

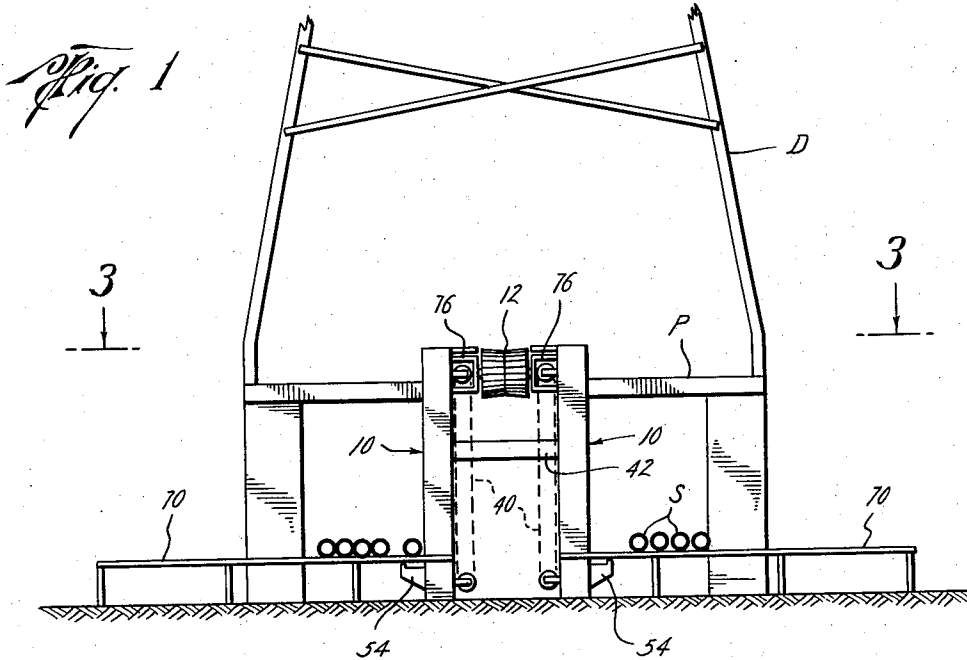
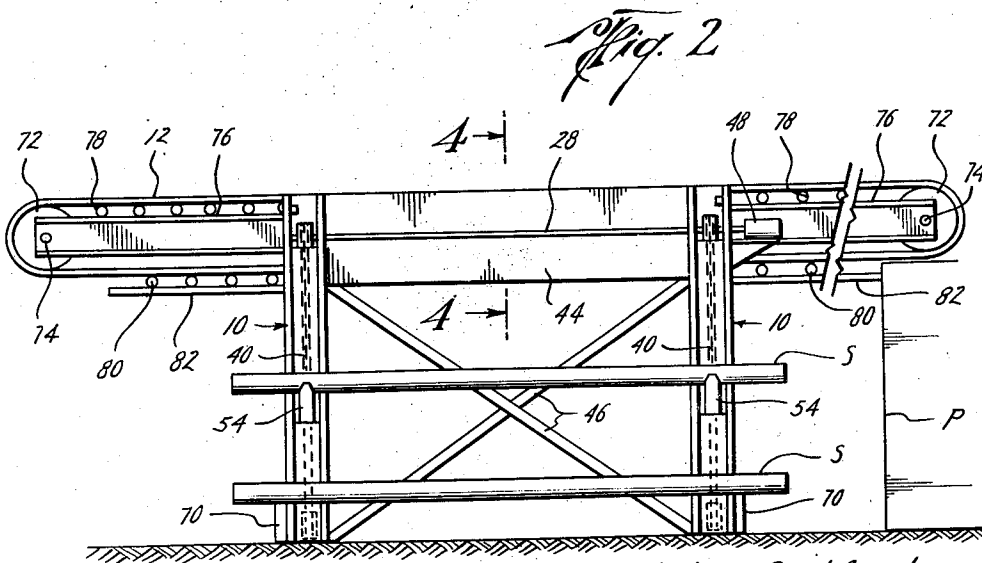
Aug. 18, 1959

J. O. MINTER
PIPE HANDLING EQUIPMENT

2,900,091

Filed Dec. 5, 1955

3 Sheets-Sheet 1



John O. Minter
INVENTOR.

