

Aug. 31, 1943.

M. MORGAN ET AL

2,328,388

HANDLING OF ROD BUNDLES OR THE LIKE

Original Filed Aug. 4, 1939

5 Sheets-Sheet 1

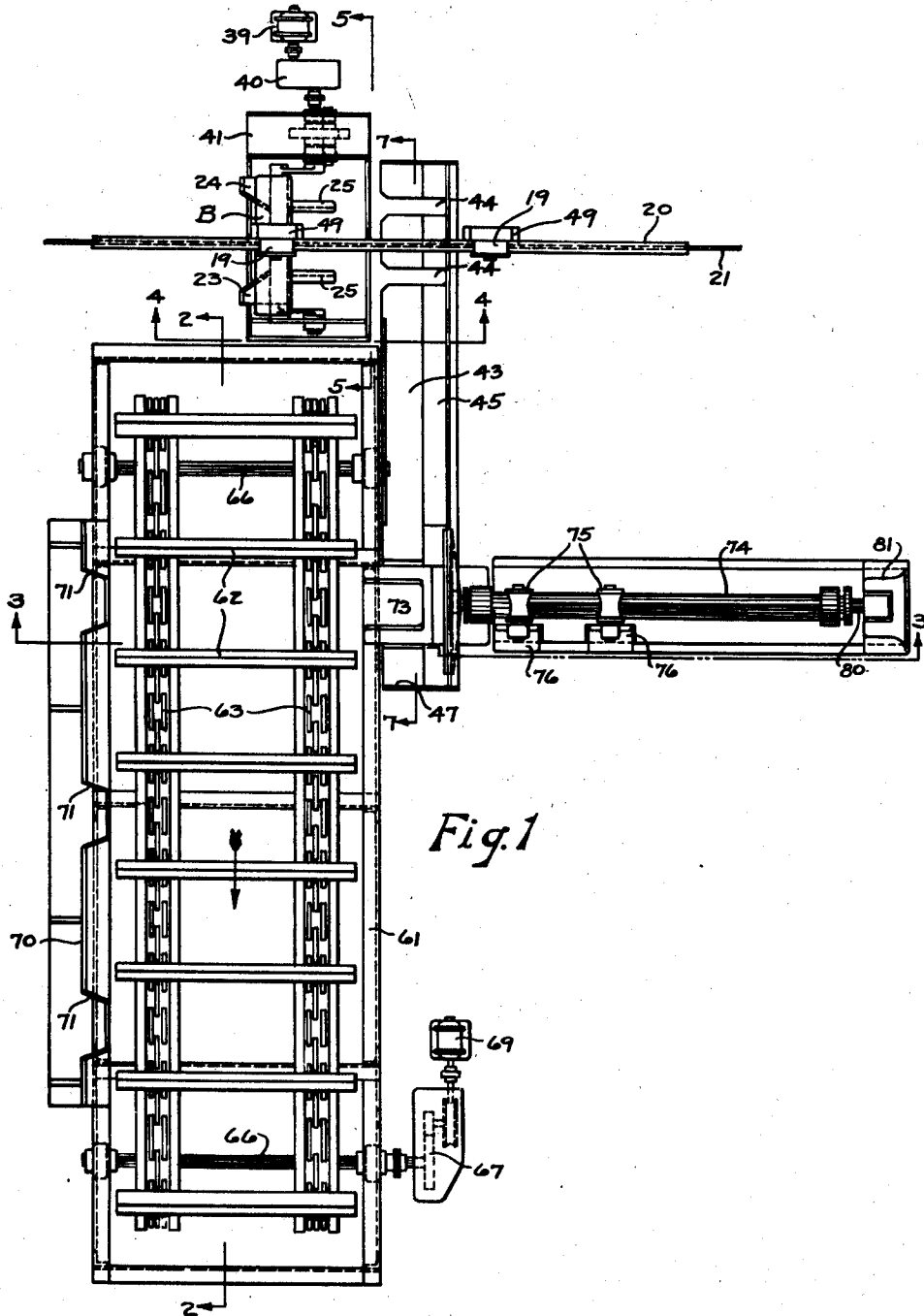


