Sept. 29, 1931. N. K. SMITH 1,825,018

ROTARY AND CASING HOOK

Filed April 7, 1930 3 Sheets-Sheet 1

Fig. 1

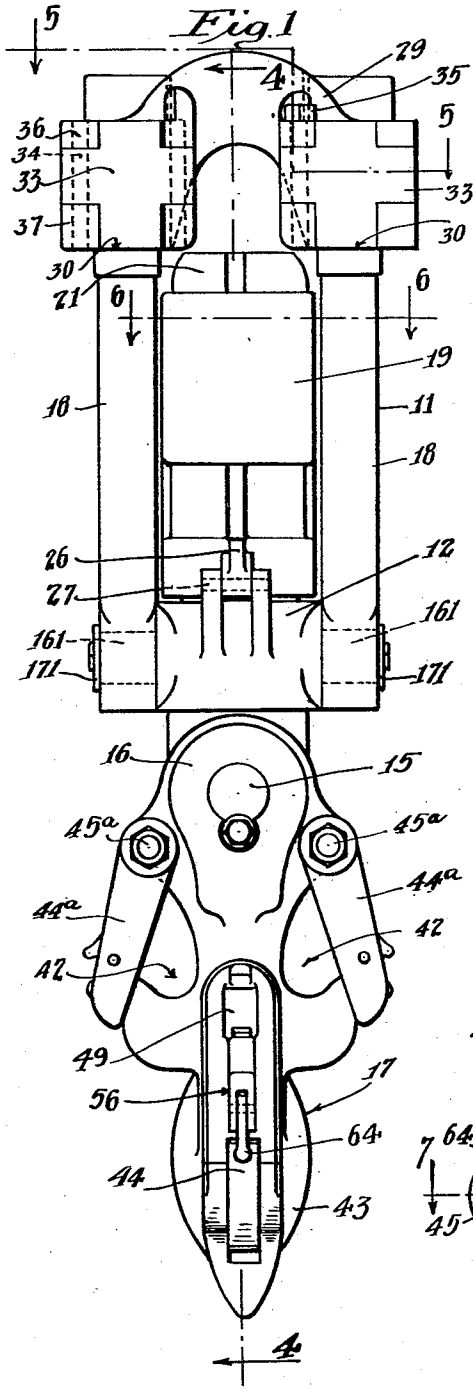
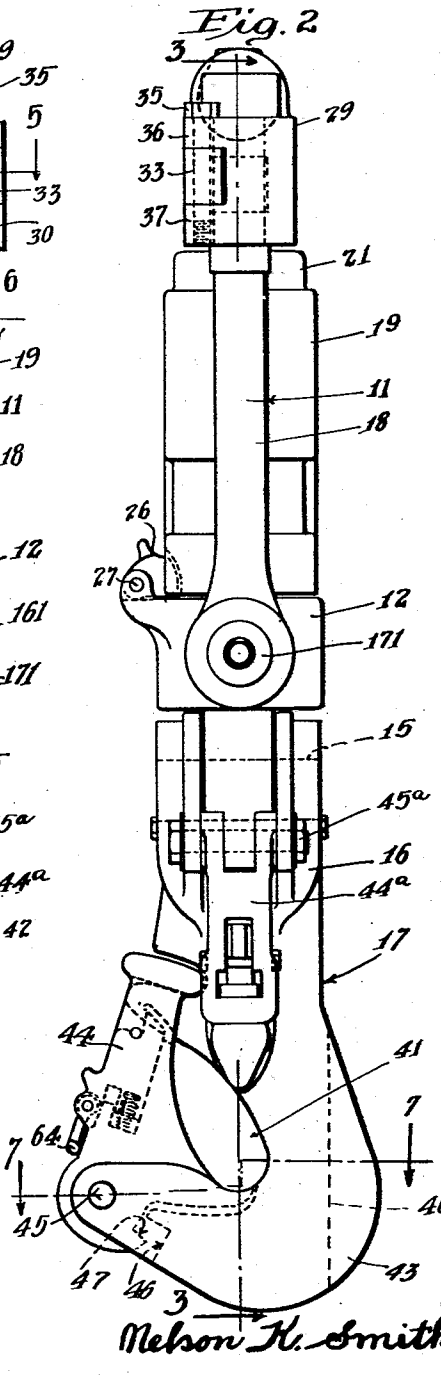


