel operatively associated with said slips and having a cam cooperating with said cam follower for shifting said plunger and slips upon rotation of said mandrel, said plunger being partially spaced from said mandrel to form a chamber therebetween, a yoke member enclosed in said chamber and having a splined connection with said plunger to permit relative axial movement therebetween, and means for securing said yoke against rotary movement during actuation of said slips by rotation of said mandrel.

2. A tubing catcher assembly including in combination, a mandrel provided with a spreader and a cam follower, a pair of fixed collars arranged on opposite sides of said cam follower, slips cooperating with said spreader, a slidable collar connected to said slips, a plunger sleeve, said plunger sleeve operatively engaging said sliding sleeve at its upper end and having a cam in cooperative engagement with said cam follower, a pair of yoke members adapted to abut said fixed collars, one of said yoke members being splined to said plunger sleeve to permit relative axial movement therebetween, and means carried by said yoke members for securing same against rotation with said mandrel when the latter is rotated to actuate said plunger sleeve.

3. In a positive actuating mechanism for a tubing catcher, a tubular mandrel, a cam follower thereon, a sleeve plunger on said mandrel, a cam on the lower end of said sleeve plunger in cooperative engagement with said cam follower, a plurality of longitudinally positioned slots formed intermediate the ends of said sleeve plunger, a yoke on said tubular mandrel, a plurality of guide lugs thereon slidably positioned in said slots for guiding the travel of said sleeve plunger, and means for holding said yoke against rotation with said mandrel when the latter is rotated to actuate said sleeve plunger.

4. An anchoring means for holding a sleeve plunger on the mandrel of a positive actuating mechanism for a tubing catcher, including a mandrel as aforesaid and a cam follower thereon, a sleeve plunger as aforesaid having a cam surface formed at its lower end and coacting with said cam follower, a plurality of longitudinally disposed guide slots in said sleeve plunger formed above said cam surface, a pair of yokes one of which is provided with a plurality of radially extending guide lugs for said sleeve plunger each respectively engaging one of said guide slots, a plurality of sockets in both of said yokes, and a plurality of arched springs the ends of which are held in their respective sockets in said pair of yokes, and means for holding said yokes on said mandrel.

5. In combination, a tubing catcher including a mandrel formed with a spreader, a cam follower and spaced collars, slips cooperating with said spreader, a tubular plunger on said mandrel operatively associated with said slips and having a cam at one extremity cooperating with said cam follower for shifting said plunger and slips upon rotation of said mandrel, the upper portion of said plunger being formed with guide slots and enlarged to enclose a portion of one of said collars and provide a housing therebetween, a yoke member enclosed in said housing having radially projecting lugs positioned in said guide slots and projecting outwardly beyond the outer wall of said plunger to permit relative axial movement therebetween, and spring means engaging said projecting lugs and securing said yokes against rotary movement during actuation of said slips by rotation of said mandrel.

6. In combination, a tubing catcher including a mandrel formed with a spreader and cam follower, slips cooperating with said spreader, a tubular plunger on said mandrel operatively associated with said slips and having a cam cooperating with said cam follower for shifting said plunger and slips upon rotation of said mandrel, said plunger being formed with a longitudinally extending guide slot, spaced independent upper and lower yoke members, stop means for limiting the downward movement of the lower yoke member, stop means for limiting the upward movement of the upper yoke member, means carried by the upper yoke member and normally engaging the wall of said guide slot in said plunger to permit relative axial movement therebetween, and spring means connecting said yoke members and normally urging same against said stop means and securing same against rotative movement during actuation of the slips by rotation of said mandrel.

WILLIAM H. McKISSICK.