Fig. 1

INVENTORS
MYLES MORGAN
JOHN N. WHALEN
BY *Albert D. Blaylock*
ATTORNEY

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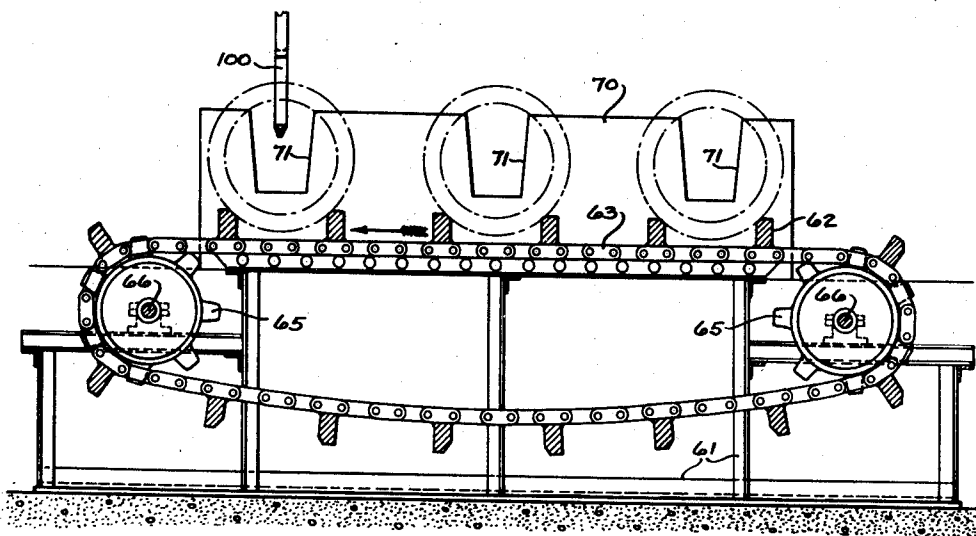