Fig. 2



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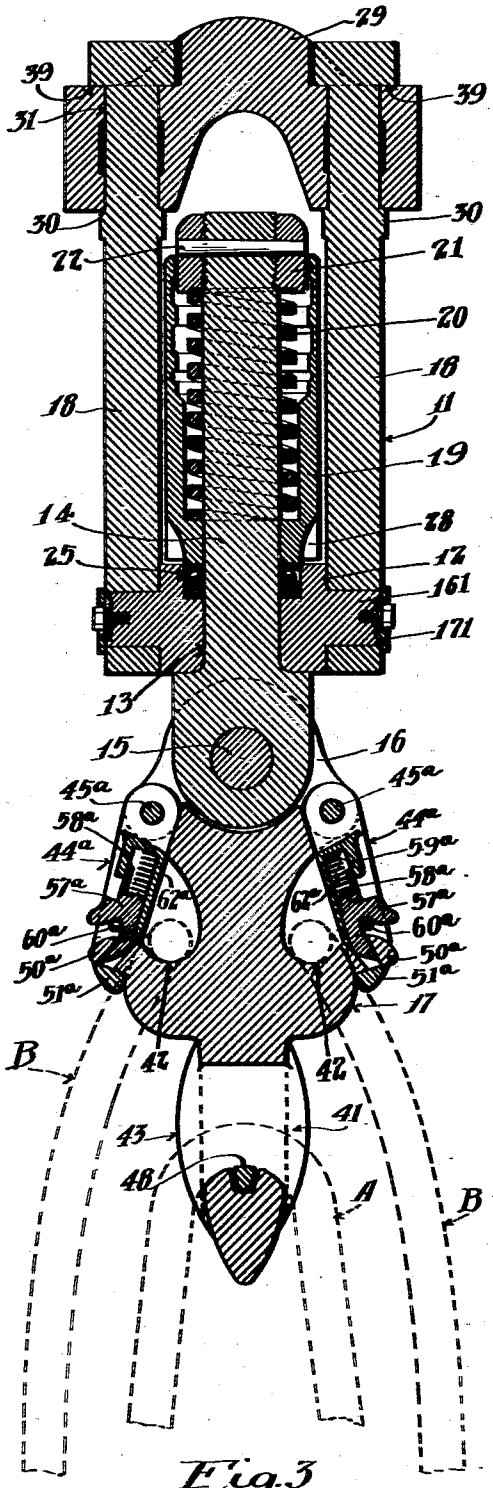


