May 5, 1959 F. D. DE JARNETT 2,885,096

PIPE-HANDLING APPARATUS FOR OIL WELLS

Filed Aug. 9, 1954

4 Sheets-Sheet 1

FIG. 1.

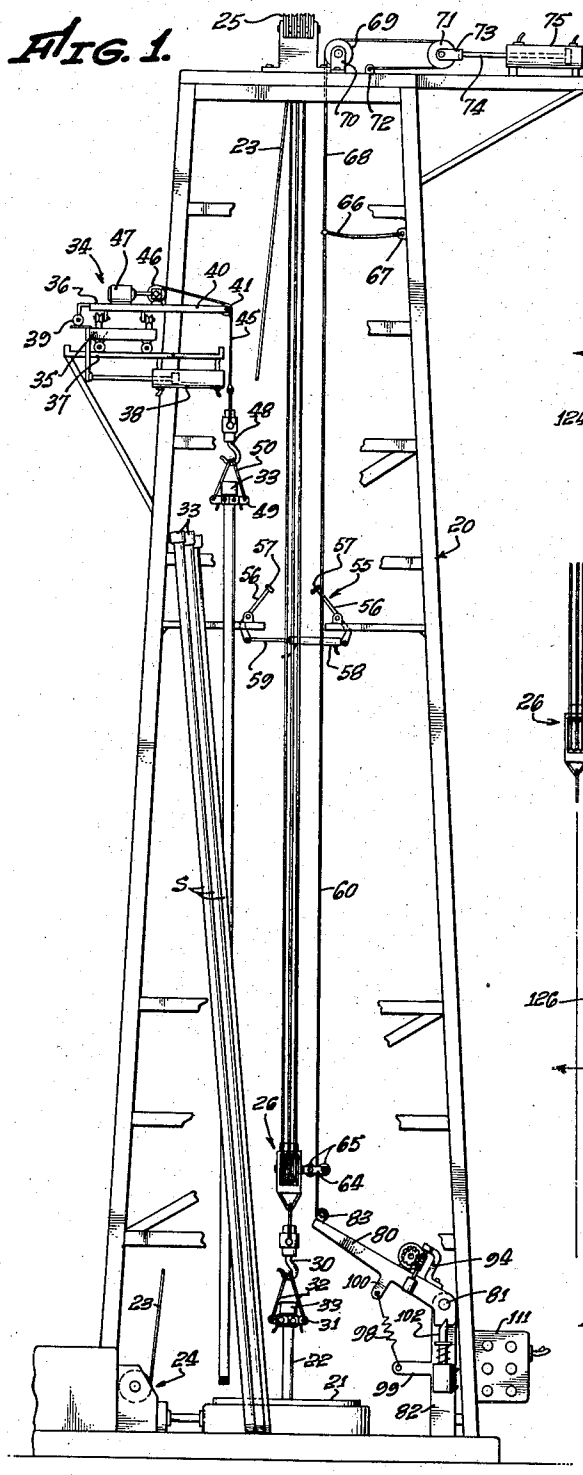
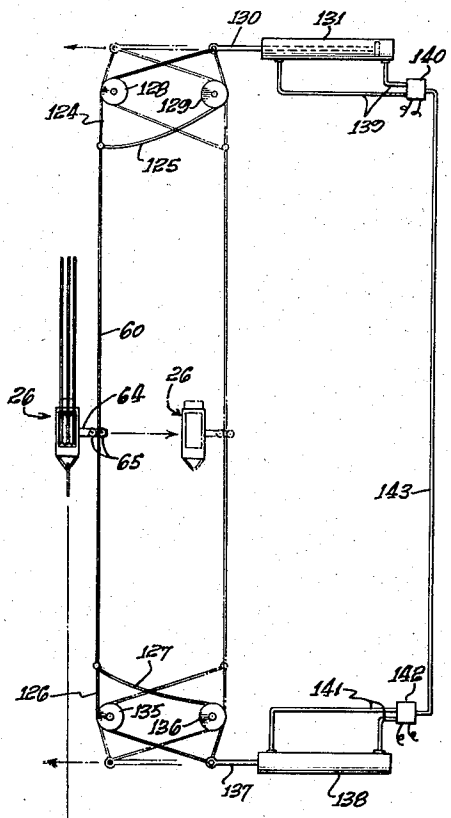


FIG. 7.



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PIPE-HANDLING APPARATUS FOR OIL WELLS

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FIG. 2.

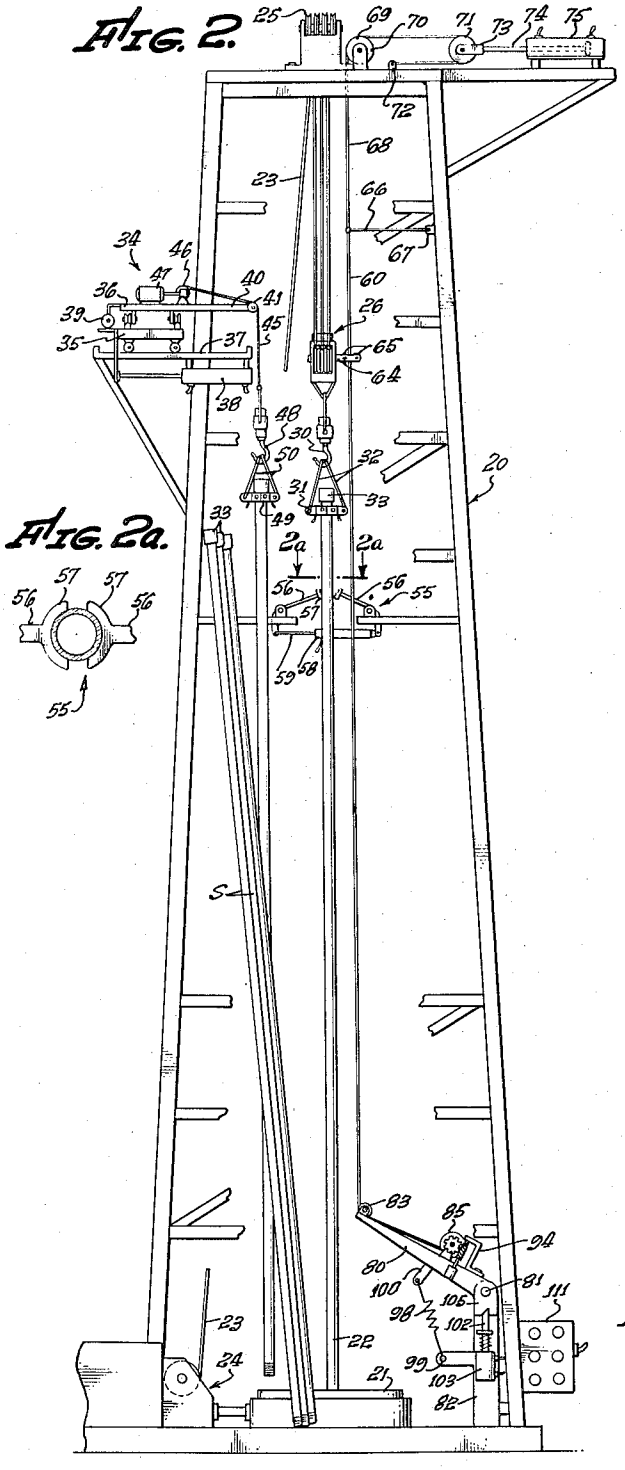
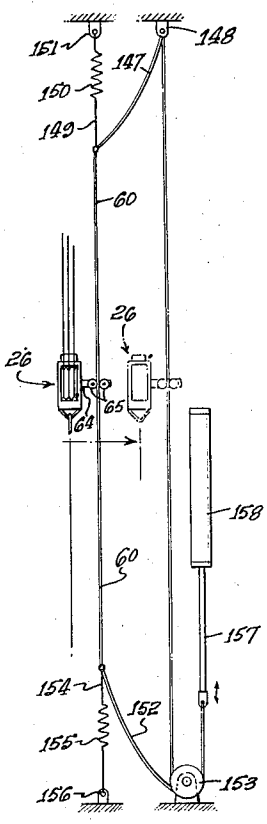