Fig. 2

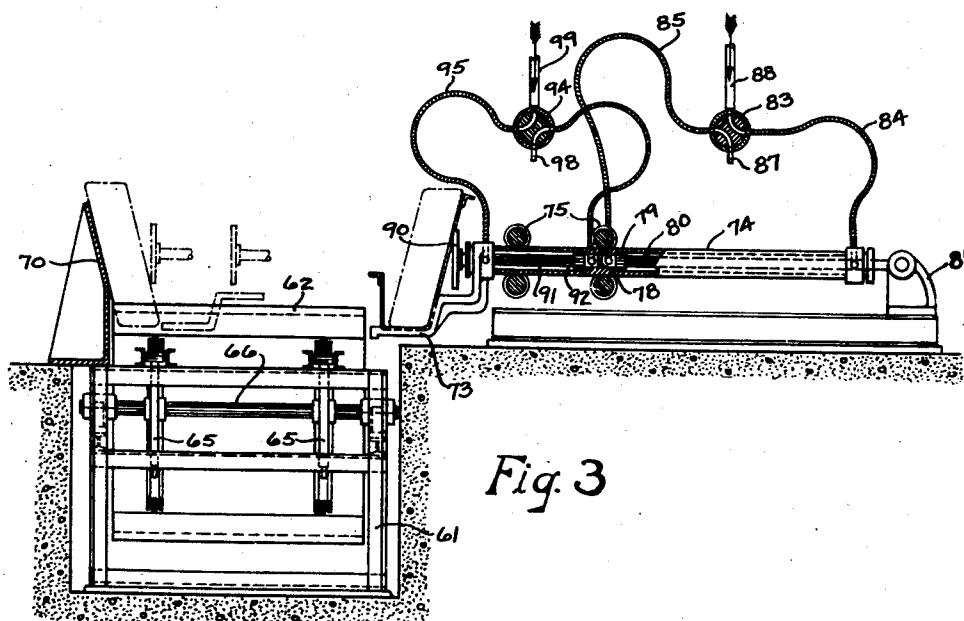


Fig. 3

INVENTORS
MYLES MORGAN
JOHN N. WHALEN
BY *Albert G. Blodgett*
ATTORNEY

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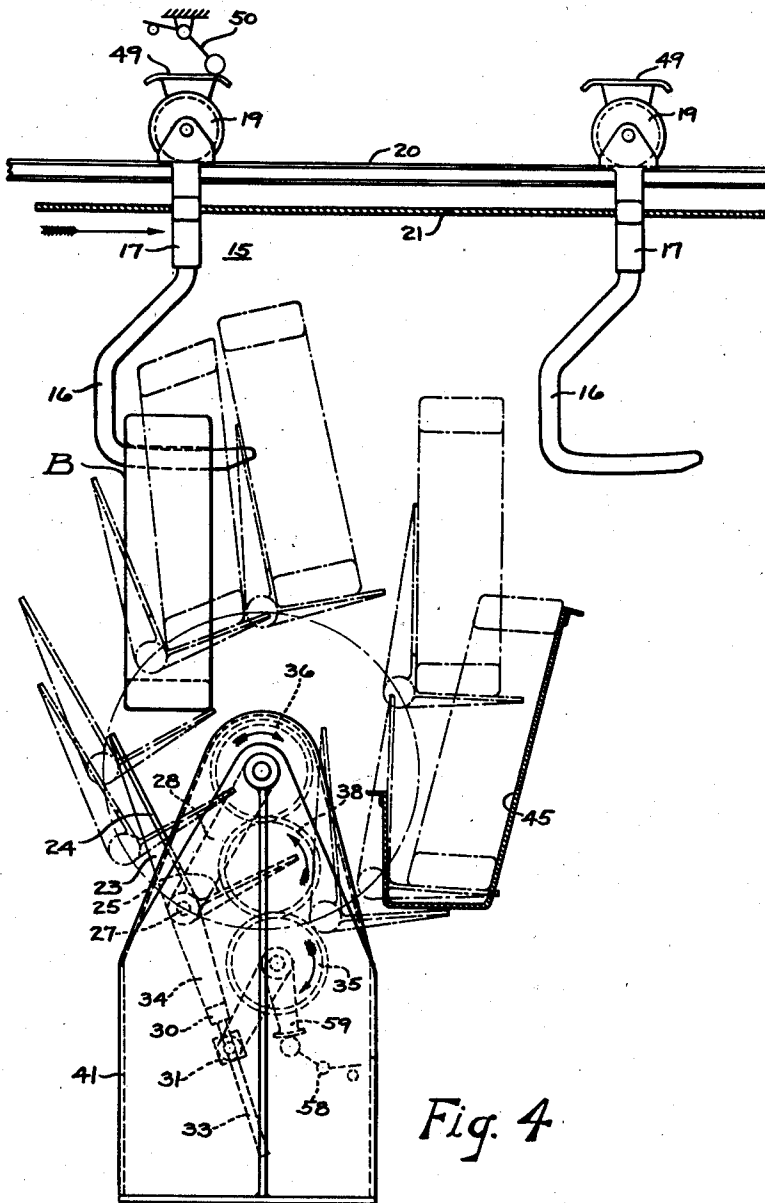


Fig. 4

INVENTORS
MYLES MORGAN
JOHN N. WHALEN
BY *Albert G. Blodgett*
ATTORNEY

Aug. 31, 1943.

