

July 5, 1949.

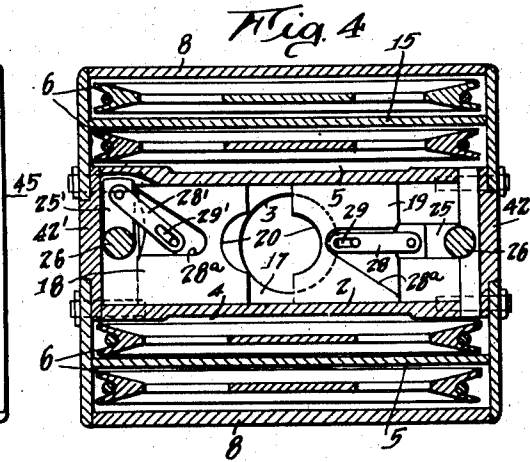
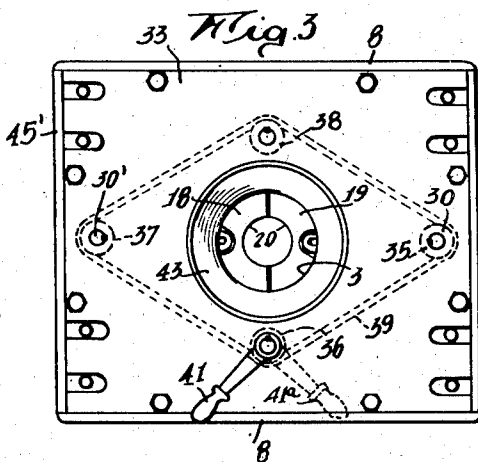
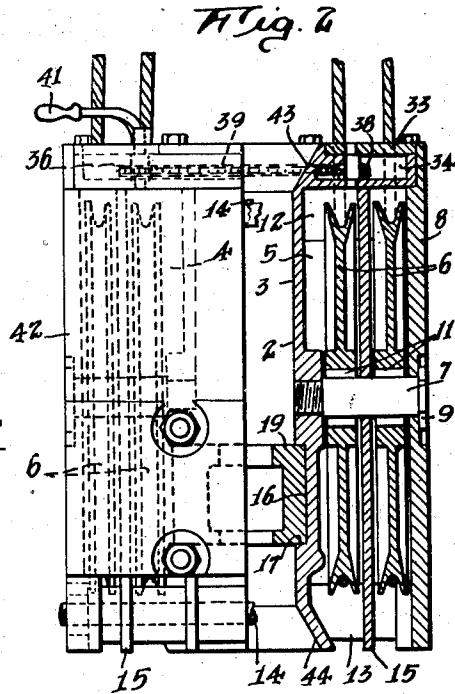
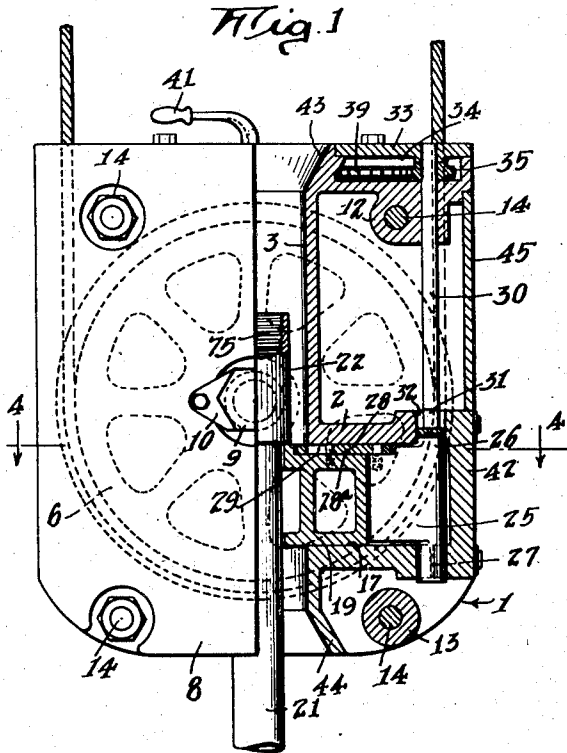
D. F. JOHNS

2,474,846

APPARATUS FOR HANDLING WELL PIPE

Filed Feb. 22, 1945

2 Sheets-Sheet 1



Inventor

Don F. Johns

By

Lyon & Lyon

Attorneys

July 5, 1949.