BY
Charles E. Lightfoot
ATTORNEY

Aug. 18, 1959

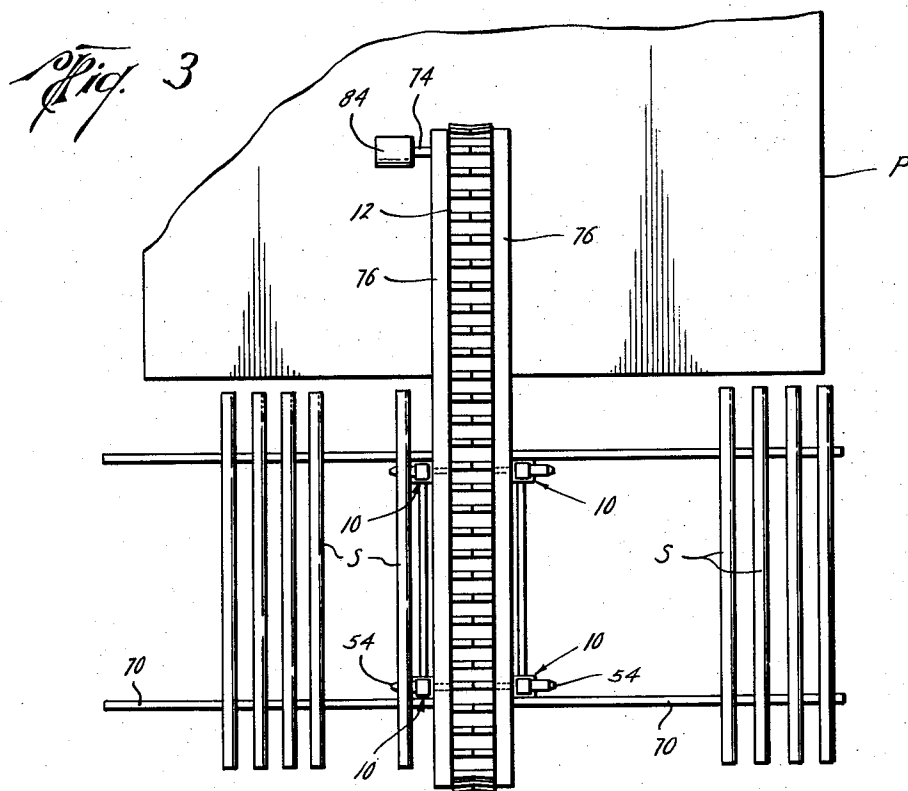
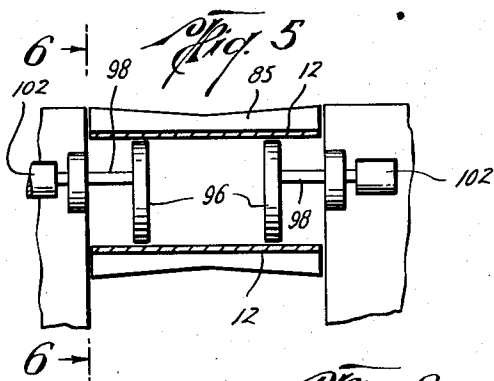
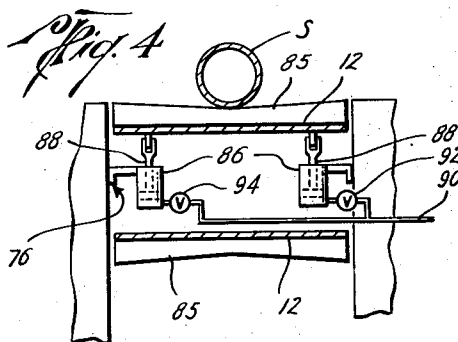
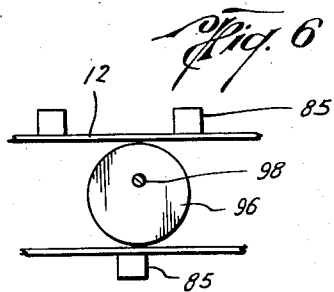
J. O. MINTER