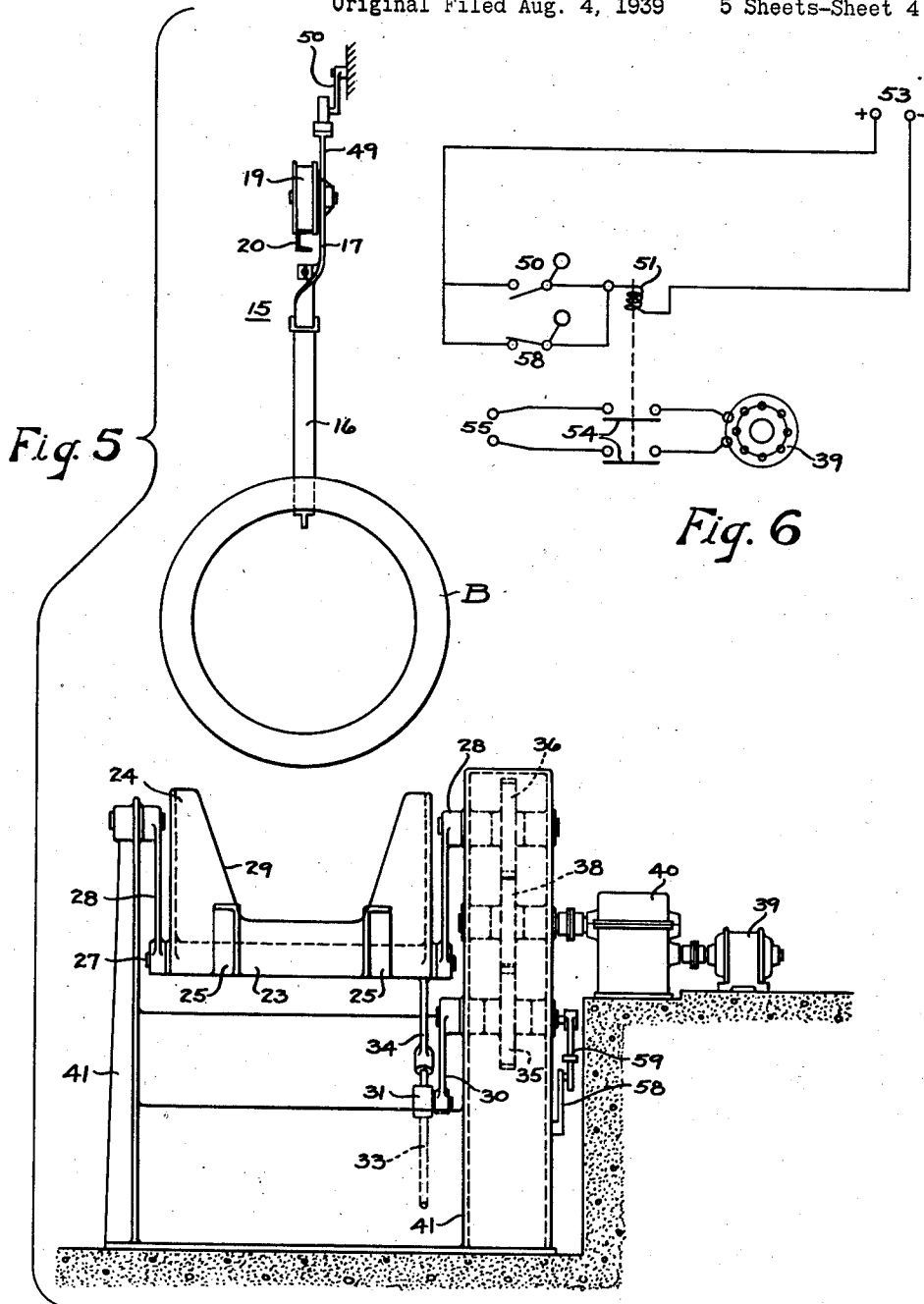
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INVENTORS
MYLES MORGAN
JOHN N. WHALEN
BY *Albert G. Blagden*
ATTORNEY

Aug. 31, 1943.