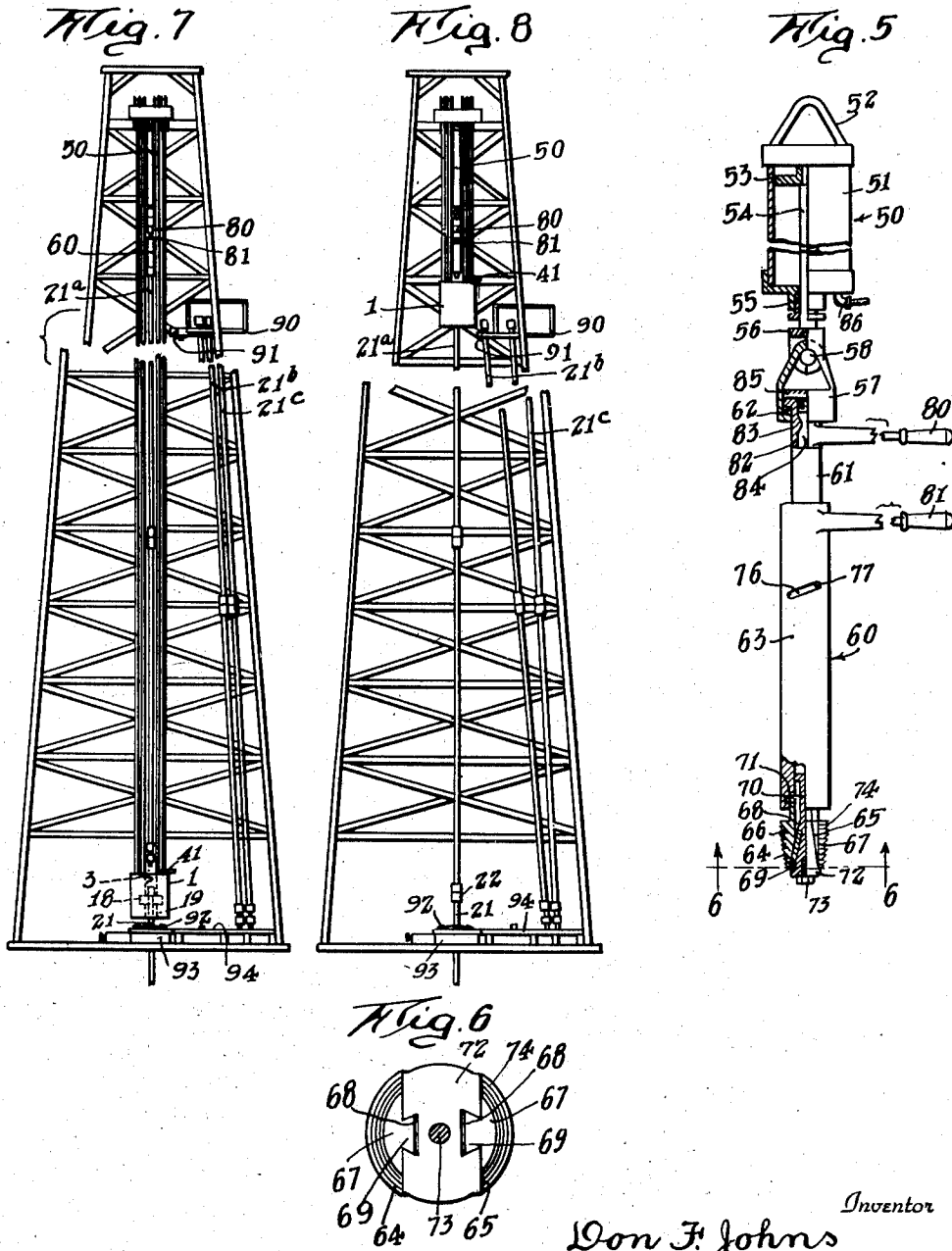
D. F. JOHNS

2,474,846

APPARATUS FOR HANDLING WELL PIPE

Filed Feb. 22, 1945

2 Sheets-Sheet 2



Inventor
Don F. Johns

By
Lyon & Lyon
Attorneys

UNITED STATES PATENT OFFICE

2,474,846

APPARATUS FOR HANDLING WELL PIPE

Don F. Johns, Huntington Beach, Calif., assignor
to Byron Jackson Co., Vernon, Calif., a corpora-
tion of Delaware

Application February 22, 1945, Serial No. 579,279

10 Claims. (Cl. 294—82)

1

This invention relates generally to the art of handling well pipe such as drill pipe and well casing, and is directed particularly to a novel apparatus for handling such pipe while it is sus-
pended in a well derrick.

In the operation of drilling a deep well such as an oil well, the string of drill pipe is periodically withdrawn from the well to replace the worn drilling bit. This involves separating the drill string into "stands" of two or more sections, ranging from 60 to 120 feet in length, depending on the height of the derrick, and racking the stands in upright position in the derrick. In accordance with standard practice, the main hoisting equipment which is used for raising or lowering the drill string in the well is also used to support a broken-out stand while it is being racked in the derrick. The racking operation, and also the reverse operation of picking up the stand from the racked position, requires that the elevator, or other tool by which the pipe is supported, be shifted laterally into an offset position with respect to the center line of the derrick. It is for this reason that an articulated connection is provided between the traveling block and the elevator, by means of the usual long elevator links and the hook.