2,900,091

PIPE HANDLING EQUIPMENT

Filed Dec. 5, 1955

3 Sheets-Sheet 2



John O. Minter
INVENTOR.

BY
Charles E. Lightfoot
ATTORNEY

Aug. 18, 1959

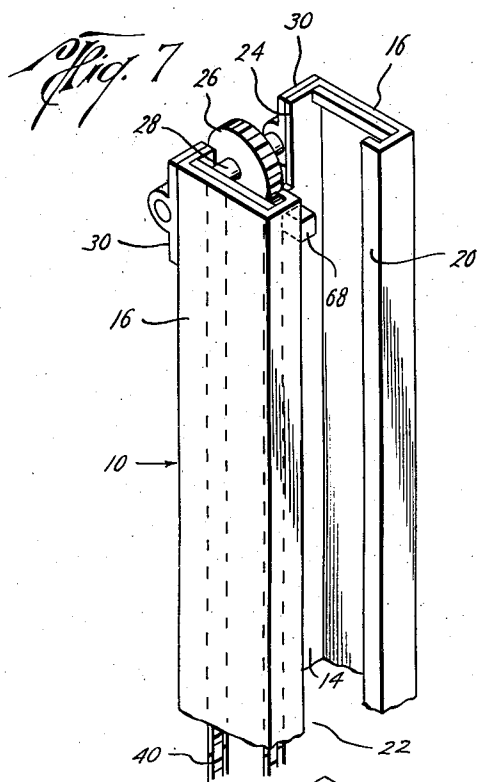
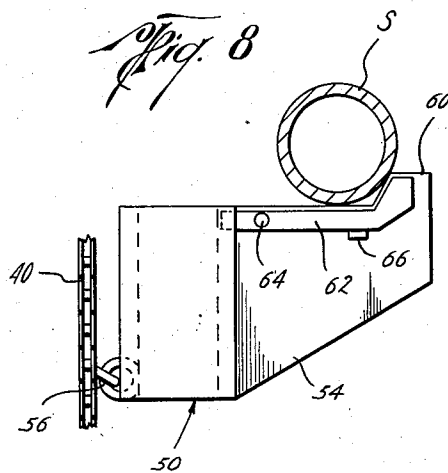
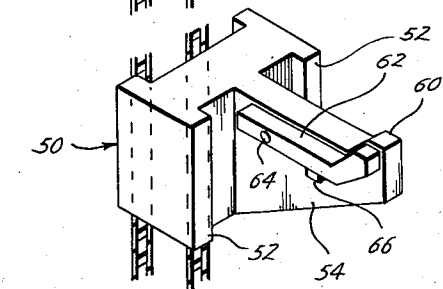
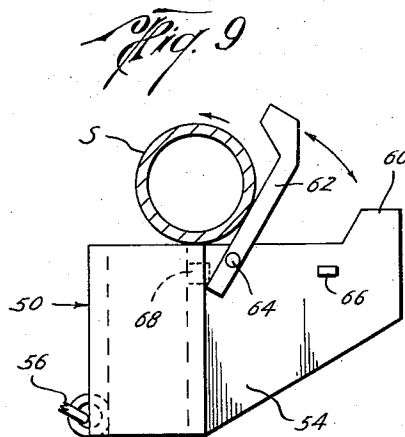
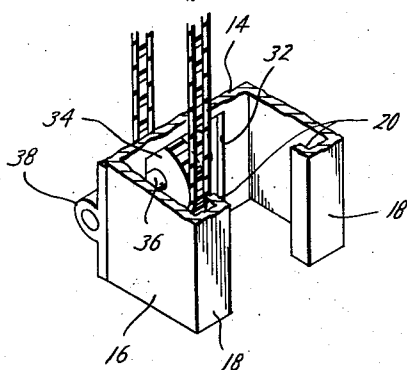
J. O. MINTER