M. MORGAN ET AL

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5 Sheets-Sheet 5

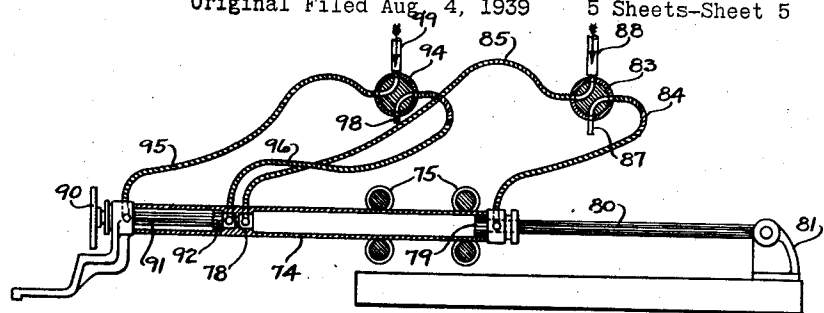


Fig. 8

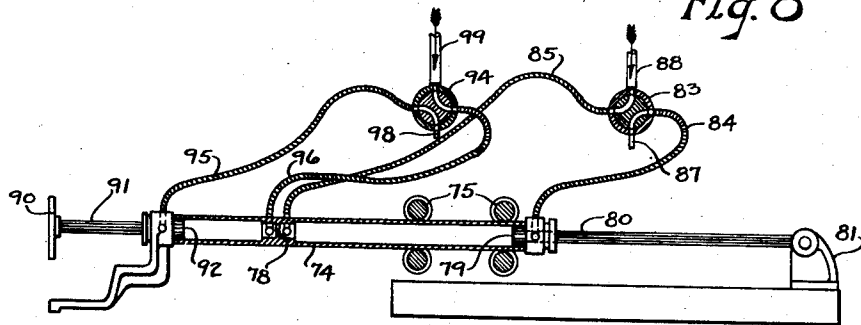


Fig. 9

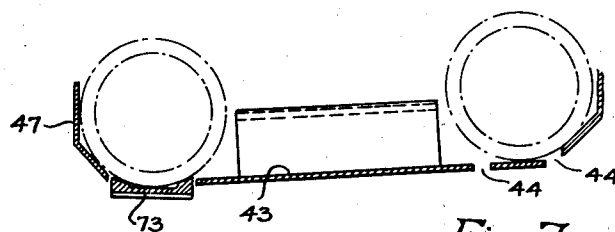


Fig. 7

INVENTORS
MYLES MORGAN
JOHN N. WHALEN
BY *Albert S. Blagden*
ATTORNEY

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UNITED STATES PATENT OFFICE

2,328,388

HANDLING OF ROD BUNDLES OR THE LIKE

Myles Morgan, Worcester, and John N. Whalen, Boylston, Mass., assignors to Morgan Construction Company, Worcester, Mass., a corporation of Massachusetts

Original application August 4, 1939, Serial No. 288,392. Divided and this application December 27, 1940, Serial No. 371,938

5 Claims. (Cl. 198—24)

This invention relates to the handling of rod bundles or the like, and more particularly to the construction and arrangement of apparatus for handling coiled rod bundles and similar annuli. This application is a division of our prior application Serial No. 288,392, filed August 4, 1939, now Patent No. 2,256,684, granted September 23, 1941.

In rod mills it is the practice to coil the rods into annular bundles which are placed on a coil conveyor and then transferred to a so-called "hook carrier" comprising a series of suspended hooks upon which the bundles are hung with their axes substantially horizontal. These hooks travel continuously at a rather slow speed. The bundles are eventually removed from the hooks one at a time, either by hand labor or by a suitable mechanism. After the bundles have been thus removed, it is desirable to convey them in groups to a place of use, storage or further processing, but the arrangement of the bundles in such groups presents a difficult problem.

It is one object of the invention to provide a simple, inexpensive, and dependable apparatus for placing rod bundles or similar annuli in groups to facilitate their subsequent handling.

It is a further object of the invention to provide a mechanism of a rugged and dependable nature adapted to receive rod bundles or similar annuli one at a time and to arrange such bundles in a succession of groups which can be withdrawn at convenient intervals by apparatus of known construction.

With these and other objects in view, as will be apparent to those skilled in the art, the invention resides in the combination of parts set forth in the specification and covered by the claims appended thereto.

Referring to the drawings illustrating one embodiment of the invention and in which like reference numerals indicate like parts,

Fig. 1 is a top plan view of an apparatus for handling rod bundles;

Fig. 2 is a section on the line 2—2 of Fig. 1;

Fig. 3 is a section on the line 3—3 of Fig. 1, with certain parts broken away for clearness of illustration;

Fig. 4 is a section on the line 4—4 of Fig. 1;

Fig. 5 is a section on the line 5—5 of Fig. 1;

Fig. 6 is a wiring diagram;

Fig. 7 is a section on the line 7—7 of Fig. 1;

Fig. 8 is a view of a portion of Fig. 3, showing a different part of the cycle; and

Fig. 9 is a view similar to Fig. 8 showing a still different part of the cycle.

The embodiment illustrated comprises a hook carrier 15 (Figs. 4 and 5) including a series of hooks 16, of which only two are shown. These hooks are arranged to move in a substantially horizontal path, and in the particular construc-

tion shown in the drawings their points extend in the direction of travel. For this purpose each hook is suspended from a bracket 17 thereabove which is provided with a wheel 18 arranged to roll along a horizontal rail 20. A horizontal flexible cable 21 extends beneath and parallel to the rail, this cable being suitably connected to the brackets 17. The cable is moved longitudinally by any suitable and well-known means. The hooks 16 serve to support bundles B of wire-rod, or similar annuli, which depend from the hooks in a well-known manner with their axes substantially horizontal.