It is characteristic of the present-day method of handling drill pipe that all operations are performed in sequence, the arrangement being such that it is impossible to perform some operations simultaneously with others. Thus, when coming out of the hole, the string of drill pipe is pulled upwardly until a complete stand is above the rotary table, and the string is supported in the table by the usual slips. Tongs are then applied to the joint and the joint is broken and spun out, whereupon the separated stand is swung to one side of the derrick while being supported by the traveling block, hook, links and elevator, and is racked in upright position in the derrick. The above-mentioned equipment is at that time in the upper part of the derrick, close to the upper end thereof, and must be lowered the full length of a stand before being again connected to the drill string to repeat the operation.

When running the drill string back into the well the above sequence of operations is reversed. The empty block, hook, links and elevator are raised to the upper portion of the derrick and the elevator is swung to one side and latched about one of the stands of pipe. The stand is then picked up and swung to the center of the derrick and the joint at its lower end is con-

2

ected to the upper end of the string of pipe supported in the table. After the joint is made up, the slips are removed and the string of pipe is lowered in the well until the upper end of the newly-added stand is just above the table. The slips are again set, the elevator is detached from the pipe and the empty elevator, links, hook and block are hoisted in the derrick to pick up another stand from the rack.

It is thus apparent that the standard system employed at present not only is time-consuming because of the sequential performance of the various steps of a cycle of operations, but it also requires the use of equipment of considerable overall length between the traveling block and the elevator. In a drilling rig equipped to drill wells to a depth of 10,000 feet, the overall length of a conventional hook-up of traveling block, drilling hook and links is approximately twenty feet and hence, when allowance is made for clearances and for picking up the stand about six feet off the floor, it is apparent that the vertical clearance in the derrick between the floor and the crown block must be at least thirty feet greater than the length of a stand.

It is a general object of this invention to provide novel and improved apparatus for handling well pipe in a derrick whereby the operation may be expediated by performing certain of the steps simultaneously, and also whereby the overall length of the equipment used may be very materially reduced.

It is another object of this invention to provide apparatus for handling well pipe in a derrick, wherein the main hoisting equipment is used only for supporting the string of pipe in the well, the separated stands of pipe being handled by auxiliary, light-duty equipment.

A further object of this invention is to provide a novel and improved traveling block which is capable of traversing the length of a stand of pipe while the latter is suspended in the center of the derrick.

A still further object is to provide a novel traveling block having a well pipe elevator or other pipe supporting device directly associated therewith.

It is still another object of this invention to provide, in conjunction with a novel traveling block capable of traversing the length of a stand of pipe while the latter is suspended in the center of a derrick, other auxiliary supporting means for the stand of pipe for supporting the pipe while the traveling block is traversing its length, and for transferring the stand of pipe between the

3

center of the derrick and the racking platform.

My improved apparatus comprises in general a novel traveling block having a central vertical opening therethrough, of a size to accommodate the well pipe and any lateral protuberances thereon such as tool joints and protector sleeves. An elevator or other means for supporting the drill pipe is directly associated with the traveling block, and may either be built into the block as a component part thereof or may be attached thereto at either end of the central opening. Auxiliary apparatus is also provided for engaging the upper end of the stand of pipe and transferring it between the racking platform and the center of the derrick, and for supporting the stand while the joint is being made up or broken out.

In the use of the novel apparatus when coming out of the hole, the elevator or other pipe supporting means associated with the traveling block is disconnected from the pipe by the derrick man as soon as the weight of the string of pipe is transferred from the elevator to the slips mounted in the table, and the empty elevator and block is immediately allowed to descend in the derrick, with the stand of pipe disposed in the central opening in the block. In the meantime, the auxiliary supporting and transfer mechanism, which is mounted in the upper portion of the derrick within easy reach of the derrick man, is connected to the upper end of the stand as soon as the block and elevator starts its descent. During the descent of the empty block and elevator, the joint between the lower end of the stand and the pipe string is broken out, and hence as soon as the block and elevator reach a position close to the table the separated stand is picked up by the auxiliary transfer device and is moved to one side and racked. The time normally wasted while waiting for the empty block and elevator to descend is not lost in this case, since this step takes place while the joint is being broken.

When running the string of pipe back in the hole, the hollow block and elevator are positioned close to the table, with the block telescoped over the upper end of the pipe protruding above the table. A stand of pipe is picked up from the pipe rack by the transfer device, operated by the derrick man, and is swung over to the center of the derrick and lowered into the central opening in the traveling block. The block and elevator are then hoisted in the derrick, sliding upwardly over the stand of pipe. As soon as it clears the lowermost joint, the spinning rope or other spinning means is applied and the joint is spun up and then made up tightly with the tongs. This operation requires about the same length of time that is required for the empty block and elevator to travel up to the upper end of the stand. As the block approaches the upper end of the stand the derrick man disconnects the transfer device from the stand, and closes the elevator or other supporting means associated with the block. The pipe string is then lowered in the well until the block and elevator are just above the table. While the pipe string is being lowered, the derrick man attaches the transfer device to another stand, and as soon as the block reaches its lowermost position the next stand is picked up from the rack and stabbed into the opening in the block. The sequence of steps is then repeated. As in coming out of the hole, no time is lost during travel of the empty

4

block and elevator, since the joint is being made up while this takes place.

