Dec. 12, 1933. F. V. JOHNSON 1,939,055

APPARATUS FOR HANDLING MATERIAL

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Fig. 1.

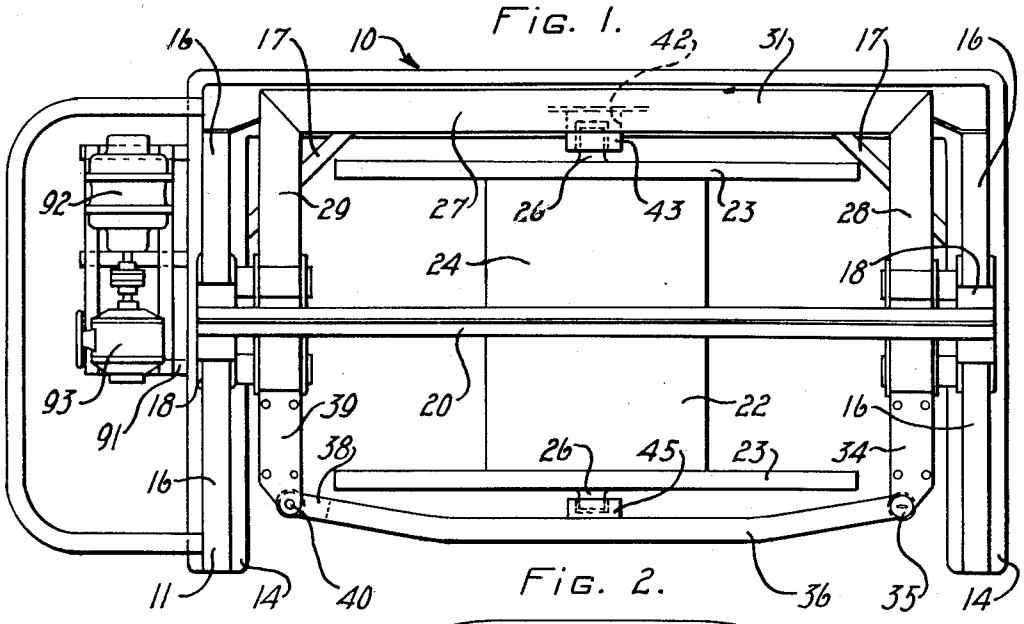
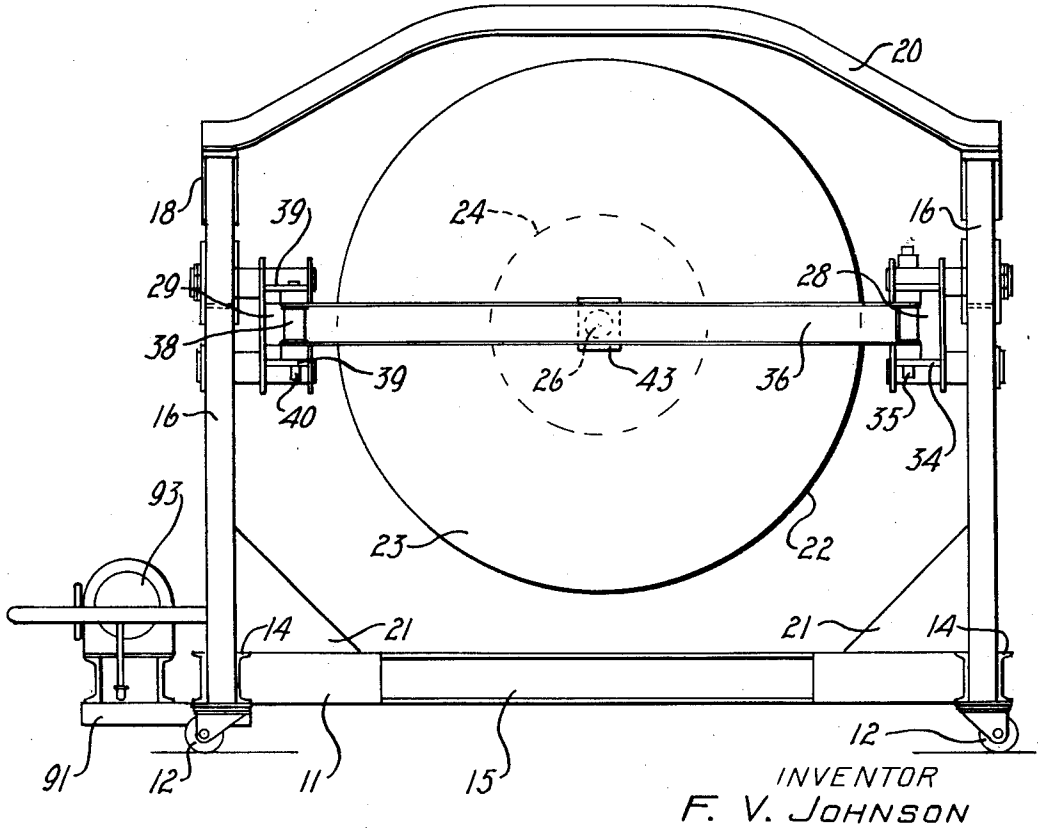


