Feb. 10, 1970 E. J. McFADDEN 3,494,484

TILTING ELEVATOR

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FIG. 1.

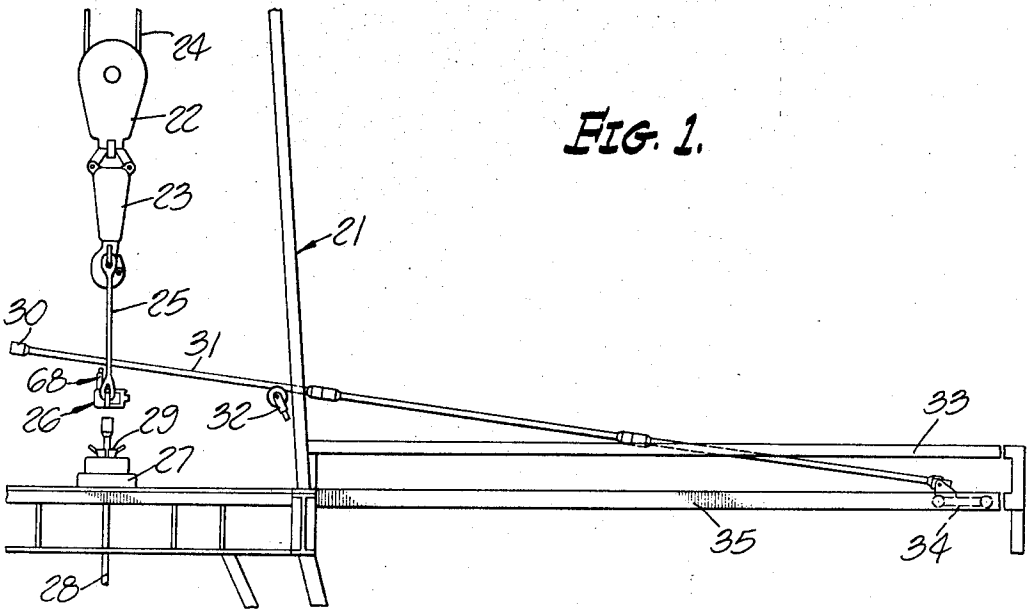

FIG. 2.

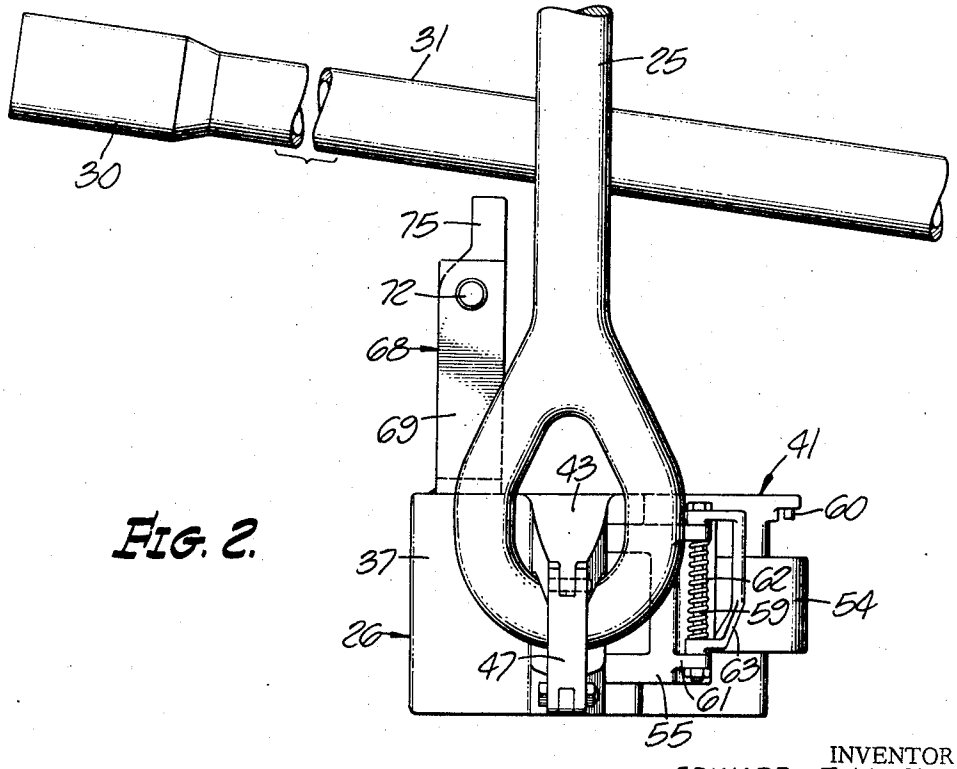

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FIG. 3.