When the bundles reach a predetermined location they are removed from the hook carrier by an automatic mechanism which serves to lift them upwardly and then move them axially at a speed sufficient to avoid interference with the hooks, whereupon they may be lowered and deposited in a suitable receptacle. For this purpose there is provided a transfer device in the form of an L-shaped cradle 23 located beneath the path of the hooks and comprising an upright back-rest 24 and a pair of laterally spaced parallel arms 25 which extend in the same general direction as the points of the hooks 16. The arms 25 join the lower portion of the back-rest 24 at substantially a right angle, and the cradle is pivotally supported near this junction point on a horizontal pin 27 which is connected at its opposite ends to a pair of parallel cranks 28 arranged to rotate about a horizontal axis transverse to the axes of the bundles. The back-rest 24 is cut away centrally at 29 to avoid interference with the hooks.

In addition to the circular movement which is imparted to the cradle 23 by the rotation of the cranks 28, the cradle is also preferably given an oscillating motion about the crankpin 27. For this purpose a crank 30 is mounted beneath one of the cranks 28 and arranged to rotate about an axis parallel to the axis of the cranks 28. The lower crank 30 has a somewhat smaller radius than the upper cranks, and it carries on its free end a block 31 which is free to turn thereon about an axis parallel to the crank axis. The block 31 is provided with an aperture there-through to receive a rod 33 forming a downward extension of an arm 34 which projects downwardly from the cradle 23. During the rotation of the cranks the rod 33 slides through the block 31, and the block imparts the desired oscillating motion to the cradle. The upper and lower cranks are rotated in the same direction and at the same speed by any suitable driving mechanism. In the embodiment illustrated the lower crank 30 is connected to a gear 35 and the crank 28 thereabove is connected to a gear 36. A gear 38 is located between the gears 35 and 36, and meshes with both these gears. The intermediate

gear 38 is driven by an electric motor 39 which is connected thereto by a suitable speed-reducing unit 40. The rotatable cranks and the gears associated therewith are shown mounted in a supporting frame 41.

As indicated in Fig. 4, clockwise rotation of the cranks 28 and 30 will cause the cradle 23 to move upwardly beneath the bundle B, the arms 25 first engaging the bottom of the bundle to lift it from the hook 16. As the crank rotation continues the back-rest 24 will move into contact with the surface of the bundle which is remote from the point of the hook, and the bundle will be carried axially and downwardly until it is deposited in a receptacle shown as a trough or guideway 43 which extends transversely of the axes of the bundles. The bottom of this trough is notched at 44 (Fig. 1) to allow the arms 25 to pass downwardly therethrough without interference, leaving the bundle in the trough. Preferably one wall 45 of the trough is inclined slightly so that the bundles may lean against the same, as shown in Fig. 4. Referring now to Figs. 1 and 7, it will be seen that the trough 43 slopes downwardly from its receiving end, so that the bundles will roll along the trough until they are stopped by a wall 47 extending across the lower end thereof.

Preferably the cradle 23 remains stationary in the position shown in full lines in Fig. 4 until one of the hooks 16 arrives, whereupon the cranks 28 and 30 are turned through one revolution and the cradle serves to remove the bundle from the hook. This is preferably brought about by automatic means arranged to start and stop the motor 39 at the proper times. For this purpose each bracket 17 on the hook carrier is provided with a cam plate 49 arranged to engage and close a normally open limit switch 50 when the hook reaches the unloading position. As shown in Fig. 6, the limit switch 50 is connected in series with a coil 51 across a source 53 of electric current, this coil being arranged to control a pair of normally open contacts 54 which in turn control the energization of the motor 39 from a source 55 of electric current. These parts are so arranged that when the switch 50 is closed by the cam plate 49, upon arrival of a hook 16, the coil 51 will be energized, closing contacts 54 and starting the motor 39. The cradle 23 will thus be actuated and the bundle will be removed from the hook and placed in the trough 43. In order that the cranks 28 and 30 may continue their movement after the cam plate 49 has passed the limit switch 50, and then come to rest when they have completed one revolution, we provide a normally closed limit switch 58 to form a shunt circuit for the switch 50. The limit switch 58 is controlled by a cam plate 59 carried by the shaft of the gear 35 (Fig. 4) and arranged to open the switch when the cycle has been completed. Before this occurs the cam plate 49 will pass the switch 50, which will thereupon open. Consequently when the switch 58 is opened the coil 51 will be de-energized, and the motor 39 will stop.