Fig. 2.



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Fig. 4.

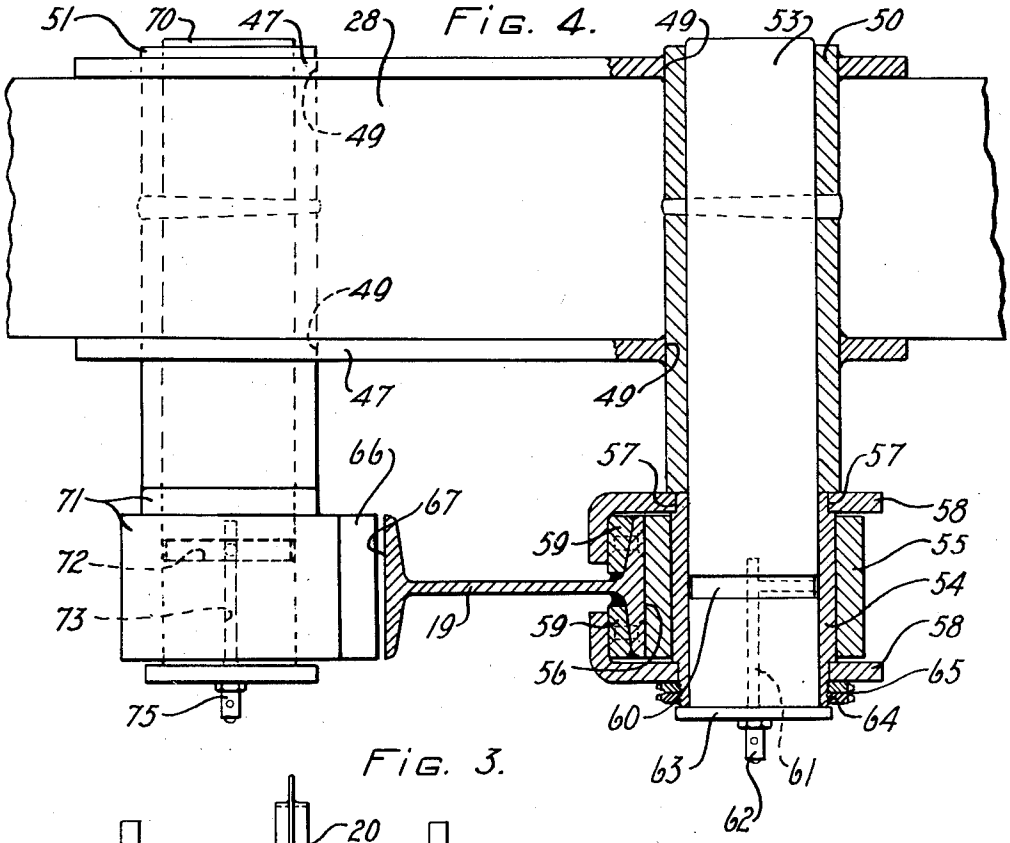
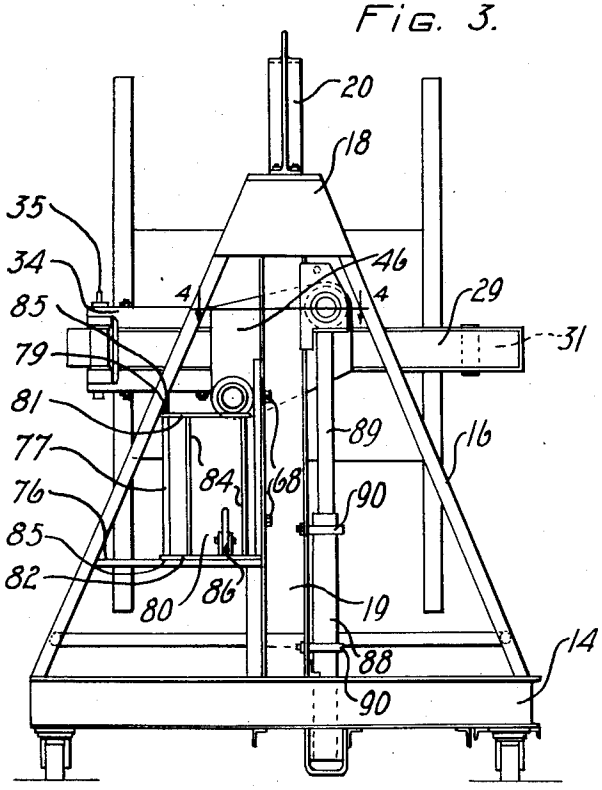