From the foregoing general description of the apparatus and its uses, it will be apparent that the invention possesses many advantages. One manner in which it may be put to practical use will be evident from the following detailed description of an embodiment thereof, reference being had to the accompanying drawings wherein:

Fig. 1 is a view, partly in side elevation and partly in central vertical section, of a combined block and elevator constituting one form of an essential element of the invention;

Fig. 2 is in part an end elevation as viewed from the right of Fig. 3, and in part a central vertical section;

Fig. 3 is a top plan view of the block;

Fig. 4 is a transverse sectional view taken on line IV—IV of Fig. 1;

Fig. 5 is a view in elevation of an auxiliary pipe support and transfer device for use in conjunction with the block and elevator;

Fig. 6 is a transverse sectional view taken on line VI—VI of Fig. 5;

Fig. 7 illustrates one stage in the cycle of operation of handling drill pipe in accordance with the novel method of this invention; and

Fig. 8 illustrates another stage in the cycle of operation.

Referring to Figs. 1 to 4 of the drawings, it will be observed that the combined block and elevator, generally designated 1, comprises generally an integral body section 2 provided with a central opening 3 of circular cross-section extending vertically therethrough and so shaped as to provide pockets or recesses 4 and 5 (Fig. 2) at opposite sides of the central opening, in each of which is mounted a pair of sheaves 6, 6. Each pair of sheaves is journaled on a sheave pin 7 supported at its inner end by the body 2 and at its outer end by a detachable side plate 8. The pin may be secured to the body and plate in any suitable manner, and as herein shown its inner end threadedly engages a tapped bore in the body, the side plate 8 being bored to receive the pin and having a countersunk recess in its outer face to receive the hexagonal head 9 of the pin. A locking device such as that shown at 10 in Fig. 1 may be provided, if desired, to prevent inadvertent rotation of the pin. The sheaves are supported for free rotation on the pin by suitable bearings 11, 11. The body 2 is provided with upper and lower transverse bosses 12 and 13 (Fig. 1) extending parallel with the sheave pins 7, and which are bored to receive bolts 14 for securing the side plates 8 to the body. Spacer plates 15 may be interposed between the sheaves of each pair, and may be suitably secured to the body 2 to serve as supports for the central portion of each sheave pin 7.

The elevator or other pipe-supporting means associated with the block may assume various forms. In this instance it is built into the block as a component part thereof. The lower portion of the body, intermediate the axis of the sheave pins 7 and the lower extremity of the block, is recessed to provide a pocket 16 extending transversely through the body in a direction parallel to the planes of the sheaves. The pocket is rectangular in cross section, and the lower wall 17 thereof forms a supporting seat for a pair of pipe-supporting jaws 18 and 19.

The jaws 18 and 19 are mounted for limited sliding movement in the pocket 16 toward and

5

away from the axis of the central opening 3, and each is provided on its inner vertical face with a semi-cylindrical recess 20. When the jaws are moved inwardly the recesses 20 cooperate to define a pipe opening slightly larger than the pipe 21 (Fig. 1), but smaller than the tool joint 22 on the upper end of the pipe. The upper surfaces of the jaws thus form a supporting shoulder engaged by the downwardly facing shoulder on the tool joint to support the pipe string. In order to illustrate both the operative and retracted positions of the jaws, in Fig. 4 the jaw 18 is shown in the retracted position and the jaw 19 is shown in operative position. It will be understood, however, that this is solely for illustrative purposes and that in practice both jaws are either in operative or in retracted position.

Means are provided for moving both jaws in unison between their two extreme positions. Referring to Figs. 1 and 4, actuator cams 25 and 25' are mounted in the pocket 16 on the outer side of the respective jaws 19 and 18, each cam having upper and lower pivot bosses 26 and 27 which are journaled in the body 2 whereby the cams are mounted for pivotal movement about an upright axis located in the central longitudinal plane of the pocket 16. In order to move the jaws 18 and 19 from their retracted positions to their operative positions, the cams 25 and 25' are rotated through 90° in a clockwise direction, as viewed, from above, the cams bearing on the rear or outer faces of the jaws to force them inwardly. In order to retract the jaws, links 28 and 28' are pivotally connected at one end to the respective jaws and at their other ends to the respective cams. As shown in Fig. 1, the upper surface of each jaw is recessed downwardly at 28a to provide a pocket to receive the respective link. It is necessary to coordinate the straight-line movement of the jaws to the compound pivotal movement of the links, and for this purpose the inner ends of the links are slotted at 29 and 29' to provide a sliding pivotal connection between the links and their respective jaws.