2,900,091

PIPE HANDLING EQUIPMENT

Filed Dec. 5, 1955

3 Sheets-Sheet 3



John O. Minter
INVENTOR.

BY
Charles E. Lightfoot
ATTORNEY

1

2,900,091

PIPE HANDLING EQUIPMENT

John O. Minter, Thompson, Tex.

Application December 5, 1955, Serial No. 550,900

2 Claims. (Cl. 214-2.5)

This invention relates to pipe handling equipment, and more particularly to mechanism for moving sections of well pipe onto and off of a well platform during the operations of inserting the pipe in or removing the same from a well.

In the drilling and production of oil and gas wells it is often necessary to remove and reinsert long strings of pipe in the well and during such operations each section of pipe is separately handled as it is connected into or disconnected from the string, the sections being moved off of the platform and laid horizontally on a rack during the removing operation and returned to the platform one at a time during the reinserting operation. The handling of the pipe in this manner as heretofore commonly practiced is a laborious, time consuming and dangerous procedure which adds greatly to the cost of drilling and production of wells.

The present invention has for an important object the provision of pipe handling equipment whereby the handling of tubing, casing and drill collars in the laying down and picking up of the same during well drilling and producing operations may be greatly facilitated.

Another object of the invention is to provide pipe handling equipment by which sections of pipe may be readily moved onto and off of a well platform during the removal of a string from or the insertion of the same into a well without danger of damaging the threads of the pipe, thereby eliminating the necessity for the use of thread protectors.

A further object of the invention is the provision of pipe handling equipment whereby relatively long lengths of pipe may be quickly and easily moved onto and off of a well platform, thus reducing the number of pipe connections or joints which must be made up or disconnected on the well platform during the removal or insertion of the string.

Another object of the invention is to provide pipe handling equipment by which the safety of well drilling and producing operation may be greatly increased and the danger of dropping sections of pipe during such operations may be eliminated.

A further object of the invention is the provision of pipe handling equipment by which the manpower required for carrying out well drilling and production operations may be substantially reduced.

Another object of the invention is to provide equipment for the handling of pipe by the use of which the sections may be piled in higher stacks whereby pipe racks of smaller dimensions may be employed.

A further object of the invention is the provision of pipe handling equipment by which the sections of pipe are held in a straight condition while being moved onto and off of a well platform, thus reducing the likelihood of bending or otherwise damaging the pipe.

Another object of the invention is to provide pipe handling apparatus by which sections of pipe may be moved onto and off of a well platform without suspending the sections in a position for swinging movement so that

2

danger due to sudden swinging movement of the pipe section as it is moved into a vertical position above the well platform is eliminated.

A further object of the invention is the provision of pipe elevating and lowering apparatus by the use of which wear on the catline of the drilling equipment is substantially reduced.

The above and other important objects and advantages of the invention will best be understood from the following detailed description constituting a specification of the same when considered in conjunction with the annexed drawings, wherein—

Figure 1 is a front elevational view of the invention, showing the same as applied to its use in connection with a well platform;

Figure 2 is a side elevational view of the invention on a somewhat enlarged scale;

Figure 3 is a plan view of the invention as illustrated in Figure 1;

Figure 4 is a cross-sectional view, taken along the line 4-4 of Figure 2 looking in the direction indicated by the arrows, showing structural details of the unloading mechanism for the conveyor belt of the invention;

Figure 5 is a fragmentary detail view, partly in cross-section illustrating a somewhat modified form of the conveyor belt unloading mechanism;