Fig. 3.



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Fig. 5.

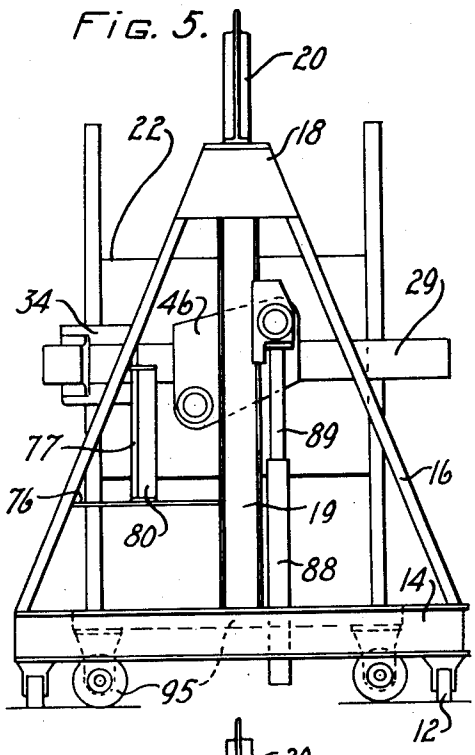


Fig. 6.

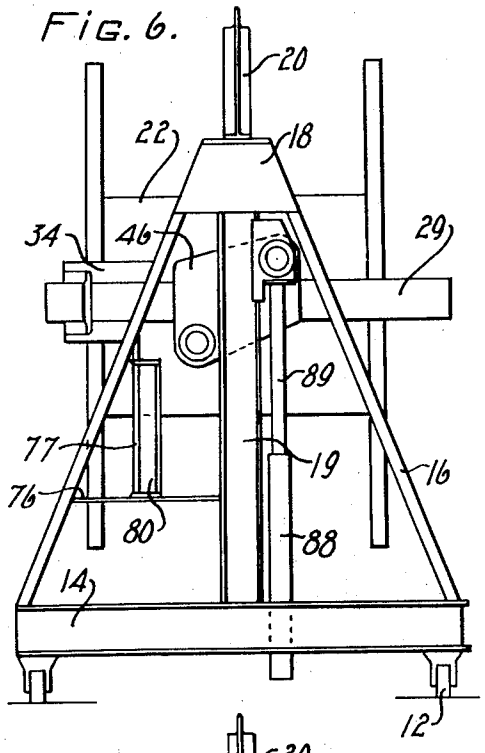


Fig. 7.