Fig. 3

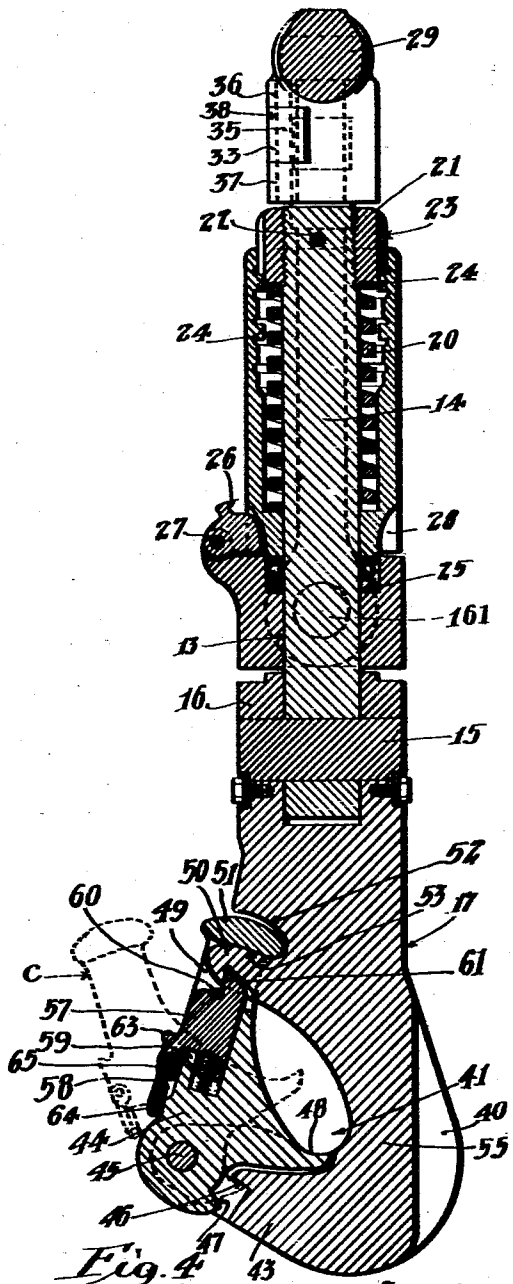


Fig. 4

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ROTARY AND CASING HOOK

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Fig. 5

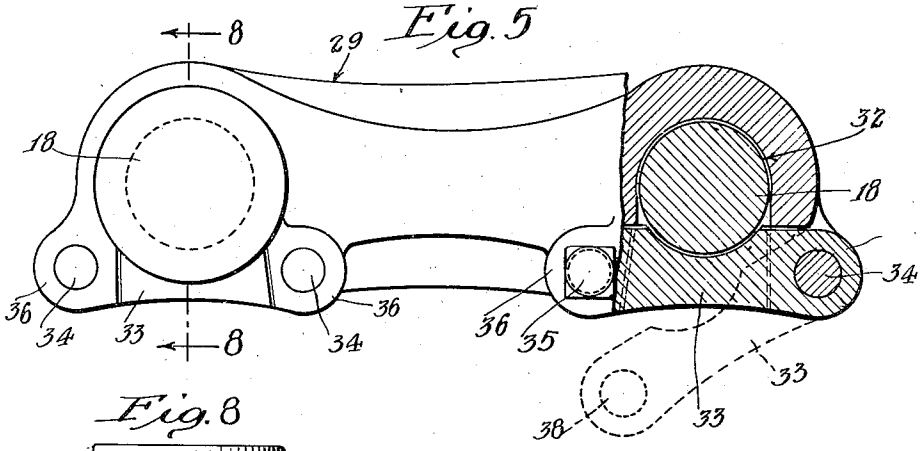


Fig. 8

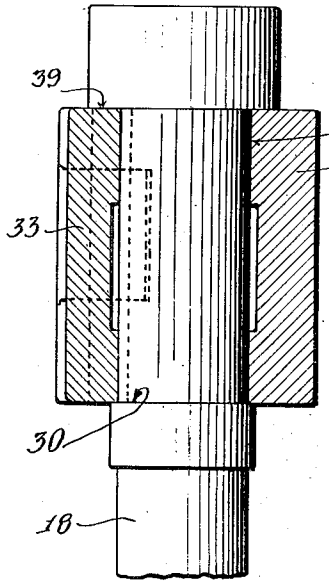
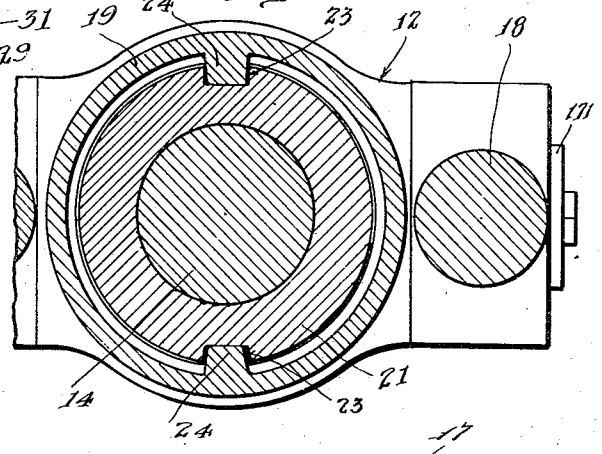