Figure 6 is a cross-sectional view taken along the line 6-6 of Figure 5, looking in the direction indicated by the arrows;

Figure 7 is a fragmentary, perspective view illustrating the pipe elevating and lowering mechanism of the invention;

Figure 8 is a fragmentary side elevational view of the pipe elevating and lowering mechanism, illustrating structural details of the pipe supporting cradle of the mechanism and showing the same with a section of pipe supported thereon in position to be raised or lowered, and,

Figure 9 is a view similar to that of Figure 8 showing the means by which the pipe is unloaded from the cradle and the manner in which the unloading is accomplished.

Referring now to the drawings in greater detail, the invention is illustrated in connection with its use with well drilling and production equipment of conventional type including a well platform P above which a derrick D extends and which is provided with the usual cable operated apparatus, not shown, for inserting pipe into and removing the same from a well bore.

The pipe handling equipment of the invention is positioned in proximity to the platform P and comprises means for raising and lowering sections of pipe to move the same from pipe storage racks up to the level of the platform or lower the same from the platform level to the racks, and means for moving the pipe sections onto and off of the platform when supported at the platform level.

The pipe elevating and lowering apparatus of the invention comprises spaced apart, parallel, vertically disposed trackways indicated generally at 10, four such trackways being shown in the present illustration, arranged in pairs on opposite sides of an endless belt 12, supported substantially at the level of the platform P and by which the pipe sections are moved horizontally onto and off of the platform. Each of the vertical trackways 10 is of generally channel shape in cross-section having a bottom wall 14, side walls 16, and spaced apart front wall portions 18 which are intumed along their free longitudinal margins, as indicated at 20 to form a longitudinal front opening 22 extending throughout the length of the trackway.

The bottom wall 14 is cut away at the upper end of each trackway to provide an opening 24 through which an upper sprocket 26 may extend into the interior of

3

the trackway, which sprocket is mounted on a shaft 28 rotatably supported in bearings 30 attached to the exterior of the bottom wall 14 at opposite sides of the opening 24. An opening 32 is also provided in the bottom wall 14 at the bottom of the trackway through which a lower sprocket 34 may extend, the sprocket 34 being carried on a shaft 36 supported in bearings 38 attached to the exterior of the wall 14 on opposite sides of the lower opening 32.

An endless chain 40 extends about the sprockets 26 and 34 which chain passes longitudinally along the interior of the trackway and also along the exterior thereof.

The trackways 10 are suitably tied together, as by means of horizontal end members 42, shown in Figure 1, and horizontal side members 44, shown in Figure 2, and may also be connected together by diagonal braces such as those designated at 46 in Figure 2 to form a rigid and strongly braced structure.

The upper shafts 28 may be extended between the trackways of the pairs, as best seen in Figure 2 and may also have end portions extending beyond the trackways for the attachment thereto of a suitable driving element such as a drum or pulley 48 positioned for rotation in any convenient manner and for any desired source of power, not shown, whereby the endless chains 40 may be driven in either direction.

Within each of the trackways 10 a carriage 50 is movably positioned for vertical movement in the trackway, the carriage having a portion of generally H-shape provided with flanges 52 which extend between the turned portions 20 of the front wall portions of the trackway and the side walls 16 thereof to guide the carriage in the trackway. Each carriage has extension or lug 54, which projects horizontally through the opening 22 of the trackway and which forms a pipe supporting arm or cradle positioned to receive and support a pipe section S to be raised or lowered by the mechanism. The carriages 50 are suitably connected to the endless chains 40, as by means of links 56 connected to eyes 58 attached to the carriages, and the carriages of each pair of trackways are positioned at the same level to support the pipe S in a substantially horizontal position while the same is being raised or lowered. Each of the lugs 54 has an upwardly extending projection 60 at its outer end positioned to engage the pipe section S to prevent the pipe from rolling off of the cradle.