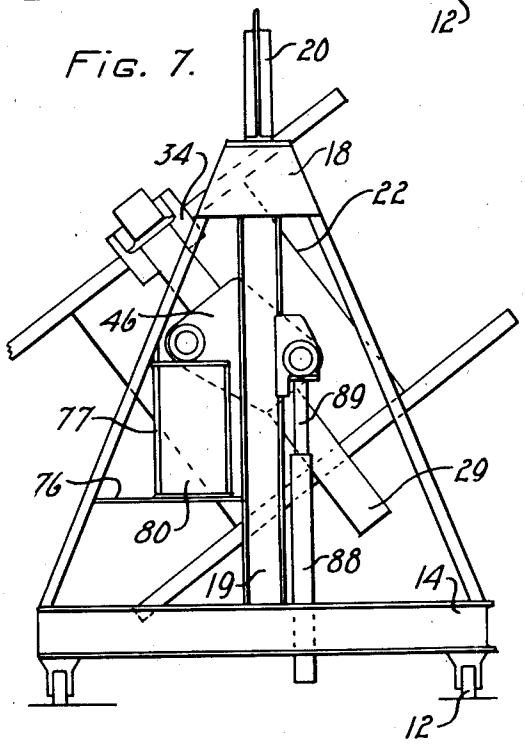
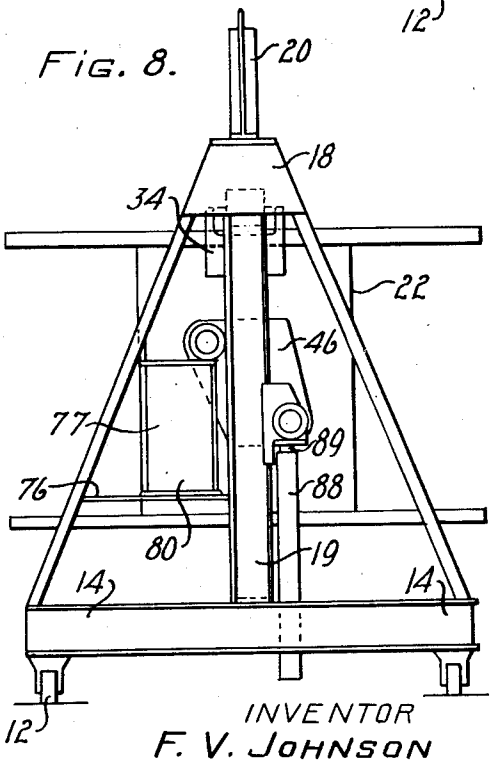


Fig. 8.



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UNITED STATES PATENT OFFICE

1,939,055

APPARATUS FOR HANDLING MATERIAL

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Application February 24, 1931. Serial No. 517,648

11 Claims. (Cl. 242—90)

This invention relates to an apparatus for handling material and more particularly to apparatus for handling heavy material such as reeled cable.

In the manufacture of lead sheathed cable of the type used for the subterranean transmission of intelligence electrically, the sheath is applied to the cable core by passing the latter through a lead extruding press, the cable core having been formed previously by stranding together the desired number of individual conductors. In order to derive a satisfactory sheathing the core should be supplied to the extruding press at a constant speed, a desideratum which may not be readily obtained if the core is supplied from a reel rotating vertically. Since the core at the stranding operation is stored upon a take-up reel rotating vertically, it is desirable that the disposition of the axis of the reel be altered from the horizontal to the vertical in order to permit the reel to rotate horizontally when the core is fed to the press.

An object of the invention is to provide a sturdy, efficient and safe apparatus for handling material.

The above object may be attained by use of a cradle wherein a heavy loaded take-up reel is engaged with its axis in a horizontal position. By lifting the reel within the cradle and revolving it through an angle of 90°, facile and efficient handling of the heavy reel is made possible and movement of the core to the press at a constant speed is facilitated. Specifically, in one embodiment of the invention, the cradle is provided with a vertically movable carriage in which the reel, with its axis extending horizontally, is locked. Hydraulic plungers raise the carriage vertically above the top of a gate which is then closed beneath the carriage. The carriage is lowered, encounters the gate and revolves so that the axis of the reel becomes vertical.

A clear understanding of the invention will be had by referring to the following detailed description, read in connection with the accompanying drawings forming a part thereof, in which

Fig. 1 is a diagrammatic plan view of a cable core reel handling cradle, the reel being shown empty for convenience;

Fig. 2 is a diagrammatic front elevational view thereof;

Fig. 3 is a diagrammatic end elevation thereof;

Fig. 4 is an enlarged fragmentary section taken on the line 4—4 of Fig. 3 showing details of the roller construction at one end of the cradle, it being understood that the construction at the opposite end is correspondingly similar, and

Figs. 5 to 8 inclusive indicate schematically the progressive functioning of the cradle in altering the axial disposition of the reel from horizontal to vertical.

Referring to the drawings, wherein similar parts are indicated by identical reference numerals, a substantially rectangular cable core reel cradle, generally designated by the numeral 10, comprises a rigid frame 11 mounted upon corner rollers 12, 12 (Fig. 2). The frame includes a pair of horizontal oppositely disposed channel or I members 14—14, comprising the base ends of the cradle, and a horizontal channel or I member 15 (Fig. 2) which is longer than the end members 14 and rigidly interconnected therewith at the back of the cradle, the connection being strengthened at each end by diagonal braces 17—17. An upright member 16 is secured at each end of each end I member 14, the two upright members 16—16 on each end member being brought together at their upper extremities (Figs. 1 and 3) and bolted or otherwise suitably secured to a double gusset plate 18 in order to form triangular end braces or trusses at opposite ends of the cradle. A vertical guide member 19, which may be in the form of an I beam, is bolted or otherwise suitably secured within the gusset plate 18 at each end of the cradle and extends to the corresponding end member 14 therebeneath, to which it is rigidly secured in any suitable manner. The opposite end trusses are interconnected at the top with a channel spacer 20, which is bolted or otherwise suitably secured at either end to the gusset plates 18—18. The connection between the inclined uprights 16—16 and each end I member 14 is braced by an angle plate 21 (Fig. 2) which is bolted or otherwise suitably secured thereto.