Fig. 6



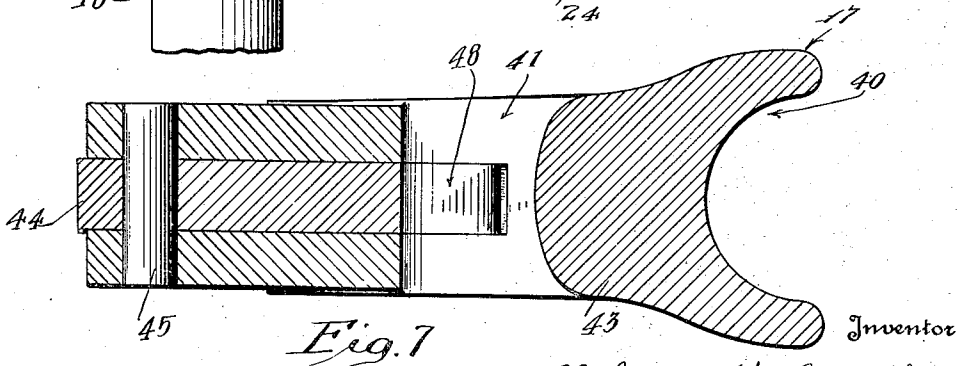


Fig. 7

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Patented Sept. 29, 1931 1,825,018

UNITED STATES PATENT OFFICE

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ROTARY AND CASING HOOK

Application filed April 7, 1930. Serial No. 442,260.

This invention relates to rotary and casing hooks, a type of hook that is employed in rotary drilling for supporting the drill pipe and for raising and lowering casing in the operations of connecting new sections of casing to the casing in the well and then lowering the casing so as to encase that portion of the well that has recently been drilled.

A further important object of the invention is to increase the facility with which the various operations may be performed.

An important object is to make provision for supporting the elevator bails in positions at right angles to the bail of the swivel thereby avoiding the necessity of tying back the elevator while the drill stem is being rotated.

Another very important object is to provide a link connection between the bail of the hook and the shank thereof so that the strain upon the hook will be partly transmitted to the shank through said link, thereby insuring against breakage of the hook at its weakest point.

Another very important object is to provide for selfadjustment of the hook so as to equalize the strain on the elevator bails in event of said bails being of unequal length as is frequently the case. The elevator bails may be of exactly the same length when the elevator is new but after use the bails may become bent to different degrees, thus changing the distance from the point of their engagement with the hook to the axis of the elevator trunnions.

Another very important object of the invention is to insure to as great an extent as possible against the pressure being thrown eccentrically on the bearing, thereby increasing the life of said bearing.

Another important object is to provide a novel latch for holding the relatively rotatable members of the hook against relative rotation when this is desirable.

Another important object is to facilitate connecting the eye of the block and tackle to the bail of the hook.

Another very important object is to make provision for engaging the elevator bails at other points on the hook than the point where the swivel bail is engaged.

Another important object is to insure the hook hanging vertically when it engages the stand of drill pipe that it is to pick up, in order that the elevator may be readily engaged with said stand without the necessity of tilting the elevator, as would be necessary if the hook did not hang vertically at the time that the elevator is to be placed around the stand of drill pipe.

Another very important object is the general improvement of the type of hook in which a coil spring is employed for lifting the stand of pipe off the section from which it has been screwed, as soon as the screw threads disengage. During the drilling operation, when the drill stem is supported more or less by the hook, the spring is fully compressed, the coils resting upon one another.

Another very important object is to facilitate engagement of the hook with the bails when the hook is being elevated for the purpose of lifting the "Kelley" out of the "rat-hole", preparatory to connecting the Kelley with the drill stem in the well-hole. This object is attained by providing a folding bill on the hook, the extensible portion of the bill being adapted to engage the swivel bail and to then be actuated into folded position by the weight of the bail as said bail slides inwardly into the notch of the hook.

Other objects and advantages will appear in the sub-joined detailed description.

The accompanying drawings illustrate the invention:

Figure 1 is a longitudinal view of a rotary and casing hook constructed in accordance with the provisions of this invention.

Fig. 2 is an elevation of Fig. 1 from the right thereof.

Fig. 3 is a vertical section on the line indicated by 3—3, Fig. 2. Fragments of the bails of the swivel and elevator are indicated in dotted lines.