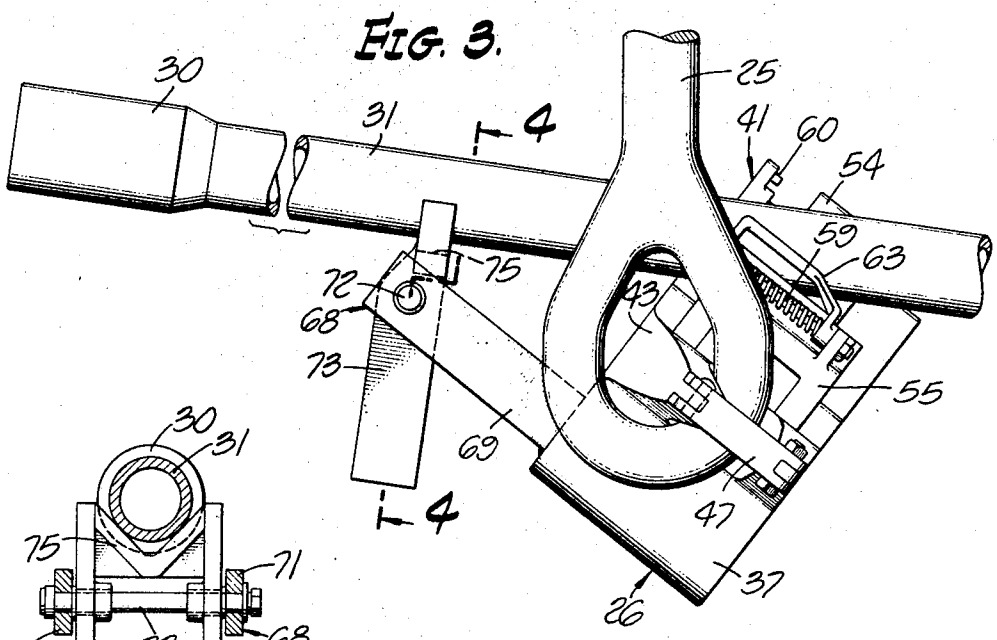

FIG. 4.

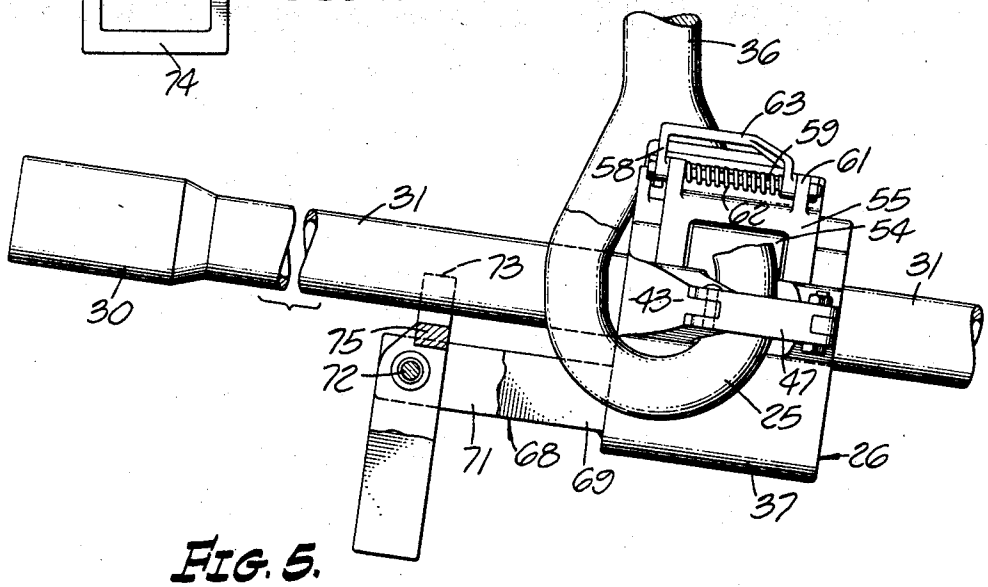

FIG. 5.