FIG. 2a.

FIG. 8.



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FIG. 3.

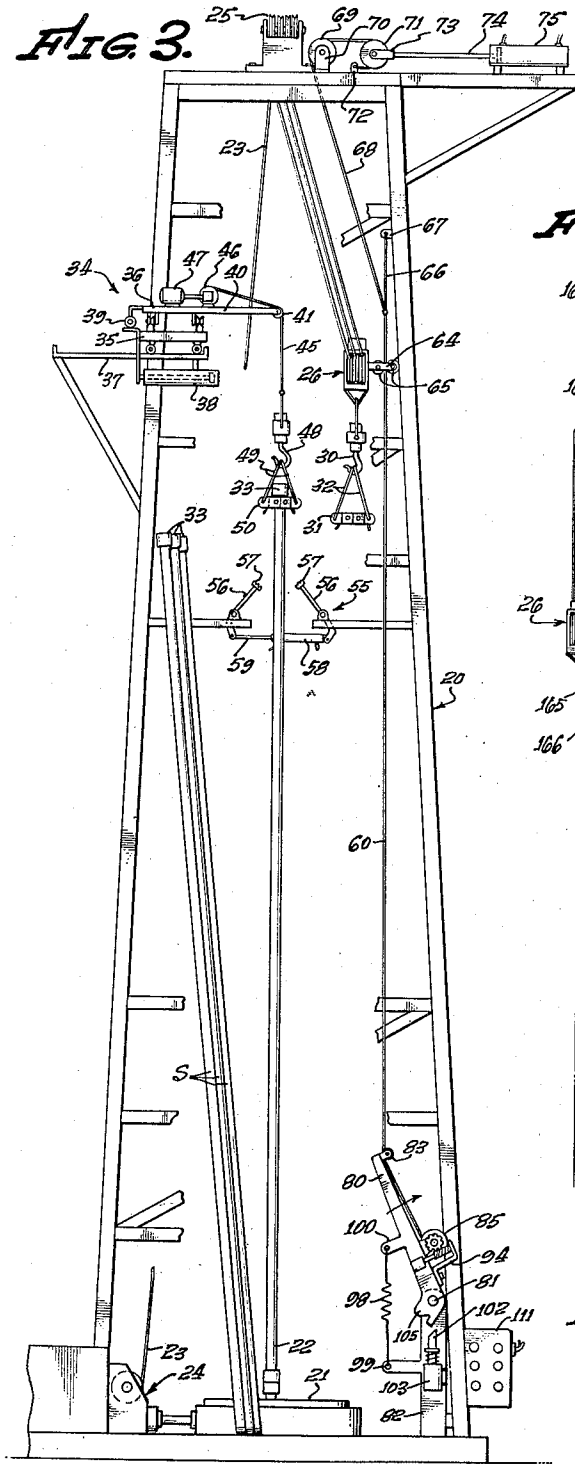


FIG. 11.

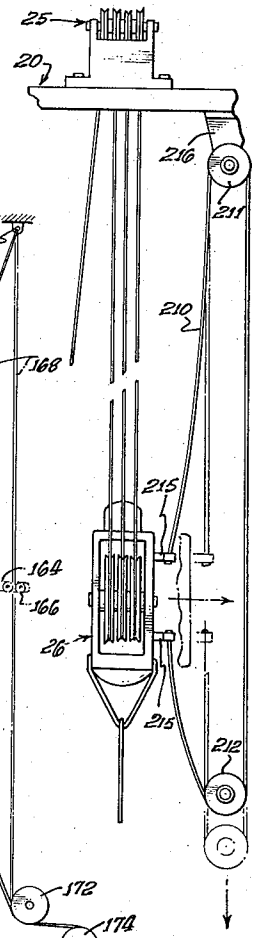


FIG. 9.

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PIPE-HANDLING APPARATUS FOR OIL WELLS

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FIG. 10.

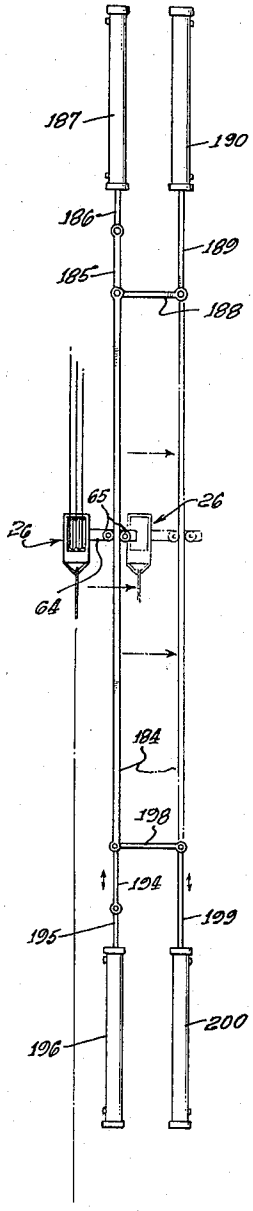
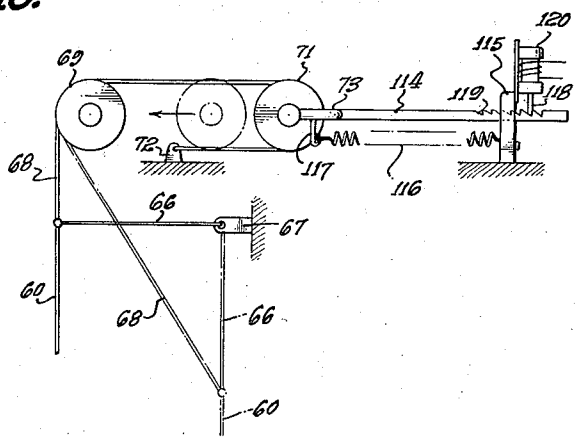


FIG. 6.