Fig. 4 is a vertical section on the line indicated by 4—4, Fig. 1, the extensible bail member being shown in solid lines in closed

position and being indicated in extended position in dotted lines.

Fig. 5 is an enlarged plan view of Fig. 1, partly in section, on the irregular line indicated by 5—5; the latch for holding the bail-head in closed position is shown closed in full lines and is shown in open position in dotted lines.

Fig. 6 is a fragmental view, mainly in horizontal section, on the line indicated by 6—6, Fig. 1.

Fig. 7 is an enlarged horizontal section on the line indicated by 7—7, Fig. 2.

Fig. 8 is a fragmental view of the left end portion of Fig. 5, portions being in section on the line indicated by 8—8.

Referring to the drawings, there is provided a bail 11 which pivotally supports a trunnion block 12. The trunnion block is provided with a central bore 13 through which passes a stem 14. The lower end of the stem 14 carries a pivot 15, the ends of which extend into a shank 16 of a hook which is indicated in general by the character 17. The longitudinal axes of the trunnion block 12 and pin 15 may be at a right angle, or any other angle, to one another, since, normally, the stem 14 is free to rotate within the trunnion block 12. The outer ends of the trunnions 161 of the trunnion block 12 are provided with washers 171 to prevent the arms 18 of the bail 11 from coming off of said trunnions.

The stem 14 projects above the level of the trunnion block between the bail arms 18 and surrounding the upper projecting end of the stem 14 is a tubular member 19 that constitutes a housing for a coil spring 20 that also surrounds the stem 14. The lower end of the spring 20 rests on the housing 19 and the upper end of said spring engages a nut 21 that is threaded or otherwise secured to the upper end of the stem 14.

The nut 21, in this instance, is locked on the stem by a taper pin 22 which passes through the stem and nut. Preferably, the stem 14 and spring housing 19 are connected for simultaneous rotation and this is effected, in this instance, by vertical grooves 23 in the nut 21, and inwardly projecting tongues 24 in the member 19, said tongues slidably engaging in the grooves 23 so that when the stem 14 is pulled downwardly to compress the spring 20, the nut 21 is in sliding engagement with the member 19 but is held against turning relative to said member 19.

The lower end of the spring housing 19 seats on a bearing 25 which, in this instance, is of the ball type. A suitable means is provided for releasably locking the member 19 and the trunnion block 12 against relative rotation and, in this instance, said means includes a latch member 26 pivoted at 27 to the trunnion block 12 and selectively engaging notches 28 in the outer face of the spring housing 19, at the lower end of said housing. Owing to engagement of the tongues 24 in the grooves 23 and engagement of the latch 26 with one of the notches 28, the stem 14 is releasably locked against rotation relative to the bail 11. When it is desired to permit relative rotation between the stem and bail, the latch 26 will be retracted. Besides the arms 18 of the bail 11, said bail includes a head 29, said head being supported on the arms by shoulders 30. At one end the bail-head 29 is provided with a bore 31 through which one of the bail arms 18 extends and the head 29 may be swung on said arm into open position away from the other arm 18 or into closed position on said other arm.

When the head 29 is closed, a vertical recess or groove 32 therein receives a portion of that bail arm 18 on which the head 29 does not swing, and a latch member 33 is pivoted at 34 to the head 29 and is adapted to close across the groove 32 so as to prevent the head 29 from being swung into open position. The latch 33 is held in closed position by a pin 35 which, in this instance, is in the form of a cap screw which is inserted through an ear 36 and threaded into an ear 37, the ears 36, 37 being on the head 29. The pin 35 passes through a hole 38 in the latch 33. The arms 18 are provided just above the head 29 with shoulders 39 which prevent the head 29 from being pulled upwardly off of the arms 18.

When the loop or eye of the block and tackle is to be connected or disconnected from the bail, the pin 35 will be removed, the latch 33 swung open and the head 29 then swung into open position. After the loop or eye of the block and tackle has been swung over the free end of the head 29, said head will be swung closed and the operations just described will be performed in the reverse order so as to secure the head 29 in its closed position.

Preferably the back of the hook 17 is provided with a vertical groove or channel 40 which may be of arcuate contour. When the operator in the derrick swings the hook toward the stand of pipe that is to be connected with the pipe in the well, the groove 40 will engage said stand of pipe and thus maintain the hook in vertical position while the operator places the elevator in position on said stand of pipe.