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TILTING ELEVATOR

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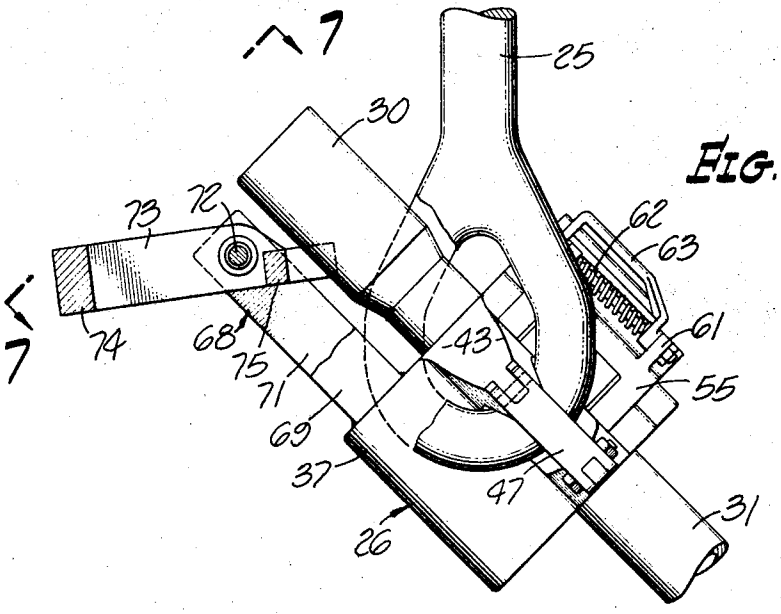
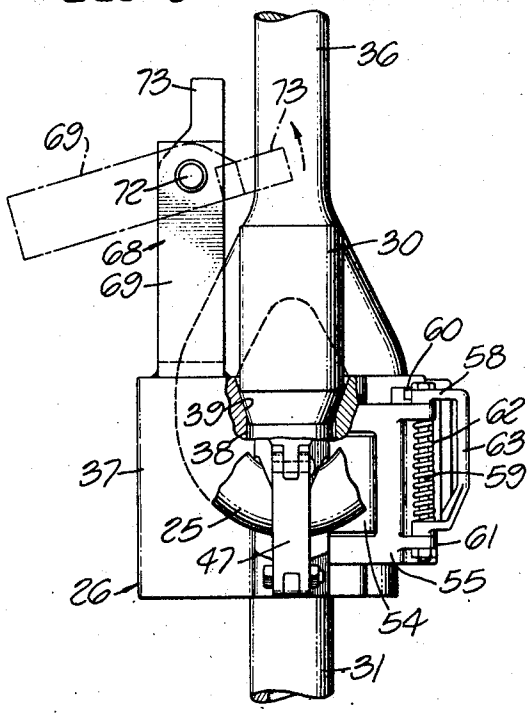


FIG. 6.

FIG. 8.



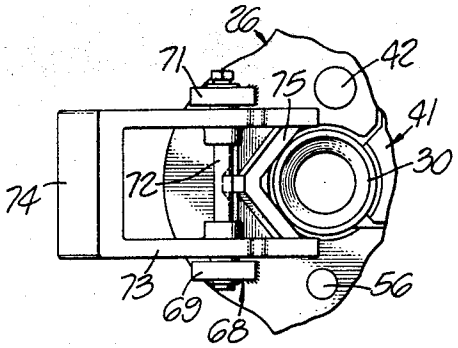


FIG. 7.

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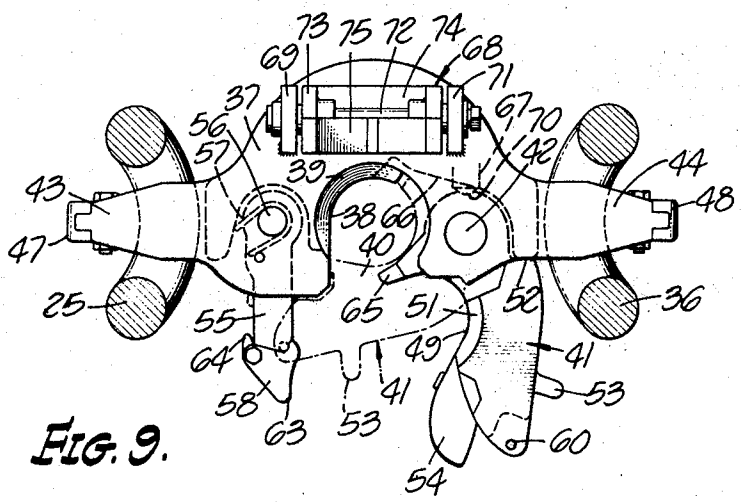

FIG. 9.