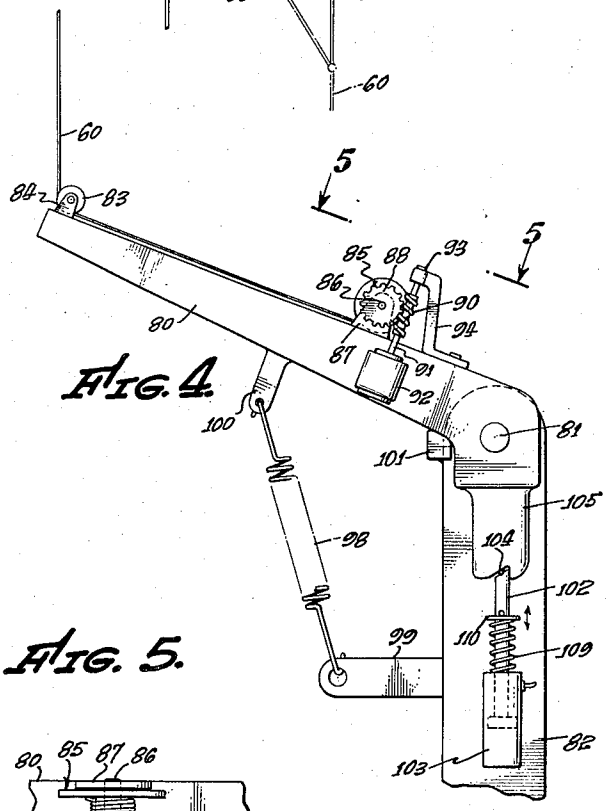
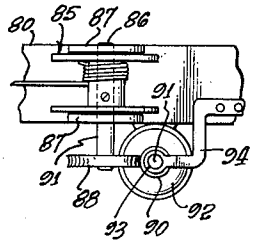


FIG. 4.

FIG. 5.



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United States Patent Office

2,885,096

Patented May 5, 1959

2,885,096

PIPE-HANDLING APPARATUS FOR OIL WELLS

Frank D. De Jarnett, Barcelona, Venezuela, assignor of one-half to Paul A. Medearis

Application August 9, 1954, Serial No. 448,643

26 Claims. (Cl. 214—2.5)

This invention relates to methods and apparatus for handling stands of well pipe, particularly drill pipe, as exemplified by the De Jarnett Patent 2,643,005 entitled "Well Pipe Handling Equipment."

In the procedure set forth in the De Jarnett patent, for example, the pipe-elevating assembly comprising the traveling block and the usual elevator suspended therefrom is movable along a normal path substantially in alignment with the axis of the well bore and is optionally movable along a second vertical path sufficiently offset from the axis of the well bore to clear a stand of drill pipe extending upward from the well bore along the normal path of the assembly. In pulling a drilling string from the well bore the pipe-elevating assembly is moved in a cycle comprising two stages. In the first stage the assembly moves upward along its normal vertical path to withdraw the drilling string sufficiently from the well bore to expose a stand of the drill pipe and in the second stage of the cycle the assembly is shifted laterally and returned downward along its alternate offset path. Before the elevator is disengaged from the upper end of the elevated drilling string a suitable stabilizer means is brought into operation to brace the elevated pipe temporarily against tipping. After the elevator is disengaged and has been shifted to the offset path, a suitable hoist for racking the stands of pipe is engaged with the upper end of the pipe. While the elevator is returning on its downward offset path, the elevated stand of pipe is unscrewed from the drilling string and is transferred to the storage rack by the hoist means. Thus, in the first stage of the cycle, the elevator operates to lift the drilling string from the well bore and during the second stage of the cycle the hoist racks the stand of pipe. The actual racking of the pipe may be completed while the elevator is lifting the next stand of pipe from the well bore.

The important advantage of this procedure is that with the offset return path available the pipe-elevating assembly is in practically continuous operation and the drilling string is lifted to start a new cycle as soon as a stand of pipe is moved out of the way. With the usual lost time eliminated in this manner a drilling string can be pulled expeditiously and at low labor cost.

In the reverse procedure of returning the drill pipe to the well bore, the elevator lowers the drilling string in the first stage of the cycle and returns upward on the offset path during the second stage of the cycle. During this second stage the hoist means moves a pipe stand from the storage rack into position to be screwed onto the drilling string and the stabilizer is brought into temporary operation to hold the new stand of pipe upright for screwing onto the drill string. The cooperation of the stabilizer permits the hoist to be returned to the storage rack without loss of time. It is apparent that this reverse cycle for returning the drill pipe to the well bore saves time in the same manner as the first described cycle.

The present invention is directed to the problem of adapting a pipe-elevating assembly for movement along an offset path in addition to the normal path for the sake

of the foregoing advantages. In the above-mentioned De Jarnett disclosure, the traveling block that carries the elevator is guided by cable means which extends vertically inside the derrick. The crown block that supports the traveling block is mounted on a carriage at the top of the derrick, which carriage is adapted to reciprocate between a normal position with the traveling block and elevator suspended in line with the axis of the well bore and a second alternate position suspending the elevator and travelling block for movement along the desired vertical path offset from the axis of the well bore. The cable means that guides the elevator along both the normal path and the offset path extends from the upper carriage that carries the crown block to a lower carriage at the bottom of the derrick and these two carriages are adapted for reciprocation in unison between the positions to cause the pipe-elevating assembly to follow the two paths.

The broad object of the present invention is to provide improved means for causing the pipe-elevating assembly to move along the normal path and the desired offset path selectively. In general this object is attained by an upright guide means that is adapted to take an effective position substantially offset from the axis of the well bore to displace the pipe-elevating assembly laterally from its normal path to the desired alternate offset path. Cooperation between the assembly and the upright guide means is provided by means extending laterally from the assembly in moving engagement with the guide means. Such means in movable engagement with the guide means preferably extends laterally from the traveling block.

The crown block in the present arrangement, unlike the crown block in the above-mentioned patent, remains stationary instead of reciprocating laterally between two positions. The guide means pulls the suspended travelling block laterally out of its normal gravitational position to cause the elevator to follow the desired offset path. Since the elevator is not weighed down with a load when it travels along the alternate offset path, only moderate force is required for lateral displacement of the traveling block. In the preferred practice of the invention the pipe-elevating assembly is also guided along its normal path in alignment with the axis of the well bore, but such guidance may be omitted since gravity tends to hold the assembly on its normal path.