A lever 62 is pivotally attached to each carriage, as by means of a pivot pin 64, for vertical swinging movement relative to the lug. Stop means, such as the lug 66 is provided on the carriage, which is positioned to be engaged by the lever 62, to hold the lever in an inactive position with its upper surface below the upper surface of the cradle 54. A stop element 68 is also positioned on the trackway, near its upper end, in a position to be engaged by the inner end of the lever 62 to cause the lever to swing upwardly, in the manner shown in Figure 9, to roll the pipe S off of the carriage across the top of the trackway onto the endless belt 12 when the carriages reach their uppermost positions in the trackways.

Pipe storage racks, such as those shown at 70 are provided extending laterally from the trackways and located at a level to permit the cradles 54 to be positioned below the upper surfaces of the racks, whereby the pipe sections may be rolled into position to be engaged by the cradles to elevate the sections or to permit the sections to be rolled off of the cradles onto the racks when the cradles are lowered, as illustrated in Figure 1.

The endless belt 12 passes about rollers 72 which are mounted on shafts 74 journaled at the ends of horizontal beams 76 connected to the upper ends of the trackways 10 and positioned between the pairs of trackways and extending beyond the trackways at each end. Suitable means, such as the rollers 78 are positioned at spaced

4

intervals along the lengths of the beams 76 in position to be engaged by the belt 12 to support the belt against sagging under the weight of the pipe sections, and additional rollers 80 may be provided beneath the belt, carried on supports, such as those indicated at 82 attached to the trackways, as best seen in Figure 2. One of the shafts 74 may be driven, as by means of a pulley 84, shown in Figure 3, attached to an extended end portion of the shaft, and which is rotated from any desired source of power. The belt 12 may, if desired, be provided with cleats, such as those shown at 85, located at longitudinally spaced intervals therealong, and whose pipe engaging surfaces may be somewhat V-shaped to the center the pipe on the belt.

It will be apparent that sections of pipe when moved onto the upper portion of the belt 12 may be moved onto or off of the platform P by rotation of the pulley 84.

In Figure 4 there is illustrated one embodiment of mechanism whereby the pipe sections may be caused to roll off of the belt 12 onto the cradles 54 at either side of the belt. This mechanism comprises one or more cylinders 86 supported on the beams 76 and positioned beneath the upper portion of the belt. Each of the cylinders has a piston movably positioned therein and provided with a piston rod 88 which extends upwardly into engagement with the under surface of the upper portion of the belt. The cylinders are connected at their lower ends in communication with any suitable source of fluid under pressure by a pipe 90, under the control of suitable valves 92 and 94, whereby fluid under pressure may be supplied to either of the cylinders to move the corresponding piston rod 88 upwardly to tilt the upper portion of the belt 12 to one side or the other to cause the pipe section S to roll off of the belt and onto the cradles 54, at one side of the belt.

A somewhat different form of the belt tilting mechanism is illustrated in Figures 5 and 6, wherein rollers or cains 96 are positioned beneath the upper portion of the belt 12 which are eccentrically mounted on shafts 98 for rotation therewith, the shafts being suitably journaled in bearings 100 attached to the beams 76 in any convenient manner. Each shaft 98 has a pulley 102 at its outer end which is adapted to be rotated in any convenient manner and from any desired source of power to rotate the corresponding cain. It will be apparent that the cains 96 may be positioned to be operated to tilt the belt in either direction and that by rotating the cains at one side the belt may be tilted to roll the pipe off of the other side of the belt.

In the operation of the invention, constructed as described above, the equipment may be positioned beside a well platform P with the belt 12 extending to a location near the point at which the pipe is inserted in or removed from the well. During the removal of the pipe from the well, each section of pipe as it is disconnected from the string may be placed with its lower end on the belt and the belt operated as the pipe section is lowered to move the pipe into horizontal position on the belt. As soon as the pipe section has been moved by the belt to a position opposite the cradles 54, the belt tilting mechanism is then actuated to roll the pipe off of the belt and onto the cradles at one side of the belt, whereupon the cradles are lowered by actuation of the chains 40 to lower the pipe to the level of the racks, after which the pipe may be rolled onto the rack.