After reaching the lower end of the trough 43, the bundles are removed therefrom and arranged in groups adapted to facilitate their further handling. For this purpose there is provided a conveyor 61 located close to the trough and at the rear side thereof. This conveyor comprises a series of spaced parallel horizontal bars 62 arranged in pairs to form supports for groups of bundles. These bars are mounted on two endless chains 63 which pass around sprocket wheels 65 carried by a pair of horizontal rotatable shafts

66. One of the shafts 66 is connected by suitable gearing 67 (Fig. 1) to an electric motor 69. At the opposite side of the conveyor 61 from the trough 43 there is provided a stationary upright plate 70 which is inclined slightly away from the conveyor. This plate is formed with a series of notches 71 therein which extend downwardly from the upper edge of the plate, these notches being spaced apart a distance corresponding to the spacing of the successive pairs of bars 62.

Means is provided to remove the bundles from the lower end of the trough 43 and arrange them in groups on the conveyor bars 62. As shown particularly in Figs. 1, 3 and 7, the bottom of the trough 43 is cut away near the wall 47 to receive a tray 73 so located that the bundles will rest thereon after they have rolled along the trough into contact with the wall 47. This tray is arranged to move horizontally across the conveyor 61 between two of the bars 62, and for this purpose the tray is mounted on the front end of a horizontal cylinder 74 which is arranged to be moved longitudinally. This cylinder is supported by two pairs of guide rolls 75 mounted in brackets 76 (Fig. 1). A partition 78 (Fig. 3) extends across the cylinder, and a piston 79 is mounted within the cylinder in the rear of this partition, the piston having a piston rod 80 which extends rearwardly therefrom and connects with a stationary bracket 81. In order to control the movements of the cylinder 74, a manually operable four-way valve 83 is provided, this valve being connected by a flexible tube 84 to the rear end of the cylinder and by a flexible tube 85 to the cylinder at a point immediately in the rear of the partition 78. This valve 83 is provided with an exhaust pipe 87 and an inlet pipe 88, the latter being supplied with a suitable fluid such as compressed air. By proper actuation of the valve 83, a bundle can be transported on the tray 73 to a position over the conveyor bars 62.

In order to remove the bundles from the tray and deposit them on the bars 62, we provide a pusher 90 which is located immediately in front of the cylinder 74 and connected by a rod 91 to a piston 92 within the cylinder and in front of the partition 78. The movements of the pusher 90 are controlled by a manually operable four-way valve 94 which is connected by a flexible tube 95 to the front end of the cylinder 74 and by a flexible tube 96 to the cylinder at a point immediately in front of the partition 78. This valve 94 is provided with an exhaust pipe 98 and an inlet pipe 99, the latter being supplied with compressed air or any other suitable fluid under pressure. By means of the valve 94 it is possible to advance and withdraw the pusher 90 relative to the tray 73 in a desired manner.

The operation of the invention will now be apparent from the above disclosure. As each hook 16 reaches the unloading station, the cam plate 49 will engage the limit switch 50 and close the same, thereby energizing the coil 51. This will close the contacts 54, starting the motor 39 and turning the cranks 28 and 30 in a clockwise direction as viewed in Fig. 4. As soon as the cam plate 59 has cleared the switch 58, this switch will close. The cradle 23 will move from the full line position shown, and pass successively through the several broken line positions indicated. During this movement the cradle will move upwardly and forwardly beneath the bundle B, the arms 25 engaging the bottom of the bundle to lift it from the hook and the backrest 24 tipping forwardly to engage the rear of the bun-

die. The speed of movement of the cradle is so much greater than the speed of the hook that the bundle will be carried forwardly and then lowered into the trough 43 without interference with the hook. The arms 25 will pass downwardly through the notches 44 in the bottom of the trough, so that the bundle will be deposited in the trough and supported by the wall 45 thereof. Because of the slope of the trough the bundle will immediately roll downwardly along the same until it rests on the tray 73. In the meantime, and before the cranks have completed one revolution, the cam plate 49 will have cleared the limit switch 50 and allowed this switch to open. This will not stop the motor, however, since the coil 51 will be supplied with current through the switch 58. Upon completion of the cycle, the cam plate 59 will open the limit switch 58, de-energizing the coil 51, opening the contacts 54, and stopping the motor 39. Upon arrival of the following hook 16 the cycle will be repeated.