The guide means may be a flexible means and in some practices of the invention, is a cable means. If desired, two guide cables may be used, one for each path, the two cables being tightened and slackened alternately to cause the pipe-elevating assembly to follow the two paths alternately. In other practices of the invention, a single guide cable is used. If a single guide cable is used, it may be tightened to displace the pipe-elevating assembly to follow the alternate offset path and may be slackened to permit the assembly to gravitate to its normal path.

A feature of some practices of the invention is the concept of using a single guide cable with at least one end of the guide cable connected by two short support cables to two support points corresponding respectively to the two desired paths. The two short support cables may be alternately tightened and loosened to cause the corresponding end of the guide cable to shift between the two desired alternate positions. In other practices of the invention other arrangements may be employed to cause the guide cable to shift in the desired manner as will be explained.

In the preferred practice of the invention, it is contemplated that the guide means will be power-actuated under remote control for causing the pipe-elevating assembly to follow the two paths selectively. If the elevator and the pipe-racking hoist are also adapted for remotely controlled power-actuated engagement and dis-

engagement with the pipe, the whole system may be operated in a nearly automatic manner with a minimum crew.

The various objects, features and advantages of the invention may be understood from the following detailed description considered with the accompanying drawings.

In the drawings, which are to be regarded as merely illustrative:

Fig. 1 is a somewhat diagrammatic side elevation of an oil well derrick incorporating one embodiment of the invention, the pipe-elevating assembly being shown at the beginning of its upward movement along its normal path to pull the drilling string upward from the bore hole;

Fig. 2 is a similar view showing the pipe-elevating assembly advanced to its uppermost position along its normal path;

Fig. 2*a* is a section taken along the line 2*a*—2*a* of Fig. 2, showing how the stabilizer engages the drill pipe;

Fig. 3 is a similar view showing the pipe-elevating assembly shifted to the upper end of its alternate offset path;

Fig. 4 is an enlarged side elevation of the mechanism employed in this first embodiment of the invention for shifting the lower end of the guide means between its two alternate positions;

Fig. 5 is a plan view of a portion of the mechanism shown in Fig. 4 as viewed along the line 5—5;

Fig. 6 is a diagrammatic side elevational view of means that may be employed to shift the upper end of the guide means between the two desired alternate positions in a modified practice of the invention;

Fig. 7 is a simplified diagrammatic view illustrating a second embodiment of the invention;

Fig. 8 is a diagrammatic side elevational view illustrating a third embodiment of the invention;

Figs. 9 and 10 are similar views of further embodiments of the invention; and

Fig. 11 is a side elevational view illustrating another embodiment of the invention.

Figs. 1, 2 and 3 show a drilling rig including a derrick 20 and a rotary table 21 for controlling and actuating a drilling string 22. The usual cable 23 operated by a draw works 24 extends to a crown block 25 for raising and lowering the usual traveling block 26.

In the process of extending the drilling string into the oil well bore, the traveling block is employed to handle successive stands of pipe, generally designated S, and for this purpose the usual hook 30 is mounted on the traveling block and, in turn, a suitable elevator 31 is mounted on the hook 30 by the usual pair of links 32. Each of the stands of pipe S is made of the usual lengths of drill pipe interconnected by collars (not shown) and the upper end of the stand terminates in a tool joint box 33 that is engaged by the elevator 31.

Preferably the elevator 31 is a power-actuated type adapted for remote control. Such a remotely controlled elevator is disclosed, for example, in my co-pending application, Serial No. 245,898, now Patent No. 2,684,166, entitled Power-Elevator for Oil Wells, which prior disclosure is hereby incorporated in the present disclosure by reference. Briefly described, such an elevator is opened and closed by compressed air to engage and release a stand of pipe and the air-actuated power means is controlled by a valve that is adapted for electrical actuation by remote control.

Figs. 1, 2 and 3 also show what may be termed a racking hoist generally designated by numeral 34 which comprises a lower carriage 35 and an upper carriage 36. The lower carriage 35 is movable on a track 37 by means of a remotely controlled pneumatic power cylinder 38. The lower carriage 35 is provided on its upper side with tracks laterally perpendicular to the tracks 37 and the upper carriage 36 is movable on the upper tracks by means of a second remotely controlled pneumatic power cylinder 39. The upper carriage has a beam extension 40 on the outer end of which is mounted a sheave 41. A hoist cable 45 which passes over this sheave is controlled by a winch 46 that is actuated by a remotely controlled motor 47 or other suitable power means.

The hoist cable 45 carries a hook 48 from which a second elevator 49 is suspended by the usual links 50. The second elevator 49, like the main elevator 31, is preferably power-actuated under remote control.

Also shown in Figs. 1, 2 and 3 is a stabilizer, generally designated 55, comprising a pair of arms 56 which, as best shown in Fig. 2*a*, terminate in forks 57 at their outer ends. The two forks 57 are shaped and adapted to engage a stand of pipe S from opposite sides to keep the stand from tilting out of upright position. One of the two arms 56 is operatively connected to an air cylinder 58 and the other is operatively connected to a piston rod 59 that extends out of the air cylinder. The air cylinder 58 is adapted for actuation under remote control to position the two stabilizer arms 56 either in the release positions shown in Fig. 1 or in the effective stabilizing positions shown in Fig. 2.

Fig. 1 shows how, in carrying out the previously described cycle of operation, the main elevator 31 is lowered and engaged with the tool joint box 33 at the upper end of the drilling string 22 to prepare for elevating the drilling string to expose a new stand of pipe. Fig. 2 indicates how the main elevator 31 is then moved upward along its normal path in alignment with the axis of the well bore to lift the drilling string. While the main elevator is carrying out this operation illustrated by Figs. 1 and 2, the racking hoist 34 is occupied with racking the preceding stand of pipe.

When the drilling string is lifted to the desired height, the usual slips (not shown) are employed at the rotary table 21 to hold the drilling string and the stabilizer 55 is moved into effective position as shown in Fig. 2 to hold the newly exposed stand of pipe in upright position. The main elevator 31 carried by the traveling block 26 is now disengaged from the newly exposed stand of pipe and the newly exposed stand of pipe is unscrewed from the drilling string. During the operation of unscrewing the newly exposed stand of pipe, the pipe-engagement assembly comprising the traveling block 26, the hook 30 and the elevator 31, is shifted laterally away from alignment with the axis of the well bore to a position substantially offset from the well bore axis as shown in Fig. 3.

The pipe-engagement assembly is then lowered along a vertical path offset from the axis of the well bore, the downward movement being along this path to avoid interference with the newly exposed stand of pipe. While the pipe-engagement assembly is moving down this offset path the racking hoist 34 is engaged with the new stand of pipe as shown in Fig. 3 and the stabilizer 55 is actuated to release the new stand of pipe to permit the stand to be racked by the hoist. It is apparent that in this cycle of operation for pulling drill pipe from the well bore and in the reverse cycle for lowering drill pipe into the well bore, the pipe-engagement assembly is nearly constantly in motion for maximum usage and the racking hoist is also occupied most of the time.