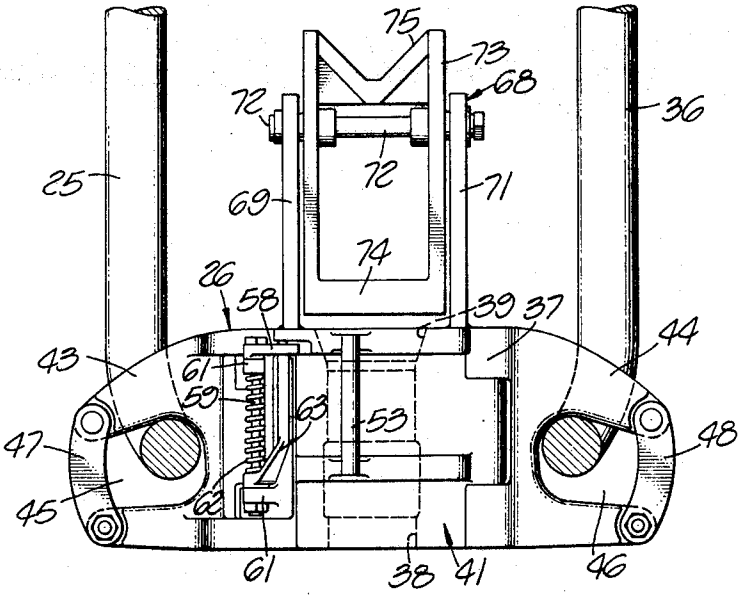

FIG. 10.

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United States Patent Office 3,494,484 Patented Feb. 10, 1970

3,494,484

TILTING ELEVATOR

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Filed July 30, 1968, Ser. No. 748,700
Int. Cl. E21b 19/06; B66c 1/56
U.S. Cl. 214—2.5 11 Claims

ABSTRACT OF THE DISCLOSURE

An elevator for well pipe and the like having cam mechanism thereon adapted to tilt the elevator automatically for mounting on a horizontally racked pipe, and illustrated as applied to a side opening elevator, the cam means comprising an upstanding pair of cam arms with a counterweighted pipe receiving saddle on the top rear portion of the elevator body, and a door with a detent retaining it in open position during tilting, with a finger projecting into the elevator bore adapted to contact a pipe being engaged and close the door automatically, the door having self-latching and locking mechanism. The saddle remains engaged on the pipe until approximately the position where the joint seats in the bore, whereupon the saddle disengages from the pipe and the cam means becomes inoperative.

BACKGROUND OF THE INVENTION

This invention has to do with an improved elevator for picking up a stand or section of drill pipe which has been horizontally racked. In the past it has been necessary to manually tilt the elevator for this purpose, and this required considerable effort and usually the use of special tools inasmuch as the elevator is very heavy and difficult to tilt for placing on a pipe which is in a horizontal position. Frequently for this purpose one or more holes into the elevator body have been provided and the operator has had to insert a rod or bar therein and exert considerable effort to swing the elevator on the links so that the pipe receiving bore is in horizontal alignment. Also, such arrangement usually required that the operator had to pull the elevator away from the end of the pipe and then push it onto the pipe, while at the same time controlling the hoisting mechanism to align the elevator bore with the pipe.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an elevator which will overcome the above-mentioned problems of placing the elevator on a horizontally racked stand of pipe.

It is a further object in this connection to provide an arrangement whereby the elevator may be lowered by the hoisting mechanism to a position below the pipe, the horizontally racked pipe may be moved between the elevator links, and then the elevator raised to engage the pipe and latch thereto.

In this connection it is an object to provide an arrangement wherein the raising of the elevator will automatically cause it to tilt and latch onto the pipe by merely raising the elevator against the bottom of the pipe.

It is a further object of the invention to provide an arrangement wherein the elevator has mechanism thereon for automatically tilting it for attachment to a horizontally racked stand of pipe, but which mechanism is automatically disengaged when the stand of pipe has been hoisted to a vertical position and does not interfere with the normal uses of the elevator for other purposes, such as lowering pipe into the well, or use of the elevator for

horizontally racking pipe which is being removed from or run out of a well.

It is a still further object to provide an arrangement which assists in stabilizing the pipe with respect to the elevator while the pipe is being raised from the horizontal position.

It is an object to provide an arrangement which eliminates the need for racking stands of pipe in a derrick or mast and thus eliminates the need for vertical racking equipment in the derrick or mast.

Other objects and advantages of the invention will be hereinafter described or will become apparent to those skilled in the art, and the novel features of the invention will be defined in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary side elevational view illustrating schematically a well derrick and hoisting equipment, a horizontal racking arrangement, and means for positioning a stand of pipe for engagement by an elevator;

FIG. 2 is an enlarged elevational view showing an elevator forming the subject matter of the present invention with a pipe positioned for engagement thereby, the pipe and links of the elevator being illustrated in a fragmentary manner;

FIG. 3 is a view similar to FIG. 2 but illustrating the elevator in the position where it is being tilted for placing on the pipe;

FIG. 4 is an elevational view, partly in cross section, taken on the line 4—4 of FIG. 3 looking in the direction of the arrows;

FIG. 5 is a side elevational view similar to FIGS. 2 and 3 but illustrating the elevator engaged on the pipe, with the door closed, certain portions of the view having been cut away to better illustrate the mechanism and parts thereof being shown in dotted lines;