If the groove 40 were not provided, the hook would slip to one side of the stand of pipe, thus canting the hook and, since the hook is at this time carrying the elevator, said elevator would also be canted and, consequently, it would require that the operator tilt the elevator until the axis of its bore was substantially parallel to the axis of the stand of pipe. This would require time and considerable effort and, accordingly, the presence of the groove 40 economizes the

operator's time and facilitates his swinging the elevator into the right position for engaging the stand of pipe.

The hook member 17 is provided near its lower extremity with a notch 41 which constitutes one of the openings of the hook, said notch being intended to receive the bail of the swivel, said bail being indicated in broken lines at A in Fig. 3. The groove 40 being, as stated above, in the back of the hook member, the notch 41 opens to the front of said hook member. Above the level of the notch 41 is a pair of other notches 42 that constitute hook openings. These openings 42 are in the opposite sides of the hook member 16 and are adapted to receive the two bails, indicated at B, of an elevator, of which only the bails are fragmentarily indicated in Fig. 3. It will be seen that the bails B straddle the lower portion of the hook so that when the elevator is not in use it can rest against the swivel, not shown.

The particular construction of the lower end portion of the hook member 17, that engages the swivel bail, will now be described: The hook member 17 terminates below the opening 41 in a foldable bill that includes a stationary section 43 and a swinging section or link 44 which is pivoted at 45 to the section 43. The section 43 is provided with an upwardly and forwardly extending shoulder 46 adapted, when the link 44 is in the open position indicated at C in Fig. 4, to engage a shoulder 47 on said link 44 so as to support said link 44 in its open position, in which position it extends aslant upwardly and outwardly from the section 43. This link 44 has a two-fold function. When in the open or extended position, the link 44 readily engages the bail of the swivel when the hook is hoisted for that purpose, as is done when it is desired to pull the Kelley out of the rat-hole, a term applied to the hole in the derrick floor in which the Kelley is placed while sections are being added to the drill pipe and casing or being disconnected therefrom. As the bail of the swivel slides inwardly along the upper face of the extended bill section, it comes into contact with a shoulder 48 on said section 44 near the inner end of said section 44. This shoulder 48, even when the section 44 is extended, lies inwardly of a vertical plane through the pivot 45 and, when said shoulder 48 is engaged by the swivel bail, said shoulder is urged inwardly and downwardly, thus swinging the link into the closed position shown in dotted lines in Fig. 4 and, at the same time the swivel bail slides off of the shoulder 48 and into the lower portion of the hook opening 41.

The shoulder 48 is spaced inwardly a sufficient distance from the pivot 45 to insure that, when the link 44 is extended, the bail of the swivel will engage the shoulder 48 rearwardly of a vertical plane that passes through the axis of the pivot 161, even though the hook member be canted rearwardly as naturally occurs because at the moment the weight of the bail is first imposed on the hook said weight is eccentric relative to the longitudinal axis of the hook member. In this instance, the shoulder 48 is positioned approximately on the longitudinal axis of the hook member.

When the section or link 44 is in the closed position, a transversely extending opening 49 in said link 44 accommodates a protrusion 50 while that portion 51 of the link 44 immediately above the opening 49, that forms the upper wall of the opening 49, is accommodated more or less in a notch 52 in the front of the hook member 17. The lower face of the portion 51 is more or less concave, as indicated at 53, to fit the convex upper face of the protrusion 50, the radii of the faces 53, 54 being struck from the axis of the pivot 45 as a center. The faces 53, 54, when the link 44 is closed, are approximately in engagement so that when the strain comes upon the swivel bail, all of the strain is not transmitted through the rear wall 55 of the hook opening 41 but a portion of said strain is transmitted through the link 44, thereby insuring against breakage of the hook through said rear wall portion 55 of the hook.