None of the structure described to this point is a part of the present invention. The present invention is directed to means per se for causing the pipe-engagement assembly, including the main elevator 26, the hook 30 and the elevator 31, to follow selectively the normal path in alignment with the axis of the well bore and the offset path spaced substantially from the axis of the well bore.

In the first embodiment of the invention shown in Figs. 1, 2 and 3, an elongated upright guide means in the form of a length of cable 60 is adapted to be shifted alternately between what may be called a first normal position relatively near the axis of the well bore and what may be called a second offset position more remote from

the well bore. Any suitable means may be provided for causing the required cooperation between the guide cable **60** at its two alternate positions and the vertically movable pipe-engagement assembly comprising the traveling block **26**, the hook **30** and the elevator **31**. In this particular practice of the invention, for example, the traveling block **26** is provided with a guide bracket **64** fixedly extending laterally therefrom and a pair of guide rollers **65** are journalled in the guide bracket for movable engagement with the cable **60** from opposite sides thereof.

By virtue of this arrangement it is apparent that when the guide cable **60** is in its first normal position shown in Fig. 1 the engagement of the guide rollers **65** with the guide cable **60** will guide the pipe-elevating assembly along the normal path along the extended axis of the well bore. When the guide cable **60** is shifted to its alternate offset position shown in Fig. 3, however, it will cause a corresponding shift of the pipe-elevating assembly away from alignment with the well bore to guide the pipe-elevating assembly along its offset path.

In this first embodiment of the invention, the upper end of the guide cable **60** is connected to a short support cable **66** which is anchored to a fixed bracket **67** on the derrick. The upper end of the guide cable **60** is also connected to a second support cable **68** which extends upward to a support point provided by a sheave **69** that is journalled in a fixed bracket **70** at the top of the derrick. The support cable **68** passes over the sheave **69** and doubles back around a movable sheave **71** to terminate at a fixed bracket **72**. The movable sheave **71** is mounted in a yoke **73** at the end of a piston rod **74** that extends from one end of a power cylinder **75**. The power cylinder **75** may be operated by compressed air under remote control to shift the movable sheave **71** between a normal retracted position shown in Fig. 1 and an alternate extended position shown in Fig. 3.

The bottom end of the guide cable **60** is operatively connected to means that is effective to shift the bottom end between the normal and offset positions of the cable and is also effective to place the guide cable under tension if desired. In this first embodiment of the invention an arm **80** is mounted by a pivot **81** on a post **82** to shift the bottom end of the guide cable **60** between the two positions in the required manner.

As best shown in Figs. 4 and 5 the guide cable **60** passes under a pulley **83** journalled in a bracket **84** at the end of the arm **80** and the end of the guide cable is wound onto a suitable spool or winch **85** on the upper side of the arm. The winch **85** is fixedly mounted on a shaft **86** that is journalled in a pair of spaced wings **87**. One end of the shaft **86** carries a worm gear **88** that is actuated by a worm **90**. The worm **90** is carried by a shaft **91** that extends upward from a motor **92** to a bearing **93** at the outer end of a bracket **94**.

A suitable coiled spring **98** connected at its bottom end to a bracket **99** on the post **82** and connected at its upper end to a bracket **100** on the arm **80** continuously urges the arm to the normal position shown in Fig. 4, at which position the arm rests against a fixed stop **101** on the post. Preferably suitable means is provided to releasably latch the arm **80** in this normal position. For this purpose a piston rod **102** extends upward from an air cylinder **103** on the side of the post **82**, the upper end of the piston rod serving as a detent to engage a detent notch **104** in a short extension **105** of the arm **80**. A suitable spring **109** in compression between the air cylinder **103** and a disc **110** on the piston rod **102** normally urges the piston rod upward towards its effective position shown in Fig. 4. The air cylinder **103** is adapted to be energized by remote control when it is desired to release the arm **80** for movement upward from the normal position shown in Fig. 4 to the alternate position shown in Fig. 3. The remote control panel is shown at **111**.

In the first or normal position of the guide cable **60** shown in Fig. 1 the short upper support cable **66** is ineffective and may be quite slack. The second longer support cable **68**, however, supports the guide cable **60** from the support point provided by the sheave **69**. The arm **80** is in its normal lower position with the pulley **83** on the end of the arm in substantially vertical alignment with the sheave **69** at the top of the derrick. The guide cable **60** along with the upper support cable **68** may be placed in tension either by the action of the power cylinder **75** at the top of the derrick or by the action of the motor **92** acting on the winch **85** at the bottom of the derrick. Thus the power cylinder **75** may be under sustained pressure to exert sufficient pull on the piston rod **74** to place the guide cable **60** under the required tension.

To cause the guide cable **60** to shift from the normal position shown in Fig. 1 to the second offset position shown in Fig. 3, the upper power cylinder **75** is operated to shift the movable sheave **71** leftward to its alternate extended position and thereby relax the support cable **68** to permit the shorter support cable **66** to take over the support of the guide cable. The air cylinder **103** on the post **82** is then energized to retract the piston **102** for unlatching the arm **80**. The motor **92** is then energized to actuate the winch **85** to wind in a sufficient length of the lower end of the guide cable **60** to pull the arm **80** upward to its second position in opposition to the coiled spring **98**. The operation of the winch **85** is continued until the guide cable **60** is placed under sufficient tension to hold the pipe-elevating assembly to the desired offset path as shown in Fig. 3.

To return the guide cable **60** from its offset position shown in Fig. 3 to its normal position shown in Fig. 1, the motor-driven winch **85** is actuated to play out the lower end of the guide cable **60** and as a result of this slackening of the guide cable the arm **80** at the bottom of the derrick is moved downward by the coiled spring **98**. When the arm **80** reaches its normal lower position it is latched automatically by engagement of the detent end of the piston rod **102** with the detent notch **104**. The upper power cylinder **75** is then energized to retract the movable sheave **71** to draw in the upper support cable **68** and thus place the guide cable **60** under tension in its normal position.

Fig. 6 illustrates how the arrangement at the top of the derrick in this first embodiment of the invention may be modified if desired. In Fig. 6 the yoke **73** that carries the movable sheave **71** is mounted on the end of a longitudinally reciprocal slide bar **114** that extends in a slidable manner through an upright bracket **115**. A suitable coiled spring **116** extending from the bracket **115** to a downward extension **117** of the yoke **73** continuously urges the movable sheave **71** towards its rightward retracted position. Preferably suitable latch means is added to prevent yielding action on the part of the coiled spring **116** when desired. For this purpose a suitable detent **118** is adapted for releasable engagement with teeth **119** formed on the upper side of the slide bar **114**. The detent **118** is adapted in a suitable manner for retraction under remote control and for this purpose may be actuated by a suitable means such as a solenoid **120**. Normally the detent **118** is in its downward position for engagement with the teeth **119** and is retracted when desired by energization of the solenoid.