In replacing the pipe in the well, the cradles 54 are lowered to positions below the racks and a pipe section is rolled onto the cradles, the levers 62 being in the positions shown in Figure 8. The cradles are then moved upwardly by actuation of the chains 40, and as the cradles approach their uppermost positions the levers 62 engage stops 68 to actuate the levers in the manner illustrated in Figure 9, to roll the pipe off of the cradles and onto

5

the belt 12. The pipe may then be moved onto the platform by actuation of the belt.

If desired, the belt may be operated to move the pipe to a position to be connected to the catline or other hoisting means in the derrick and as the inner end of the pipe is lifted, the belt may be further operated to move the outer or lower end of the pipe inwardly toward the point at which it is to be connected into the string. By operation of the equipment in this manner swinging of the pipe as it is moved into vertical position is avoided.

It will thus be seen that the invention provides pipe handling equipment of unitary design, which is of simple and rugged construction and by which sections of pipe may be quickly and easily moved into and out of the derrick during the insertion of pipe into or its removal from a well.

The invention has been disclosed herein in connection with certain specific embodiments of its structure, but it will be understood that this is intended by way of illustration only and that numerous changes can be made in the construction and arrangement of the various parts, without departing from the spirit of the invention or the scope of the appended claims.

Having thus clearly shown and described the invention, what is claimed as new and desired to secure by Letters Patent is:

1. Pipe handling equipment comprising longitudinally spaced pairs of laterally spaced uprights, conveyor means movably supported on the uprights for horizontal movement and positioned to support a pipe in a horizontal position for longitudinal movement, pipe supporting means movably carried on the uprights for vertical movement at each side of the conveyor means and engageable with pipes at longitudinally spaced points to support the pipes in horizontal positions, means for moving the pipe supporting means to move the pipes from one level to another, means on the pipe supporting means and uprights positioned for coaction to move the pipes from the pipe supporting means to the conveyor means when the pipes are at the level of the conveyor means, and means for

6

tilting the conveyor means in one direction to cause the pipe to roll from the conveyor means onto the pipe supporting means at one side of the conveyor means and in the other direction to cause the pipe to roll off of the conveyor means onto the pipe supporting means at the other side of the conveyor means.

2. In pipe handling equipment the combination with an endless belt movably supported for movement in a horizontal plane and positioned to support a pipe in an elevated position for horizontal movement, of longitudinally spaced uprights positioned at one side of said belt, pipe supporting means movably carried on the uprights for vertical movement and engageable with a pipe to support the pipe in a horizontal position, means for moving the pipe supporting means vertically to move the pipe from one level to another, means on said pipe supporting means and said uprights positioned for coaction when the pipe reaches said plane to move the pipe in said plane from the pipe supporting means to said belt and means for tilting said belt out of said plane in a direction laterally of the direction of movement of the belt to cause the pipe to move from said belt to said pipe supporting means.

References Cited in the file of this patent

UNITED STATES PATENTS

362,103	Nason	May 3, 1887
389,242	Palmer	Sept. 11, 1888
673,258	Harrington	Apr. 30, 1901
702,408	Cook	June 17, 1902
706,294	Beck	Aug. 5, 1902
1,330,099	Stoop	Feb. 10, 1920
1,571,360	Williams	Feb. 2, 1926
1,707,998	Shaw	Apr. 9, 1929
2,231,087	Protin	Feb. 11, 1941
2,535,979	Witte	Dec. 26, 1950
2,631,741	Tucker	Mar. 17, 1953
2,733,826	Manion et al.	Feb. 7, 1956

FOREIGN PATENTS

116,424	Austria	Feb. 25, 1930
---------	---------------	---------------