A latch is provided to releasably hold the link 44 in its closed position and this latch may be of any suitable construction and, in the present instance, is constructed as follows: Communicating with the opening 49 is a channel 56 in which is slidably mounted a latch 57. The latch 57 is held in place by a guide member 58 that projects into a slot 59 extending longitudinally of said latch member at the lower end thereof. At its upper end, the latch is held in the channel 56 by a pin 60 that extends transversely of said channel across the outer edge of the latch member 57. The upper end of the latch member 57 is adapted, when the link 44 is closed, to engage behind a shoulder 61 on the underface of the protrusion 50. The latch 57 is yieldingly held in its latching position by a coil spring 62.

Projecting from the outer face of the latch 57 is a knob 63 over which the operator may place the eye of an operating member for retracting the latch and swinging the link 44 into open position, said operating member being used when the hook is considerably above the level of the operator so that he is unable to reach the latch with his extended arm. In order to facilitate retracting the latch 57 and opening the link 44, when the operator has access to the latch with his hand, there is provided a handle 64 that is pivoted at 65 to the latch 57.

Links are also provided for closing across

the openings 42 and these links are practically of the same construction and function in the same manner as the link 44 and the various elements that constitute them are indicated by the same reference characters employed for the link 44 with the addition of the suffix "*a*." Also latches are employed to releasably hold the links 44ª closed and said latches, being constructed practically the same as the latch 57, the various elements thereof are designated by the same reference characters as employed for the latch 57, with the addition of the suffix "*a*."

The foregoing will make clear the construction of the invention and the operation of the various features thereof, and, briefly stated, the operation is as follows: Assuming that the bail-head 29 has been connected with a block and tackle, that the swivel bail is in the opening 41, that the link 44 is closed, that the elevator bails are in the openings 42 with the links 44ª closed, and that the Kelley supported by the swivel is being rotated by the rotary table, not shown, the elevator bails will be positioned astride of the lower portion of the shank member 16 and the elevator rest against the upper portion of the swivel. Now, assuming that it is necessary to connect another stand of drill pipe to the drill stem, the operator will cause the hook to be raised until the lower end of the Kelley is above the rotary table. The slips will then be set in the rotary table to hold the drill pipe and, thereupon, the Kelley will be disengaged from said drill pipe. The Kelley will then be swung to one side and lowered into the rat-hole. The link 44 will then be swung into open position and the hook detached from the swivel bail.

The hook will then be raised by operation of the drawworks into a position in the upper portion of the derrick, thus raising the elevator, the bails of which are in the opening 42, into position adjacent to the upper end of the stand of pipe that is to be connected with the drill stem. The operator in the upper portion of the derrick will move the upper portion of the stand of pipe along the fingerboard until said pipe is almost vertical and he will then swing the elevator into position to engage around the stand of pipe. When this last operation is being accomplished, the hook comes into engagement with the stand of pipe which enters the groove 40, thus holding the hook against swinging to one side or the other of the stand of pipe.

Accordingly, the elevator which is properly balanced on its bails so as to tend to naturally remain horizontal, is not tilted out of its horizontal position while it is being moved into place around the stand of pipe.

The drawworks will then be operated to raise the hook to cause the elevator to lift the stand of pipe which stand will swing into perpendicular position over the upper end of the pipe in the well-hole. The operator will then cause the drawworks to be operated to lower the hook and the stand of pipe will be screwed onto the pipe in the well.

The last mentioned elevator will then be detached from the pipe.

I claim:

1. A rotary and casing hook comprising a hook member provided with a notch to receive the bail of a swivel and provided with other notches to receive the bails of an elevator, the second mentioned notches having their axes at a right angle to the first mentioned notch.

2. A rotary and casing hook comprising a hook member provided with a notch to receive the bail of a swivel and provided with other notches to receive the bails of an elevator, links pivoted to the hook member closable in front of the notches, and latches on said links to releasably hold said links closed.

3. A rotary and casing member comprising a hook member provided with a notch to receive the bail of a swivel and provided with other notches to receive the bails of an elevator, links pivoted to the hook member closable in front of the notches, a stem pivoted to the hook member, a trunnion block, and means rotatably and yieldingly supporting the stem on the trunnion block.

4. A rotary and casing member comprising a hook member provided with a notch to receive the bail of a swivel and provided with other notches to receive the bails of an elevator, the second mentioned notches having their axes at a right angle to the first mentioned notch, and links pivoted to the hook member and closable in front of the notches.