FIG. 6 is a view similar to FIG. 5 but illustrating the relative position of the mechanism in a continued lifting of the elevator with the pipe held therein;

FIG. 7 is a fragmentary view, taken on the line 7—7 of FIG. 6 looking in the direction of the arrows;

FIG. 8 is a view similar to FIG. 6 but showing the relative positions of the parts of the mechanism when the elevator has reached its uppermost position and the pipe is hanging vertically therein;

FIG. 9 is a fragmentary top plan view, certain parts which are shown in full line being shown in phantom in another position; and

FIG. 10 is a front elevational view, the supporting links being broken away to better illustrate the arrangement, certain portions of the elevator being shown in dotted lines.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring next to the structure shown in the various figures and referring first to FIG. 1, there is shown schematically a well derick **21** such as that used for oil wells, the showing being fragmentary. A block **22** and its attached hook **23**, which block and hook may be conventional, are shown as suspended by the wireline **24**. The wireline **24**, as shown, is fragmentary, and in normal practice extends to the crown block and to a drawworks in the conventional manner for raising and lowering the block and hook assembly. The crown block and drawworks are not illustrated inasmuch as they are common in well drilling operations.

The hook **23** has suspended therefrom the usual elevator links (link **25** being illustrated in FIG. 1), to which is attached an elevator **26** of the type herein described. A rotary table **27** is shown on the floor of the derrick and

has illustrated therein a pipe **28** extending into a well bore (not shown) and retained suspended in the rotary table by slips **29** in position to have attached thereto an additional stand of pipe to be placed in position by the elevator.

As shown in FIG. 1, a stand of pipe **31** (usually three-thirty feet long sections joined together) has been horizontally racked and is to be raised to a vertical position. Pipe **31** has been tilted upwardly, preferably to an angle from the horizontal of approximately 5°, at its inner end which has a shouldered tool joint or box end **30**, by the lifter or support **32** (shown schematically), and has been moved longitudinally inwardly toward the well bore or center from a horizontal rack **33** by means of a dolly **34**, which dolly supports the outer end of said stand and which dolly **34** operates on a track **35**. In actual practice, the dolly **34** is usually attached to a drive chain or other device (not shown) which is operable to move the dolly, and thus the pipe stand **31**, in a longitudinal direction either toward the well bore or away from the well bore, depending on whether the pipe is being picked up or laid down. FIGURE 1 illustrates schematically how the pipe may be elevated slightly at its inner end on support **32** and moved by dolly **34** into a position where the pipe is between the links of the elevator and extends across the top of the elevator **26**, with the pipe tool joint **30** extended laterally past the elevator, the pipe **31** being in position to be engaged by the elevator **26** for hoisting into the derrick by means of the block **22**, hook **23** and links (illustrated by links **25** and **36**; see FIGS. 9 and 10).

Referring next to the construction shown in FIGS. 9 and 10 in particular, there is here disclosed an elevator known to the trade as a "side-door" elevator with the present invention illustrated thereon and with which the present invention is particularly useful. Basically, the elevator **26** here disclosed is similar to that shown and described in U.S. Letters Patent No. 2,215,649, to G. E. Mullinix, issued Sept. 24, 1940.

The elevator **26** is shown as suspended by the links **25** and **36**, which, in turn, are suspended from hook **23**. The elevator includes a body **37**, having what may be termed a substantially semicircular bore **38** extending vertically through the body, and with an open throat or front **40** for receiving a pipe (not shown in FIGS. 9 and 10), such as pipe **31** as shown in FIG. 1.

The body **37** has a pair of laterally disposed link arms **43** and **44**, one on each side thereof, which are bifurcated or slotted as shown at **45** and **46**, respectively, into which the eyes of the links **25** and **36** are loosely held forming the support for the elevator **26**. Keeper **47** extends across the slot **45** and keeper **48** extends across the slot **46**, to prevent displacement of the links **25** and **36** from their respective slots. This arrangement is conventional.

A closure member, herein usually referred to as a door or gate **41**, is hingedly connected to the body **37** at one side of the open throat **40** of the bore **38** and is shown as mounted on a vertical hinge pin **42**. This door **41** is preferably of arcuate form so as to present a substantially semicircular pipe receiving socket or half bore **49** which, when the door **41** is in its closed position, extends across the open throat **40** and completes the circumferential extent of the closure of the bore **38** through the elevator. Such arrangement retains any included pipe in the bore **38** against lateral displacement from the elevator.