As will be observed in Fig. 2 the overhead spacer 20 is curved upwardly in the center to provide clearance for a reel 22 to be accommodated within the cradle. The reel 22 in the particular embodiment is of a conventional relatively heavy steel construction comprising oppositely disposed heads 23—23 which are interconnected by a cylindrical steel drum 24. An outwardly projecting hub 26 is affixed to each reel head axially of the reel for the purpose of facilitating handling of the reel, in a manner to be hereinafter explained.

Mechanism for handling of the reel within the cradle comprises a pivoted carriage 27, including oppositely disposed parallel end beams 28 (right) and 29 (left) which are suitably rigidly connected at the rear of the cradle by a connecting beam 31. A pair of plates 34 secured upon the upper and lower surfaces, respectively, of the right end beam 28 project from the front end thereof and are connected by a vertically extending pin 35. A bar 36 is pivotally mounted at one end upon the pin 35 and forms a gate for the carriage. A pair of plates 39 secured upon the upper and lower surfaces respectively of the end beam 29 project from the front end thereof

and are fitted with a detachable vertically extending locking pin 40. The gate 36 is provided at the end adjacent the beam 29 with a perforated fitting 38 for receiving the locking pin 40 when the gate is closed in the position shown. The rear connecting beam 31 of the carriage is provided centrally thereof with an aperture 42 in which is affixed a frontwardly projecting cup 43. A rearwardly projecting cup 45 is secured upon the inner surface of the gate 36 opposite the cup 43, and axially aligned therewith in order to permit, when the reel 22 is placed therebetween, that one of the axially disposed hubs 26 of the reel will be engaged in each of the cups 43 and 45.

A mechanism for controlling the pivoting of the carriage 27 comprises a pair of balance blocks 46—46 (Figs. 3 and 4), one each of which is applied to each of the end beams 28 and 29 axially of the carriage. It will be understood that the balance blocks 46—46 are identical, one being shown in Fig. 4, wherein it will be observed that the block includes a pair of parallel substantially rectangular plates 47—47. The plates 47 are placed on opposite sides of the end beam 28 of the carriage and are aligned horizontally. Each plate is provided with two apertures 49—49, the plates being so positioned with respect to the end beam 28 that the apertures 49 at one end of each plate shall be respectively axially aligned above the beam 28 and the apertures at the other end of each plate shall be respectively axially aligned below the beam 28. A sleeve 50 extends through apertures 49 of the plates above the beam and is welded or otherwise suitably secured therein so as to secure the plates 47—47 together. A similar sleeve 51 extends through the apertures 49 at the other end of the plate, being welded or otherwise suitably secured therein and extending below the end beam 28. When this construction is employed it will be noted that the balance block 46 becomes an integral unit located at the center of the carriage, so that the axis of the balance block coincides with the axis of the carriage. It will be understood that the same method of construction is employed in assembling the balance block on the opposite end beam 29.

A shaft 53 extends through the sleeve 50, being keyed therein against relative rotation, and is provided at its outer end with a roller 54 which is provided with a tire or suitable wear-resistant surface 55. The shaft 53 projects beyond the sleeve 50 a sufficient distance to permit the roller 54 or the surface 55 thereof to coincide with and engage a rearward face 56 of the vertical I beam guide 19. The roller 54 projects beyond the tire 55, being provided at each end with a peripheral recess 57 upon each of which rides an angle plate 58. As will be observed in Fig. 4 each angle plate projects behind the face 56 of the I beam 19 to slidingly engage a shim 59 which is secured to the inner face thereof, one on each side of the stem of the I beam. It will be understood that the surface of each shim contacting with the flange of the angle plate is machined so as to provide a smooth and vertically true guide for the angle plates. Within the roller 54 the shaft 53 is provided with a peripheral groove 60 which connects with a central pass 61. A lubricating feed cap 62 is fitted to the outer face of the shaft and communicates with the pass 61 in order to permit oiling of the roller. In order to maintain the roller and flange plates 58—58 in proper position thereon, the shaft 53 is provided at its outer end with an upturned bead or retaining rim 63. The outer edge of the roller 54 projects beyond the outer angle plate 58 and is externally threaded to receive a pair of threaded lock nuts 65—65.