When the guide cable **60** is in its normal position the various parts are positioned as indicated in solid lines in Fig. 6 with the upper support cable **68** drawn taut by retraction of the movable sheave **71** and with yielding action on the part of the spring **116** prevented by engagement of the detent **118** with the teeth **119**. At this time, of course, the lower end of the guide cable **60** is held by the arm **80** at the bottom of the derrick in the normal manner heretofore described. The slide bar **114** is latched by the detent **118** to prevent yielding action of the spring **116** and tension in the guide cable **60** is provided by

tightening the lower end of the cable by means of the motor-controlled winch 85.

To shift the guide cable 60 to the alternate offset position shown in broken lines in Fig. 6 the detent 118 is withdrawn to permit the movable sheave 71 to be extended in opposition to the tension of the spring 116. The arm 80 at the bottom of the derrick is then swung to its alternate upper position by first unlatching the arm and then actuating the winch 85 to wind up the lower end of the guide cable 60. The guide cable 60 is wound up until it pulls the upper support cable 66 taut, the upper spring 116 yielding to permit extension of the upper support cable 68 to the diagonal position shown in broken lines in Fig. 6.

To return the guide cable 60 to its normal position the winch 85 is actuated to play out the lower end of the cable thereby both permitting the upper spring 116 to retract the upper movable sheave 71 rightward and permitting the lower spring 98 to shift the arm 80 at the bottom of the derrick back to its normal position. When the arm 80 reaches its normal position, and is automatically latched, the winch 85 is reversed to wind in the cable 60 until the cable is under the desired tension, the upper end of the cable being prevented from yielding by the detent 118.

In some installations the detent 118 may be omitted if desired so that the spring 116 at the top of the derrick is effective at all times to urge the movable sheave 71 towards its retracted position. Such an arrangement is practical because the upper spring 116 will provide sufficient tension in the guide cable 60 to serve the purpose of the invention at the normal position of the cable near the axis of the well bore. The tension of the guide cable may be increased if necessary by winding in a portion of the lower end of the cable by means of the power actuated winch 85 in opposition to the upper spring 116.

In the embodiment of the invention illustrated by Fig. 7 the upper end of the guide cable 60 is controlled by two support cables 124 and 125 connected thereto and in like manner the lower end of the guide cable is controlled by two lower support cables 126 and 127. The upper support cable 124 passes over a sheave 128 and the upper support cable 125 passes under a sheave 129, the ends of both of the cables being connected to a piston rod 130. The piston rod 130 is controlled by a power cylinder 131 which, by preference, is actuated by compressed air. The lower support cable 126 passes under a sheave 135 and the lower support cable 127 passes over a sheave 136 with both ends of the cables connected to a piston rod 137 extending from a second air-actuated power cylinder 138.

Both of the power cylinders 131 and 138 may be suitably adapted for remote control from a central station. For example, a pair of pipes 139 may connect the upper power cylinder 131 to an electrically actuated 3-way valve 140 and in like manner the lower power cylinder 138 may be connected by a pair of pipes 141 to a second 3-way valve 142. A supply pipe 143 from a suitable source of compressed air is connected to both of the 3-way valves.

When the two pistons 130 and 137 are in their normal retracted positions shown in Fig. 7 the various support cables are in the positions shown in full lines to place the guide cable 60 under tension in its first or normal position. At this time the upper support cable 124 and the lower support cable 126 are in tension and the other support cables 125 and 127 are slack. The two power cylinders 131 and 138 may be maintained under sustained air pressure to provide the required tension in the guide cable 60.

To cause the guide cable 60 to be shifted to its alternate offset position it is merely necessary to actuate the two power cylinders 131 and 138 by remote control to extend the two pistons 130 and 137. As a result of such extension of the two pistons the various cables are shifted to the position shown in broken lines with the two supporting cables 125 and 127 under tension and the other support cables 124 and 126 relatively slack. Here again the two power cylinders may be maintained under sustained air pressure to place the guide cable 60 under the required tension at its offset position.

In the embodiment of the invention shown in Fig. 8 the guide cable 60 is connected at its upper end to a first support cable 147 that is anchored to the derrick by a bracket 148 and is connected to a second support cable 149 that is connected by a suitable coil spring 150 to a second bracket 151 on the derrick. In like manner, the lower end of the guide cable 60 is connected to a first support cable 152 that extends around a lower sheave 153 and is connected to a second lower support cable 154 that is connected by a suitable spring 155 to a fixed bracket 156 at the bottom of the derrick. The cable 152 passes upward from the sheave 153 and is connected to a piston rod 157 that extends downward from a power cylinder 158. Preferably the power cylinder 158 is actuated by compressed air.

In the normal position of the guide cable 60, shown in full lines in Fig. 8, the guide cable is held in tension by the two springs 150 and 155 with the guide cable in alignment with the upper bracket 151 and the lower bracket 157. To shift the guide cable 60 to its alternate offset position shown in broken lines it is merely necessary to energize the power cylinder 158 for upward retraction of the piston rod 157. The upward retraction of the piston rod 157 draws in the lower support cable 152 until the guide cable 60 is shifted to its alternate offset position in opposition to the two springs 150 and 155. At this offset position the upper support cable 147 is taut with the guide cable 60 under tension in vertical alignment with the upper bracket 148 and the lower sheave 153.

In the embodiment of the invention shown in Fig. 9, the traveling block 26 is provided with a relatively long laterally extending bracket 164 which carries a first pair of guide rollers 165 and a second pair of guide rollers 166. A first guide cable 167 is engaged by the first pair of guide rollers 165 and a second guide cable 168 is engaged by the second pair of guide rollers 166. The upper end of the first guide cable 167 is connected to a fixed bracket 169 and the upper end of the second guide cable 168 is connected to a second upper bracket 170. The bottom end of the first guide cable 167 passes under a sheave 171 and the bottom end of the second guide cable 168 passes under a sheave 172, the bottom ends of the two cables being interconnected by a run of cable 173 that passes around a third sheave 174. A bracket 178 carried by the run of cable 173 is connected to the outer end of a piston rod 179 that is controlled by a lower power cylinder 180. Preferably the power cylinder 180 is actuated by compressed air.

In the position of the parts shown in full lines in Fig. 9, the power cylinder 180 is actuated to retract the piston 179 to place the first guide cable 167 under tension and at the same time to give enough slack to the second guide cable 168 to permit the traveling block 26 to be guided solely by the first guide cable 167. When the first guide cable 167 is taut the traveling block 26 is guided along its normal path in line with the axis of the well bore.