The bore **38** has an arcuate seat **39**, and the door **41** has an arcuate seat **51** which, in the illustration shown in FIGS. 9 and 10, comprise a taper extending downwardly and inwardly of the bore **38** and half bore **49**. This taper is for receiving the tapered end or what is generally called the shouldered tool joint or box end **30** of a pipe section, and accepted standards usually call for this taper to be approximately 18° from the vertical. Thus, when pipe tool joint **30** is seated in the bore **38**, it will be limited in its downward movement—so that the pipe joint is held against dropping through the elevator and thus supports the depending stand or section of pipe. The half bore **49**, when the door **41** is closed, also assists in supporting the pipe by its joint or box end **30** against such downward movement.

For purposes of description, and since this arrangement is well known and basically disclosed in the above-mentioned patent to Mullinix, the combined seat means **39** and **51** usually will be referred to as a joint seat, although the seat **39** is adequate to retain the pipe box end in the elevator against purely vertical downward movement.

The door **41**, as will be clear from FIG. 9 in particular, may be opened by swinging the door outwardly around the hinge pin **42** until a shoulder hits the body **37**, as shown at **52**, thus serving as a stop to position the door in its opened attitude. The door has a handle **53**, and a latch lug **54** adapted to be engaged by the latch **55**. The latch **55** is pivoted on a pin or bolt **56** and is urged into the latching position by the spring **57**. In other words, when the door is closed the lug **54** strikes the latch **55** and moves past the outer end or margin thereof, allowing the latch to seat in position to hold the door closed. A latch lock **58**, which is spring urged to a locking position, is carried on the end of the latch **55** and is mounted thereon by means of a lock pin **59** which extends through end lugs **61** on the latch **55**; and latch lock spring **62** urges the latch lock **58** toward engagement with a catch pin **60**, into the locking position. Handle **63** which is integral with the latch lock **58** enables the operator to swing the latch lock **58** to the open position at which point a stop **64** will engage the latch **55** and will cause the latch **55** to swing to the open position releasing the door **41** and allowing it to be swung open. This arrangement is generally similar in most respects to that in the above-mentioned Mullinix patent.

Also, there is a door closing finger **65**, which is integral with the door **41** and is adapted to extend into the opening or throat **40** of the bore **38** when the door **41** is open, and rest in the recess **66**, shown in dotted lines in FIG. 9, when the door is closed, as shown in the broken line phantom position in FIG. 9. Thus, when a stand of pipe strikes the finger **65**, the door **41** is moved to the closed position, and the latch **55** and latch lock **58** automatically secure the door and retain the pipe against lateral displacement.

For the purpose of retaining the door open, although readily overcome to release the same to allow it to close, there is provided a detent **67** which engages a complementary recess **70**. In this particular elevator such a detent is desirable inasmuch as the tilting of the elevator would tend to close the door before the pipe would be in proper position if the door was not held in open position. The detent, of course, is overcome and releases the door when the finger **65** is contacted by the pipe **31** to allow or cause the door to close. The importance of this feature will be more clearly evident from further description of the operation of the device. As shown in FIG. 9, the detent **67** is holding the door open, by the detent engaging recess **70**. The description heretofore is primarily directed to structure which is well known and disclosed in the prior art.

Continuing to refer primarily to FIGS. 9 and 10, but with occasional reference to other figures, there is provided on what may be termed the back upper surface of the elevator, that is, on the top and away from the open front **40** of the bore **38**, a cam assembly **68** which is operable to tilt the elevator automatically for picking up a horizontally racked stand of pipe. As shown in the drawings, the structure comprises upstanding cam arms **69** and **71** which are welded or otherwise attached to, or may be formed integrally with, the body **37**. Extending between the cam arms **69** and **71** at the upper ends thereof is a bolt or shaft **72** on which is mounted for pivotal movement a counterweighted cam **73**, the bottom **74** of which is weighted or constructed so as to be com-

paratively heavy, and the upper part of which counterweighted cam **73** preferably has a saddle **75** in the form of a V-shaped trough. The cam assembly **68**, as previously mentioned, is preferably positioned on the rear portion of the top of the body **37**, spaced from the bore **38** a distance giving clearance with respect to the box end or joint of pipe seated in said bore on seat **39** for the purpose hereinafter shown. It is noted that, because the cam **73** is heavier on the bottom than on the V-shaped trough portion, the V-shaped trough or saddle **75** remains upright unless acted on by forces causing it to move about the shaft **72**.