5. A rotary and casing member comprising a hook member provided with a notch to receive the bail of a swivel, said hook member being provided with a foldable bill adapted, when unfolded, to extend aslant upwardly and outwardly so as to catch and guide the swivel bail into the notch, and means at the free end of said foldable bill to automatically latch said foldable bill in closed position.

6. A rotary and casing hook comprising a hook member provided with a notch to receive the bail of a swivel, the bill of said hook including a stationary section and a section pivoted to the stationary section, the pivoted section provided with an opening, the hook member being provided with a protrusion adapted to extend through said opening, and a latch releasably locking the pivoted section to said protrusion.

7. A rotary and casing hook comprising a hook member provided with a notch to receive the bail of a swivel, the bill of said

hook including a stationary section and a section pivoted to said stationary section, the hook member provided with a protrusion, and the pivoted section provided with a portion above the protrusion and engageable with the upper side of said protrusion when said hook flexes under load to support a part of the load on said protrusion.

8. A rotary and casing hook comprising a hook member provided with a notch to receive the bail of the swivel, the bill of said hook member including a stationary section and a section pivoted to the stationary section, the hook member being provided with a protrusion, the pivoted section having an opening to receive said protrusion when the pivoted section is in folded position, the protrusion having a convex face, and the upper wall of the opening being concave and fitting said convex face.

9. A rotary and casing hook comprising a hook member provided with a notch to receive the bail of the swivel, the bill of said hook member including a stationary section and a section pivoted to the stationary section, the hook member being provided with a protrusion, the pivoted section having an opening to receive said protrusion when the pivoted section is in folded position, the protrusion having a convex face, the upper wall of the opening being concave and fitting said convex face, and a latch to releasably lock the pivoted section in folded position.

10. A rotary and casing hook comprising a block provided with trunnions, a bail engaging said trunnions, a stem extending through the trunnion block and provided with a shoulder, a housing surrounding the stem above the block, a coil spring within the housing engaging said shoulder, a bearing between the lower end of the housing and the trunnion block, and a hook member connected with the stem.

11. A rotary and casing hook comprising a block provided with trunnions, a bail engaging said trunnions, a stem extending through the trunnion block and provided with a shoulder, a housing surrounding the stem above the block, a coil spring within the housing engaging said shoulder, a bearing between the lower end of the housing and the trunnion block, and a hook member pivoted to the stem.

12. A rotary and casing hook comprising a block provided with trunnions, a bail engaging said trunnions, a stem projecting through a trunnion block and provided with a shoulder, a housing surrounding the stem, a spring between the housing and the shoulder, a bearing between the housing and the trunnion block, means slidably connecting the stem with the housing and preventing relative rotation of the stem and housing, a means releasably holding the housing and the trunnion block against relative rotation, and a hook member connected with the stem.

13. A rotary and casing hook comprising a block provided with trunnions, a bail engaging said trunnions, a stem projecting through a trunnion block and provided with a shoulder, a housing surrounding the stem, a spring between the housing and the shoulder, a bearing between the housing and the trunnion block, means slidably connecting the stem with the housing and preventing relative rotation of the stem and housing, a means releasably holding the housing and trunnion block against relative rotation, and a hook member pivoted to the stem.

14. A rotary and casing hook comprising a hook member provided with a notch to receive the bail of a swivel and provided with a pair of other notches one on each side of said first-mentioned notch and having their axes at right angles to the axis of said first notch, said other notches receiving the bails of an elevator, and links pivotally connected to said hook member and closable in front of each of the notches.

15. A rotary and casing hook comprising a hook member provided with a swivel receiving hook and provided with a pair of elevator bail receiving notches one on each side of said swivel hook, the elevator notches having their axes at a right angle to the axis of the swivel hook, and a vertically extending groove in the rear of said hook member substantially in alinement with the vertical plane of said swivel hook for engaging the casing to maintain said hook in alinement therewith while load is placed upon said elevator notches.

Signed at Los Angeles, Calif., this 2nd day of April, 1930.

NELSON K. SMITH.