As previously stated, the two jaws are actuated in unison, and to this end each jaw is connected to one of a pair of vertically disposed rock shafts 30, 30' (Figs. 1 and 3). As shown in Fig. 1, the lower extremity of each rock shaft is flattened on opposite sides at 31, and engages a transverse slot 32 in the upper extremity of the respective bearing bosses 26 on the jaws. This form of rotation interlock between the jaws and the rock shafts permits removal of the jaws outwardly through the ends of the pocket 16 without disturbing the rock shafts. Other forms of connection between the cams and the shafts may, however, be used if desired.

As shown in Figs. 1 and 2, the upper surface of the body 2 is recessed downwardly, and a detachable cover plate 33 cooperates with the recessed upper surface of the body to define a closed recess 34 in which is housed a plurality of sprockets, herein four in number and designated 35, 36, 37 and 38, and an endless chain 39 trained over the sprockets. The sprockets 35 and 37 are keyed to the upper ends of the respective rock shafts 30, and the sprockets 36 and 38 are keyed to stub shafts 40 (Fig. 2) mounted in the body and the cover plate. The sprockets 36 and 38 are idler sprockets, serving only to direct the chain around the central opening 3 in the body. An operating handle 41 is keyed to the stub shaft on which the sprocket 36 is mounted, and when moved through 90° from the position indicated by solid lines in

6

Fig. 3 to the dotted line position indicated at 41a, the cams 18 and 19 are moved in unison from their operative positions to their retracted positions. Reverse movement of the handle obviously rocks the cams in a direction to force the jaws into pipe-supporting position. The handle is so located that it is within convenient reach of the derrick man, to enable him to close the jaws as the empty block approaches the upper end of a stand when running the pipe into the hole, and to enable him to retract the jaws as the empty block starts to descend when coming out of the hole.

The combined block and elevator is adaptable to use with various sizes of drill pipe and casing, simply by substituting jaws 18 and 19 having recesses 20 corresponding to various pipe sizes. Removal and insertion of the jaws is facilitated by the provision of cover and bearing plates 42 and 42' detachably secured to the body 2 and closing the outer ends of the pocket 16 in which the jaws are mounted. It will be noted by reference to Figs. 1 and 4 that the inner half of each bearing for the pivot bosses 26 and 27 on the cams 25 and 25' is formed in the body 2, the outer half of each bearing being on the plates 42 and 42'. Thus by detaching the cover plates the cams and the jaws connected thereto may be withdrawn laterally from the pocket 16. A different set of jaws may then be connected to the cams and the assemblies inserted in the pockets. As mentioned above, the flattened faces 31 on the lower ends of the rock shafts 30 and 31', and the slots 32 in the pivot bosses 26 on the cams, permit removal of the cams without disturbing the pins and provide a driving connection between the shafts and the cams when the parts are assembled.

It will be noted that the upper and lower ends of the central opening in the block are flared outwardly at 43 and 44, to eliminate any sharp shoulders on which projections on the pipe, such as tool joints or rubber protectors, might hang up. As shown in the left half of Fig. 4, when the jaws are retracted they are disposed wholly outside the wall of the opening 3, so that they will not interfere with the free passage of the pipe therethrough as the block moves upwardly or downwardly over the pipe.

As shown in Figs. 2 and 4, the cover plates 42 and 42' extend the full width of the block and thus not only close the ends of the pocket 16 but also enclose the lower portions of the sheave recesses 4 and 5 in the body. The upper portions of the recesses 4 and 5 are enclosed by separate end plates 45 and 45' detachably secured to the body.

As previously mentioned, the combined block and elevator just described is used only for supporting and raising or lowering the drill string, auxiliary mechanism being provided for handling the individual stands of pipe while they are disconnected from the drill string. It will be obvious that the auxiliary mechanism may assume various forms differing widely in character and mode of operation. The essential functions of such a device are: (1) it must be capable of being quickly and easily attached to and detached from the upper end of the stand of pipe; (2) it must be capable of lifting the stand from the racking platform through a distance sufficient to cause the lower end of the stand to clear the block when the latter is in its lowered position close to the table; (3) it must be manipulable into a position laterally offset from the center line of the derrick, in order to transfer the stands of

pipe to and from the racking platform; and (4) it should be of such a character that it may be easily and safely manipulated and controlled by the derrick man.