As soon as the bundle has rolled along the trough 43 to the tray 73, the valve 83 will be turned ninety degrees, as shown in Fig. 8, admitting air through the tube 85 and exhausting air through the tube 84. This will move the cylinder 74 and tray 73 forwardly over the conveyor 61, whereupon the valve 94 will be turned ninety degrees, as shown in Fig. 9, admitting air through the tube 96 and exhausting air through the tube 95. This will cause the piston 92 and the pusher 90 to advance relative to the cylinder 74, thereby pushing the bundle off the tray 73 and into contact with the wall 70, the bottom of the bundle resting on two of the bars 62, which remain stationary during this phase of the operation. The valve 83 will now be turned to its original position, admitting air through the tube 84 and exhausting air through the tube 85, thereby withdrawing the cylinder 74 and the tray 73. The valve 94 will then be turned to its original position, admitting air through the tube 95 and exhausting air through the tube 96, thereby withdrawing the piston 92 and the pusher 90 until the parts once more occupy the positions shown in Fig. 3. When the next bundle reaches the tray 73, the valves 83 and 94 will again be actuated. This bundle will be deposited against the first bundle and in axial alignment therewith. This mode of operation will be continued until bundles have been placed along the entire length of one pair of bars 62, whereupon the motor 69 will be started and the conveyor 61 actuated until the group of bundles is in line with the next notch 71 and the following pair of bars are in position to receive bundles from the tray 73, when the motor 69 will be stopped. In this manner groups of axially aligned bundles are formed on the conveyor 61 and they can readily be removed therefrom by well-known means. For example, a hairpin hook 100 (Fig. 2) may be suspended from an overhead crane and inserted into the center of the bundles through one of the notches 71.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. Apparatus for handling rod bundles or similar annuli comprising a guideway arranged to receive the bundles and inclined so that gravity will cause the bundles to roll along the same, a reciprocable tray located adjacent the lower end of the guideway and arranged to receive the bun-

dles therefrom, a conveyor adjacent the guideway and arranged to support groups of bundles with the bundles in each group horizontally aligned, and means to reciprocate the tray and transfer the bundles from the guideway to the conveyor and form such groups of bundles thereon.

2. Apparatus for handling rod bundles or similar annuli comprising a guideway arranged to receive the bundles and inclined so that gravity will cause the bundles to roll along the same, a conveyor movable in a generally horizontal direction, a tray located adjacent the lower end of the guideway and arranged to receive the bundles therefrom, the tray being reciprocable in a substantially horizontal direction transverse to the direction of movement of the conveyor, and means to reciprocate the tray and deposit the bundles on the conveyor to form groups with the bundles in each group horizontally aligned.

3. Apparatus for handling rod bundles or similar annuli comprising a guideway arranged to receive the bundles and inclined so that gravity will cause the bundles to roll along the same, a tray located adjacent the lower end of the guideway and arranged to receive the bundles therefrom, a conveyor adjacent the guideway and arranged to support groups of bundles with the bundles in each group horizontally aligned, means to reciprocate the tray between its receiving position and a position directly above the conveyor, a pusher associated with the tray, and means to reciprocate the pusher relative to the tray and thereby push the bundles from the tray onto the conveyor to form such groups of bundles thereon.

4. Apparatus for handling rod bundles or similar annuli comprising a guideway arranged to receive the bundles and inclined so that gravity will cause the bundles to roll along the same, a tray located adjacent the lower end of the guideway and arranged to receive the bundles therefrom, a conveyor at one side of the guideway and arranged to support groups of bundles with the bundles in each group horizontally aligned and their axes extending substantially at right angles with the guideway, means to reciprocate the tray in a direction transverse to the guideway between its receiving position and a position directly above the conveyor, a pusher associated with the tray, and means to reciprocate the pusher relative to the tray in a direction parallel to the movement thereof and thereby push the bundles from the tray onto the conveyor to form such groups of bundles thereon.

5. Apparatus for handling rod bundles or similar annuli comprising a conveyor movable in a generally horizontal direction, a horizontal cylinder mounted adjacent the conveyor and extending transversely to the direction of movement of the conveyor, means supporting the cylinder for axial movement, a stationary piston within the cylinder, valve means to control the admission of pressure fluid to the cylinder at opposite sides of the piston alternately and thereby reciprocate the cylinder, a tray mounted on the cylinder, means to supply bundles to the tray, a pusher mounted on the cylinder adjacent to the tray, and means to reciprocate the pusher relative to the tray in a direction parallel to the movement thereof and thereby push the bundles from the tray onto the conveyor to form groups of bundles thereon.

MYLES MORGAN,
JOHN N. WHALEN,