When the power cylinder 180 is energized to extend the piston rod 179 the second guide cable 168 is placed under tension as indicated in broken lines and simultaneously the first guide cable 167 is given sufficient slack to prevent interference with the functioning of the second guide cable. With the second guide cable 168 under tension in the straight line position shown in broken lines in Fig. 9 the traveling block 26 is guided along its alternate offset path.

The embodiment of the invention shown in Fig. 10 utilizes an upright guide means in the form of a vertical steel rod 184 that is engaged by the two rollers 65 on the

traveling block bracket 64. The upper end of the guide rod 184 is connected by a link 185 to the end of a piston rod 186 that extends downward from an air-actuated power cylinder 187. The upper end of the guide rod 184 is also connected by a link 188 with the lower end of a second piston rod 189 that extends downward from a second air-actuated power cylinder 190. The lower end of the guide rod 184 is connected by a link 194 with a piston rod 195 that extends upward from a third power cylinder 196. The lower end of the guide rod 184 is also connected by a link 198 with the upper end of a piston rod 199 that extends upward from a fourth power cylinder 200.

When the two power cylinders 187 and 196 are energized to retract the two corresponding piston rods 186 and 195 and the other two power cylinders 190 and 200 are relaxed to permit extension of the corresponding piston rods 189 and 199, the upper link 185 and the lower link 194 place the guide rod 184 under tension in the first or normal upright position of the guide rod for guiding the traveling block 26 along the normal path aligned with the axis of the well bore. On the other hand when the two power cylinders 187 and 196 are relaxed to permit extension of the corresponding piston rods 186 and 195 and at the same time the other two power cylinders 190 and 200 are energized to retract the corresponding piston rods 189 and 199, the two links 188 and 198 shift the guide rod 184 to its alternate offset position shown in broken lines and place the two links 188 and 198 under sufficient tension to hold the guide rod in this second offset position to cause the traveling block 26 to follow the desired alternate offset path.

The embodiment of the invention shown in Fig. 11 utilizes guide means comprising a cable 210 in combination with an upper sheave 211 and a lower sheave 212. The two ends of the cable are fixedly attached to the travelling block 26 by suitable fittings 215. The upper sheave 211 is mounted on a fixed bracket 216 and the lower sheave 212 is adapted to move between an upper position shown in full lines and a lower position shown in broken lines.

When the sheave 212 is in its upper position to permit the cable 210 to go slack as shown in full lines in the figure the travelling block 26 is free to take its normal gravitational position to follow the normal path aligning with the axis of the well bore. On the other hand, when the lower sheave 212 is shifted downward to its alternate position the cable is pulled taut as shown in broken lines to confine the vertical movement of the travelling block to the desired offset path.

My description in specific detail herein of selected embodiments of the invention, by way of example and to illustrate the principles involved, will suggest various changes, substitutions and other departures from my disclosure that properly lie within the spirit and scope of the appended claims.

I claim:

1. In an aparatus for handling pipe at a well bore including a pipe-elevating assembly comprising a traveling block suspended from a crown block and an elevator suspended from the traveling block for movement along a normal path substantially in alignment with the axis of the well bore to raise and lower successive stands of pipe, the combination therewith of means for optionally causing the pipe-elevating assembly to follow a path offset from the axis of the well bore whereby the assembly may be raised and lowered without interference with a stand of pipe positioned along said normal path, said optional means comprising: elongated upright guide means; means connected with said pipe-elevating assembly for moving engagement with said guide means as the traveling block is raised and lowered, said guide means normally permitting said pipe-elevating assembly to follow said normal path; first elongated means connecting the upper end of said guide means with a first upper support point adjacent the axis of the well bore; second elongated means connecting the upper end of said guide means with a second upper support point offset from the axis of the well bore; means for alternatively maintaining said elongated upright guide means in each of two substantially fixed positions including means for changing the position of at least one of said elongated means to shift said guide means selectively from one upright position supported by one of said elongated means to another upright position supported by the other of said elongated means, one of said upright positions being along said normal path and the other of said upright positions being along said offset path.

2. An apparatus as set forth in claim 1 which includes power means to actuate said position-changing means.

3. In an apparatus for handling pipe at a well bore including a pipe-elevating assembly comprising a traveling block suspended from a crown block and an elevator suspended from the traveling block for movement along a normal path substantially in alignment with the axis of the well bore to raise and lower successive stands of pipe, the combination therewith of means for optionally causing the pipe-elevating assembly to follow a path offset from the axis of the well bore whereby the assembly may be raised and lowered without interference with a stand of pipe positioned along said normal path, said optional means comprising: upright flexible guide means; means connected with said elevator for moving engagement with said upright flexible guide means as the traveling block is raised and lowered, first elongated means connecting the upper end of said guide means with a first upper support point adjacent the axis of the well bore, second elongated means connecting the upper end of said guide means with the second upper support point offset from the axis of the well bore, and means for changing the position of at least one of said elongated means to shift said guide means selectively from one upright position supported by one of said elongated means to another upright position supported by the other of said elongated means, one of said upright positions being along said normal path and the other of said upright positions being along said offset path.

4. An apparatus as set forth in claim 3 which includes power means to actuate said position changing means; and which includes a remote control for said power means.

5. An apparatus as set forth in claim 4 in which said power means is remotely controlled pneumatic ram.

6. In an apparatus for handling pipe at a well bore including a pipe-elevating assembly comprising a traveling block suspended from a crown block and an elevator suspended from the traveling block for movement along a normal path substantially in alignment with the axis of the well bore to raise and lower successive stands of pipe, the combination therewith of means for optionally causing said assembly to follow a path offset from the axis of the well bore whereby the assembly may be raised and lowered without interference with a stand of pipe positioned along said normal path, said optional means comprising: a first flexible guide means; a second flexible guide means; means connected with said pipe-elevating assembly in moving engagement with both said guide means; means to place said first guide means temporarily under tension in an upright position adjacent the axis of said well bore to guide the assembly along said normal path with said second flexible means slack; and means alternately to place said second flexible means temporarily under tension in an upright position more remote from the axis of the well bore to guide the assembly along said offset path with said first flexible means slack.

7. An apparatus as set forth in claim 6 which includes power means to actuate said two alternate means alternately; and which includes a remote control for said power means.