In Figs. 5 and 6 there is shown one form which such a transfer device may assume. Reference character 50 designates a piston and cylinder assembly comprising a cylinder 51 having a bail or eye 52 at its upper end for suspending the device in any suitable manner from the crown block frame or the platform at the top of the derrick. A piston 53 is mounted in the cylinder on a piston rod 54 which extends downwardly through a stuffing box 55 and has a forked clevis 56 formed on its lower extremity. A swivel bearing housing 57 is pivotally connected to the clevis 56 by a pin 58 in such a manner as to permit free universal tilting of the bearing housing relative to the clevis in all directions.

A spear, generally designated 60, is rotatably supported by the bearing housing, and comprises a shank 61 supported on a bearing 62 in the housing, and a sleeve 63 mounted for limited rotative and axial movement on the shank. A pair of diametrically opposed, downwardly diverging wedge faces 64 and 65 are formed on the lower extremity of the shank 61 and cooperate with a pair of wedges 66 and 67 attached to the lower extremity of the sleeve 63. As shown most clearly in Fig. 6, the wedge faces 64 and 65 are flat and are provided with dovetail slots 68 slidably engaged by similarly shaped projections 69 on the backs of the wedges to retain the latter in engagement with their respective seats. An arcuate groove 70 is formed in the inner wall of the sleeve 63 adjacent its lower end, and each wedge is provided with an outwardly projecting shoulder 71 at its upper end engaging the groove 70 to support the wedges and at the same time permit rotation of the sleeve relative to the wedges and permit radially inward and outward movement of the wedges relative to the sleeve. Downward movement of the wedges relative to the shank 61 is limited by a collar 72 secured to the lower end of the shank, as by a cap screw 73. The outer faces of the wedges are serrated at 74 and tapered downwardly to conform to the tapered threads 75 of the tool joint box 22 at the upper end of the stand of pipe (Fig. 1).

An inclined slot 76 is formed in the sleeve 63 and is engaged by a pin 77 secured to the shank 61, the arrangement being such that upon relative rotation between the shank and sleeve through a small arc the sleeve is raised and the wedges 66 and 67 are drawn upwardly and inwardly along the wedge faces 64 and 65. In this manner the spear may be attached to the tool joint box 22 by engagement of the serrations 74 with the tool joint threads 75, the weight of the stand of pipe, when supported by the spear, urging the wedges downwardly and outwardly along the wedge faces 64 and 65 and thus forcing them into tight wedging engagement with the tool joint threads. Upon rotation of the sleeve 63 relative to the shank 61 in a counterclockwise direction, as viewed from above, the wedges are retracted, and the spear may then be raised clear of the tool joint box by the cylinder and piston assembly 50.

A pair of operating handles 80 and 81 are provided on the shank 61 and the sleeve 63, respectively, in positions convenient for manipulation by the derrick man. As shown, the handle 81 is formed integral with the sleeve 63, whereas the handle 80 is provided with a hub portion 82 keyed

at 83 to a reduced section 84 of the shank 61. The upper extremity of the reduced shank section is threaded to receive a nut 85 which overlies the bearing 62 for supporting the shank by the bearing housing 57.

The piston and cylinder assembly 50 is shown as of the single-acting type and is provided with a single fluid inlet and outlet connection 86 through which actuating fluid may be supplied to and released from the cylinder under control of suitable valve mechanism (not shown) located within convenient reach of the derrick man.

Referring now to Figs. 7 and 8, the manner in which the novel apparatus incorporating this invention is used is as follows:

When running the drill string into the well after replacing a worn bit, the derrick man, stationed on the usual "monkey board" 90, successively shifts the upper end of each stand of pipe to the position indicated by the stand 21b in Fig. 8, wherein it rests against the finger board 91 in position to be connected to the spear 60. At the outset, the combined block and elevator 1 is in its lowered position, telescoped over the pipe 21 supported by the rotary table 93. After swinging the transfer device over into alignment with the stand of pipe resting against the finger board, the derrick man stabs the spear 60 into the tool joint box at the upper end of the stand and then manipulates the control valve of the cylinder 50 to raise the stand and allow it to swing into the position indicated by the stand 21a in Fig. 7. From this position, the stand 21a is lowered into engagement with the pipe 21 by suitable manipulation of the cylinder control valve. Thereupon the block 1 is hoisted by the main drawworks to the position indicated in Fig. 8. As soon as the block has been hoisted clear of the joint between the stand 21a and the pipe 21, the joint is made up in the usual manner, this operation being performed while the block is traveling upwardly, with the stand 21a passing through the central opening 3 in the block. In this manner, no time is lost in waiting for the empty block to be raised to the upper end of the string.