With the structure heretofore described, and referring again to FIG. 1 and also to FIGS. 2 through 8, the elevator **26** is lowered to a position near the derrick floor, preferably just above the rotary table as shown in FIG. 1. The stand of pipe **31** has had its inner or tool joint end **30** lifted by the support **32** and has been moved longitudinally (to the left, as shown in FIG. 1) by use of the dolly **34** or any other convenient means, extending the left-hand end, the tool joint end, of the pipe between the links **25** and **36** a short distance past the elevator, the pipe being above the top of the elevator **26**, as indicated in FIGS. 1 and 2. With the elevator in the position shown in FIGS. 1 and 2, and the pipe extending across the top of the elevator and aligned with the open side of the bore **38**, and with the door swung open as indicated in FIGS. 2 and 9, the elevator links **25** and **36** are raised by the block and hook assembly until the pipe **31** engages the V-shaped trough or saddle **75** of the counterweighted cam **73**. Further movement of the elevator **26** vertically causes the pipe **31** to seat firmly in the V-shaped trough or saddle **75**, as shown in FIG. 4, and the saddle **75** to begin its pivot about the shaft **72**, the cam **73** swinging slightly outwardly at the bottom to keep the saddle **75** generally perpendicular to the pipe **31**. Continued movement upward of the elevator **26** causes the weight of the pipe to be exerted downwardly on the saddle **75** and the elevator will begin to pivot on the links **25** and **36**.

The elevator **26** moving around the pipe **31** to a position where the pipe **31** enters the bore **38** (see FIG. 3), brings the finger **65** into contact with the pipe and causes the finger **65** to move toward the recess **66**. This overcomes the detent **67**, allowing or causing the door **41** to close and latch, as shown in FIG. 5. It will be noted that the counterweighted cam **73** has remained with its saddle **75** engaging the pipe **31**; and the cam **73** extends generally perpendicular to the pipe **31** in the positions illustrated in FIGS. 3 and 5. The upward movement of the elevator **26** under the influence of the links **25** and **36** caused the elevator to assume the position illustrated in FIG. 5, in which position the counterweighted cam **73** is generally perpendicular to the pipe **31**, the elevator having been placed around the pipe and the door having been automatically closed and latched, thus attaching the elevator firmly to the pipe **31**.

Continued upward movement of the elevator **26** causes the pipe **31** to slide relatively downward in the bore **38**, the showing of FIG. 6 illustrating this occurrence, and the counterweighted cam **73** to move upwardly onto the box end **30** of the pipe, normally tilting to a position (approximately 120° from the axis of the pipe) as shown in FIGS. 6 and 7. This occurs just prior to the seating of the tapered portion of the box end or joint **30** in the seat **39**, **52** of the bore **38** and door **41**.

Continued raising of the elevator **26** will, as indicated in FIG. 8, carry the elevator upward on the pipe to where the tapered portion of the box end or joint **30** has seated on the seat **39**, **52** of the bore **38** and door **41**, bringing the end of the box end or joint **30** to where the saddle **75** slides off the end, allowing the counterweighted cam **73** to swing back into normal disengaged position. Such movement of the box end or joint **30** allows the saddle **75** to assume the vertical position as indicated in full lines in FIG. 8.

As shown in FIG. 8, the stand of pipe **31** has assumed essentially a vertical position and is being supported by the elevator **26**. In the position shown in FIG. 8, the pipe **31** is ready to be joined to the well string by attaching it to the pipe **28** in the well-known manner. The elevator is then used to lower the string including the stand **31** into the well, the slips **29** having been released for that purpose. When the string is lowered to a position where the box end or joint **30** is above the rotary table, as indicated in FIG. 1, the operator opens the door **41** in the manner previously described and the elevator is released from the string, the slips **29** having been replaced to hold the string for attachment of another stand of pipe.

It is noted that when the door **41** is opened to release the elevator from the string of pipe, the detent **67** engages the recess **70** and the door remains open until the elevator is attached to another stand of pipe. This eliminates the need for the operator to hold the door open while the elevator is placed on the stand.

It will be noted that when the cam assembly is in the position shown in FIG. 8, that is, disengaged from the stand of pipe, it is out of the way with respect to other uses of the elevator. Thus the elevator may be used for lowering the stand into the well, or for laying down pipe in a horizontal racking operation.

The cam assembly herein disclosed or its equivalent may be applied to other forms of elevators, with or without the automatic means for closing the door, inasmuch as it is of value for the purpose of tilting the elevator and eliminating the dangers to the operator, and the effort required for that purpose. Other forms of door opening and closure means can be adapted to the arrangement, especially power operated door manipulating devices, without detracting from the merits of the invention disclosed. Other forms of camming devices are feasible, but the device herein shown is believed to be superior to any other form for the purpose disclosed in respect to the side-opening elevator here illustrated.

While the specific details of the invention have been herein shown and described, changes and alterations may be resorted to without departing from the spirit of the invention.