8. An apparatus as set forth in claim 7 in which said power means is a remotely controlled pneumatic ram.

9. In an apparatus for handling pipe at a well bore including a pipe-elevating assembly comprising a traveling block suspended from a crown block and an elevator suspended from the traveling block for movement along a normal path substantially in alignment with the axis of the well bore to raise and lower susccessive stands of pipe, the combination therewith of means for optionally causing said assembly to follow a path offset from the axis of the well bore whereby the assembly may be raised and lowered without interference with a stand of pipe positioned along said normal path, said optional means comprising: an upright guide means; means connected with said assembly in moving engagement with said guide means; a first elongated means connecting the upper end of said guide means with a first upper support point adjacent the axis of the well bore; a second elongated means connecting the upper end of said guide means with a second upper support point offset from the axis of the well bore; and means to place said guide means under tension selectively either at a first upright position supported by said first elongated means from said first support point to guide said assembly along said normal path or at a second upright position supported by said second elongated means from said second support point to guide said assembly along said offset path.

10. An apparatus as set forth in claim 9 in which said selective means includes a remotely controlled pneumatic ram operable between alternate positions to place said guide means at said first and second upright positions respectively.

11. An apparatus as set forth in claim 9 in which said selective means includes a pivoted member in engagement with the lower portion of said guide means, said pivoted member being swingable between a first position to hold the lower end of said guide means at said first upright position and a second alternate position to hold the lower end of said guide means at said second upright position.

12. An apparatus as set forth in claim 11 in which said guide means is a cable; and which includes means for cooperation with said pivoted means to releasably tension the cable.

13. An apparatus as set forth in claim 12 which includes a sheave on said pivoted means in engagement with said cable and which includes winding means on the pivoted means attached to said cable to place the cable under tension.

14. An apparatus as set forth in claim 13 which includes latch means to releasably hold said pivoted means at one of its two positions.

15. In an apparatus for handling pipe at a well bore including a pipe-elevating assembly comprising a traveling block suspended from a crown block and an elevator suspended from the traveling block for movement along a normal path substantially along the axis of the well bore to raise and lower successive stands of pipe, the combination therewith of means for optionally causing said assembly to follow a path offset from the axis of the well bore whereby the assembly may be raised and lowered without interference with a stand of pipe positioned along said normal path, said optional means comprising: an upright guide means, means connected with said assembly in moving engagement with said guide means; a first elongated means connecting one end of said guide means with a first attachment point adjacent the axis of the well bore; a second elongated means connecting the same end of said guide means with a second attachment point offset from the axis of the well bore; and means to place said guide means under tension selectively either at a first upright position with said first elongated means under tension in substantial alignment with the guide means to guide said assembly along said normal path or at a second upright position with said second elongated means under tension in substantial alignment with the guide means to guide said assembly along said offset path.

16. In an apparatus for handling pipe at a well bore including a pipe-elevating assembly comprising a traveling block suspended from a crown block and an elevator suspended from the traveling block for movement along a normal path substantially in alignment with the axis of the well bore to raise and lower successive stands of pipe, the combination therewith of means for optionally causing said assembly to follow a path offset from the axis of the well bore whereby the assembly may be raised and lowered without interference with a stand of pipe positioned along said normal path, said optional means comprising: an upright guide means; means connected with said assembly in moving engagement with said guide means; a first elongated means connecting the upper end of said guide means with a first upper support point adjacent the axis of the well bore; a second elongated means connecting the upper end of said guide means with a second upper support point offset from the axis of the well bore, at least one of said two elongated connecting means being a cable means; and means to place said guide means under tension selectively either at a first upright position supported by said first elongated means from said first support point to guide said assembly along said normal path or at a second upright position supported by said second elongated means from said second support point to guide said assembly along said offset path, said selective means including means to take up said cable means at the corresponding upper support point to place said guide means at one of said upright positions.

17. An apparatus as set forth in claim 16 in which said means to take up said cable means comprises a fluid actuated means movable between two alternate positions.

18. An apparatus as set forth in claim 16 in which said take up means comprises yielding means.

19. An apparatus as set forth in claim 18 which includes latch means to releasably anchor said cable means against yielding action by said yielding means.

20. In an apparatus for handling pipe at a well bore including a pipe-elevating assembly comprising a traveling block suspended from a crown block and an elevator suspended from the traveling block for movement along a normal path substantially in alignment with the axis of the well bore to raise and lower successive stands of pipe, the combination therewith of means for optionally causing said assembly to follow a path offset from the axis of the well bore whereby the assembly may be raised and lowered without interference with a stand of pipe positioned along said normal path, said optional means comprising: an upright guide means; means connected with said assembly in moving engagement with said guide means; a first upper cable-like means connecting one end of said guide means with a first point adjacent the axis of the well bore; a second cable-like means connecting said one end of the guide means with a second point further removed from said axis; means to shift the other end of said guide means selectively to a first position in substantially vertical alignment with said first point and a second position in substantially vertical alignment with said second point; means to tighten said first connecting means and loosen said second connecting means when said other end of said guide means is at said first position and to loosen said first connecting means and tighten said second connecting means when said other end of said guide means is at said second position.

21. An apparatus as set forth in claim 20 in which the means to tighten and loosen said two connecting means comprises power-actuated means connected with both of said connecting means.

22. An apparatus as set forth in claim 21 in which said power-actuated means is a fluid-actuated means.

23. An apparatus as set forth in claim 20 which includes sheaves at said two points respectively; and in which said two cable means pass over said two sheaves respectively.

24. An apparatus as set forth in claim 23 which includes a power means connected to the two connecting means to draw the two connecting means over said sheaves; and which includes remote means to control said power means.

25. In an apparatus for handling pipe at a well bore including a pipe-elevating assembly comprising a traveling block suspended from a crown block and an elevator suspended from the traveling block for movement along a normal path substantially in alignment with the axis of the well bore to raise and lower successive stands of pipe, the combination therewith of means for optionally causing the pipe-elevating assembly to follow a path offset from the axis of the well bore whereby the assembly may be raised and lowered without interference with a stand of pipe positioned along said normal path, said optional means comprising: elongated upright cable guide means; means connected with said pipe-elevating assembly for moving engagement with said guide means, said guide means normally permitting said pipe-elevating assembly to follow said normal path; first elongated means connecting the upper end of said guide means with a first fixed upper support point adjacent the axis of the well bore; second elongated means connecting the upper end of said guide means with a second fixed upper support point offset from the axis of the well bore and spaced from said first fixed upper support point; and means to lower said first elongated means and take

up slack in guide means simultaneously to shift the position of said guide means selectively from one upright position supported by said first elongated means to another upright position supported by said second elongated means, one of said upright positions being along said normal path and the other of said upright positions being along said offset path.

26. In apparatus for handling pipe in a well bore including a traveling block suspended from a crown block, the combination comprising: guide means for sliding connection with said traveling block to guide its vertical movement in a selected one of two laterally spaced positions; first elongated means connected to said guide means near the upper end thereof to support said guide means from a first support point; second elongated means connected to said guide means near the upper end thereof to support said guide means from a second support point; and means for changing the position of at least one of said elongated means to shift said guide means selectively from one upright position supported by one of said elongated means beneath said one support point to another upright position supported by the other of said elongated means beneath the other of said support points.

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