As the block approaches the upper end of the stand 21a, the derrick man releases the spear 60 from the stand by manipulation of the handles 80 and 81, and raises the spear clear of the stand, and as the operating handle 41 on the block comes within his reach he shifts it to move the pipe-supporting jaws 18 and 19 into operative position. Meanwhile, during ascent of the block, the derrick man has shifted the upper end of the next stand 21b inwardly to the position shown in Fig. 8 wherein it rests against the fingerboard 93 in readiness for connection to the spear. When the elevator jaws 18 and 19 engage the tool joint shoulder, the weight of the pipe string is transferred from the slips 92 to the block, and upon removal of the slips from the table the string is lowered into the well while supported by the block. During the descent of the block and the drill string supported thereby, the derrick man swings the spear over into alignment with the next stand 21b and lowers it into engagement with the tool joint box. In making this connection it is not necessary for the derrick man to manipulate the handles 80 and 81 to retract the wedges 66 and 67, since the serrations on the wedges will ratchet downwardly over the tool joint threads as the spear is lowered. As soon as the block and the pipe string supported thereby are lowered to the position indicated in Fig. 7, the derrick man manipulates the cylinder control

valve to pick up the next stand 21b and swings it over into the position indicated by the stand 21a of Fig. 7. The sequence of steps described above is then repeated.

The foregoing sequence of operations is reversed when pulling the string of pipe from the well. Fig. 8 illustrates the condition which prevails when the pipe string has been raised until the stand 21a is above the table, except that in this case the stand 21b would not be resting against the fingerboard 91, the derrick man having shifted it to the position shown in Fig. 7 during ascent of the block and pipe string. As soon as the slips 92 are set in the table, the block is lowered, whereupon the derrick man shifts the operating handle 41 to retract the elevator jaws 18 and 19 to permit the block to slide freely down over the stand. The derrick man then lowers the spear into engagement with the tool joint box on the stand 21a, in readiness for picking up the stand as soon as the joint 22 at the lower end of the stand is broken.

During the descent of the empty block and elevator, the joint 22 is broken and spun out in the usual manner, this operation requiring approximately the same time as is required for the empty block to descend by gravity. When the block reaches the lower position indicated in Fig. 7, the detached stand 21a is raised by the cylinder 50 clear of the block and is swung over to the racking platform and lowered into the position indicated by the stand 21b in Fig. 8. The handle 41 is manipulated by one of the crew members on the derrick floor to move the elevator jaws 18 and 19 into operative position, whereupon the string of pipe is hoisted by the block into the position shown in Fig. 8. This cycle of operations is repeated for each stand of pipe.

The novel block and elevator 1 may be connected to the rotary swivel during the drilling operation by the use of a swivel adapter such as is commonly used to connect the swivel to a conventional type of drill pipe elevator. The term "swivel adapter" is used to denote a short stem or shank, of the same diameter as the drill pipe, which is connected at its lower end to the swivel ball and is provided at its upper end with an enlarged head forming a downwardly facing shoulder engaged by the elevator. A swivel adapter of this type may be engaged by the elevator jaws 18 and 19 to support the swivel and the drill string suspended therefrom.

It is not contemplated that the apparatus described herein would be used to pick up single sections of drill pipe from a horizontal position on the derrick floor, or to lay them down. This may be accomplished in any one of several ways, such, for example, as by the use of a light-duty "pick-up" or "rathole" elevator connected to the catline.

It will be obvious that the novel block and elevator described herein may also be used when running a string of casing into the well, it being understood that suitably shaped jaws 18 and 19 will be provided to handle the various sizes and types of casing. The maximum size of casing which can be handled will, of course, be determined by the size of the central opening 3 in the block and by the type of jaws used. This opening is preferably at least as large as the opening in the rotary table master bushing, so that any size of casing, drill pipe, etc. which can be run through the master bushing can be handled by the block and elevator.

From the foregoing description of the novel block and elevator and the auxiliary transfer

mechanism, and of the novel method of handling pipe therewith, it will be apparent that numerous advantages are gained. The time element is an important factor when pulling a string of drill pipe from the well to change bits, since the time consumed is in effect shut-down time in so far as drilling progress is concerned. The time which is wasted while waiting for the empty block, hook and elevator to ascend or descend in the derrick, in accordance with the conventional practice, constitutes from 20% to 25% of the elapsed time of one cycle of operations. By the aforesaid use of the novel apparatus incorporating this invention, this time delay is eliminated and hence a 20% to 25% reduction in overall time for running-out and running-in is effected.

The overall length of the equipment used in supporting and handling drill pipe and casing in an oil well rig is becoming increasingly important in view of the recent trend to rigs of the portable or semi-portable type having derricks or masts which may be collapsed, folded or otherwise readily broken down for transport from well site to well site. Such derricks or masts are necessarily made as short as possible, and hence any reduction in the overall length of the equipment suspended from the crown block is a decided advantage. The use of the apparatus described herein eliminates the usual hook, links and elevator, which average approximately fifteen feet in length for a rig used in drilling medium depth wells. The net saving in overall length is, of course, the difference between the length of the hook, links and elevator and the length of the cylinder assembly 50 and the spear 60. Even when a conventional pipe rack 94 and monkey board 90 are used, requiring a stroke of about 5 feet for the piston 53, a saving of at least 5 feet in overall length may be effected. By providing a special pipe rack at a suitable level to reduce the stroke of the piston to a minimum, this saving in overall length may be very materially increased.