I claim:

1. In a well pipe elevator for raising, supporting and lowering pipe, an elevator body; means for lifting said elevator body including a link receiving and retaining means on each side of said elevator body; a bore through said elevator open at the front for the entry and exit of pipe laterally thereof; closure means operable to clear the front of said bore to the lateral entry and exit of pipe with respect thereto, and to close across the front of said bore to retain pipe in said bore against lateral displacement; seat means adapted to receive and support a pipe joint to limit the downward movement of pipe through said bore; those improvements for positioning the elevator to a pipe extending across and above said elevator in a generally horizontal angle aligned with said bore, such as horizontally racked pipe, comprising:

cam means mounted on said elevator body and offset to the rear of said bore, said cam means including a pivoted member adapted to engage such pipe, said cam means operable to tilt said elevator to a generally horizontal position.

2. An elevator as set forth in claim **1**, wherein said cam means are positioned on the top of said elevator body and extend vertically upwardly therefrom, said cam means being offset to the rear of said elevator in alignment with the closed side of said bore.

3. An elevator as set forth in claim **2**, wherein said cam means is adapted to contact said pipe upon raising of said elevator, to place said elevator on said pipe, and wherein said closure means is constructed and operable automatically to close and latch said elevator on said pipe by continued upward movement of said elevator under the influence of said elevator lifting means.

4. An elevator as set forth in claim 1, wherein said cam means comprises a pair of upstanding cam arms having shaft means extending therebetween, and said pivoted member comprises a counterweighted cam having a pipe receiving saddle mounted for pivotal movement on said shaft.

5. An elevator as set forth in claim 1 wherein said cam means comprises upstanding support means for said pivoted member, said pivoted member being pivoted to said support means on a horizontal axis offset to the rear of said bore and having a pipe receiving saddle spaced from said axis a distance substantially equal to the distance that said axis is offset to the rear of said bore.

6. In a well pipe elevator for raising, supporting and lowering pipe, an elevator body; means receiving and retaining an elevator supporting link on each side of said elevator body; a bore through said elevator open at the front for entry and exit of pipe laterally thereof; closure means movable across the open front of said bore, adapted to open to allow the lateral entry and exit of pipe with respect to said bore, and to close to retain pipe in said bore against lateral displacement; seat means adapted to receive and support a pipe joint to limit the downward movement of said pipe through said bore; those improvements for positioning and attaching the elevator to a horizontally racked pipe comprising:

(a) cam means carried by said elevator body on the rear thereof and opposite said open front of said bore, said cam means including a pivoted member adapted to engage a pipe aligned with said bore and extending from front to rear across the top of said elevator body, and to which pipe said elevator is to be latched, and to tilt said elevator with the open front of said bore up when said elevator is raised against said pipe with said closure means open, whereby said bore is moved around said pipe; and

(b) means automatically closing said closure means upon continued raising of said elevator, whereby said elevator is secured to said pipe.

7. An elevator as set forth in claim 6, wherein said cam means comprises spaced upstanding cam arms, and said pivoted member comprises a counterweighted pipe receiving saddle mounted between said cam arms for pivotal movement.

8. In a method of attaching a pipe elevator having a body to a generally horizontally racked pipe in which the elevator body is supported by a supporting link on each side of said elevator body, and the elevator body has upwardly extending cam means including a pivoted member on the top rear portion of said elevator body and a bore which extends from the top to the bottom thereof and is open in the front for the reception of pipe, said

body including a seat in alignment with said bore for receipt of a pipe joint in the top portion thereof, said method comprising the steps of: placing said elevator under a generally horizontally positioned pipe having the joint end extending between said links and past the top of said elevator, raising said elevator to engage said pivoted member of said cam means against the bottom of said pipe, and continuing the raising of said elevator while maintaining said pivoted member so engaged whereby said cam causes said elevator to tilt from the vertical to a generally horizontal position and said elevator body to be swung around said pipe to where said pipe rests in said bore, and further continuing the raising of said elevator to elevate said joint end of said pipe and to cause said elevator to slide longitudinally along said pipe until said pipe joint seats in said elevator seat.

9. A method as set forth in claim 8, in which said elevator includes a door, said method including the additional step of closing said door and thereby retaining said pipe in said elevator bore.

10. A method as set forth in claim 9, in which said door has automatic closing and latching means, the additional step wherein said elevator is caused to actuate said automatic door closing means and in turn said latching means by lifting said elevator against said cam means until said pipe enters said bore, thereby attaching said elevator to said pipe and latching said closure means to retain said pipe in said bore.

11. A method as set forth in claim 10, in which said cam means includes spaced upstanding cam arms and said pivoted member comprises a counter-weighted pipe receiving saddle pivotally mounted therebetween, the method wherein said pipe is seated on said saddle by raising said elevator, causing said saddle to pivot in contact with said pipe, and continuing the raising of said elevator whereby said pipe moves vertically downward into said elevator seat, and thereby causing said pipe receiving saddle to disengage from said pipe rendering said cam means inoperative with respect to further handling of said pipe.

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U.S. Cl. X.R.

214—152; 294—90, 110