The savings in time and in overall length are considered of paramount importance. Other advantages will, however, be apparent to those familiar with drilling rigs and their operation.

I claim:

1. Well pipe handling apparatus comprising side and end walls defining a housing, a tubular member extending centrally through said housing and carried thereby and defining a pipe passageway, inner walls in said housing cooperating with said side walls to define sheave compartments at opposite sides of said tubular member, sheaves mounted in said compartments, said tubular member having openings therein communicating with oppositely disposed lateral guideways in said housing, and pipe supporting jaws carried by said guideways and movable laterally through said openings into and out of said pipe passageway, whereby a pipe may be supported by said jaws when in their inner positions, and free passage of a pipe through said tubular member is permitted when said jaws are retracted.

2. Well pipe handling apparatus comprising side and end walls defining a housing, a tubular member extending centrally through said housing and carried thereby and defining a pipe passageway, inner walls in said housing cooperating with said side walls to define sheave compartments at opposite sides of said tubular member, sheaves mounted in said compartments on axes intersecting the axis of said tubular member, said tubular

member having openings therein communicating with oppositely disposed lateral guideways in said housing, and pipe supporting jaws carried by said guideways and movable laterally through said openings into and out of said pipe passageway, whereby a pipe may be supported by said jaws when in their inner positions, and free passage of a pipe through said tubular member is permitted when said jaws are retracted.

3. Well pipe handling apparatus comprising side and end walls defining a housing, a tubular member extending centrally through said housing and carried thereby and defining a pipe passageway, inner walls in said housing cooperating with said side walls to define sheave compartments at opposite sides of said tubular member, sheaves mounted in said compartments, oppositely disposed guideways formed in said housing and tubular member and communicating with said pipe passageway, the lower surfaces of said guideways providing load-supporting shoulders, and pipe supporting jaws supported by said shoulders for lateral movement between inner pipe-supporting positions and outer retracted positions permitting free passage of a pipe through said passageway.

4. Apparatus as set forth in claim 1, wherein said pipe supporting jaws when moved into said passageway cooperate to define an annular pipe supporting seat.

5. Apparatus as set forth in claim 1 and including jaw actuating means for moving said jaws in unison.

6. A traveling block structure for handling well pipe comprising: a well pipe receiving tube; lateral ways intersecting said tube near its lower extremity; pipe gripping elements slidable in said ways to and from gripping engagement with a pipe contained within said tube; control means for said pipe gripping elements including a housing in the form of a hollow flange located at the upper end of said tube, shafts extending upwardly from said elements into said housing, a control handle protruding from said housing, and drive means within said housing between said control handle and said shafts; and sets of sheaves mounted at opposite sides of said tube.

7. A traveling block structure for handling well pipe comprising: a well pipe receiving tube; control means for said pipe gripping elements including a housing in the form of a hollow flange located at the upper end of said tube, shafts ex-

tending upwardly from said elements into said housing, a control handle protruding from said housing, and drive means within said housing between said control handle and said shafts; a pair of sheave housings at opposite sides of said tube and ways incorporating said control means housing, and including mounting structures spaced from said tube; journals supported between said tube and mounting structures; and sheaves mounted on said journals.

8. Apparatus for handling sectional well pipe while inserting and removing it from a well comprising, in combination, main hoisting apparatus adapted to be suspended in a derrick or the like for raising and lowering the pipe string, and auxiliary pipe-supporting means connectible with the upper section of the pipe string for supporting said upper section when disconnected from the pipe string, said auxiliary support means including hydraulic hoisting means and pipe-engaging means supported thereby, said hydraulic hoisting means and said pipe-engaging means being suspended in the derrick normally in coaxial relation to said main hoisting apparatus.

9. Apparatus as set forth in claim 8, and including a rotatable connection between said hydraulic hoisting means and said pipe-engaging means.

10. Apparatus as set forth in claim 8, wherein said pipe-engaging means comprises means engageable with the threads of the pipe coupling at the upper extremity of the pipe section for supporting the pipe section.

DON F. JOHNS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,093,842	Garrigan et al.	Apr. 21, 1914
1,500,459	Krell	July 8, 1924
1,540,245	Bergsten	June 2, 1925
1,622,331	Mahan	Mar. 29, 1927
1,634,859	Tibbetts	July 5, 1927
1,737,893	Reed	Dec. 3, 1929
1,776,605	Tibbetts	Sept. 23, 1930
2,091,225	Eaton	Aug. 24, 1937
2,162,653	Umphres	June 13, 1939
2,218,412	Ball	Oct. 15, 1940
2,226,947	Sheldon	Dec. 31, 1940
2,314,502	Kelly	Mar. 23, 1943