A smooth vertical strip 66 is adjustably mounted on a forward face 67 of the vertical guide beam 19 by a pair of adjusting bolts 68—68 (Fig. 3), in order to form a true bearing surface therefor. A shaft 70 extends through the sleeve 51 being suitably keyed therein against relative rotation and is provided at the outer end thereof and in alignment with the vertical guide beam 19 with a roller 71 which is freely rotatable about the shaft 70. Within the roller the shaft is provided with a peripheral slot 72 with which communicates an oil pass 73 leading to the outer end of the shaft whereat a lubricating feed cap 75 is fitted for oiling the roller.

In the lower part of each triangular truss toward the front of the cradle a cross-piece 76 is provided, being secured at one end in the front inclined upright 16 and at the other end in the face 67 of the vertical guide beam 19. A bar 77 is secured at the bottom in each cross-piece 76 extending vertically upward, and is secured at the top to the front upright 16 at 79. A rectangular gate 80, comprising a smooth-surfaced upper cross-piece 81 and a parallel lower cross-piece 82 interconnected by vertically extending supporting beams 84—84 is pivotally mounted upon each bar 77, the upper and lower cross-pieces 81 and 82 being apertured at aligned points 85—85 in order to receive the bar 77. A latch 86 is secured upon the lower cross-piece 82 of each gate 80 and adapted to engage the cross-pieces 76 on each end of the cradle when desired.

At each end of the cradle a vertically extending hydraulic cylinder 88 and a cooperating piston rod 89 is provided, the cylinder being rigidly secured to the vertical guide beam 19 by a plurality of ring clamps 90—90. At one end of the cradle (Figs. 1 and 2) a platform 91 projects, the platform being rigidly secured in any suitable manner to the cradle and mounting a motor 92 for driving a pump 93. The motor and pump may be of any types desired and may be connected to both of the cylinders 88—88 through suitable piping and valves (not shown) to constitute a source of power for operating the pistons 89—89 in unison.

Although the apparatus described is fully functionable with loaded or unloaded reels, its operation will here be described as with a loaded reel, a showing of the cable loaded thereon having been omitted from the drawings for clarity. In operating the above described apparatus, the gate 36 is opened and a reel 22, the axis thereof extending horizontally, is conveyed into the center of the carriage upon a dolly or truck 95, (Fig. 5) or any other suitable means of conveyance. The reel is positioned so that the hub 26 on one head thereof engages with the cup 43 on the connecting beam 31 of the carrier. The gate 36 is then closed by connecting the pin 40 in the perforated fitting 38 of the gate, thus locking the hub 26 of the opposite head within the cup 45 of the gate. When the gate 36 is thus locked the reel is securely held within the carriage 27 and is free to rotate axially upon its hubs 26—26; and to be revolved in a plane different from the plane in which its axis lies by rotating the carriage with respect to the frame.

As pointed out above, a lead sheath of uniform size and constant properties is best obtained when

the cable is supplied to a lead extruding press (not shown) at a constant speed, and in order to conveniently obtain this factor the reel should rotate horizontally about a vertically extending axis. Such transpositioning of the reel is accomplished by actuating the motor 92 and the pump 93 to lift the reel from the truck 95 or from the relative position shown in Fig. 5, wherein it will be noted that the reel 22 has been locked within the gate 36 while yet resting on the truck 95; and that the gate 80 is swung outwardly to an inoperative position. The cylinders 88—88 at each end of the frame are charged with fluid under pressure, the pressure quantities being equivalent at both cylinders so that the pistons 89—89 are raised equal amounts to lift the carrier vertically upward and hoist the reel, with its axis remaining horizontal, upwardly in a predetermined path from the truck 95, which may then be removed.

It will be noted (Figs. 3 and 5 to 8 inclusive) that the piston 89 bears against the lower surface of the sleeve 50 between the outer plate 47 of the balance block and the inner angle plate 58, thus leaving the roller 54 free to revolve against the face 56 of the I beam 19 to minimize friction during the upward movement, and the flanges of the angle plates 58—58 engage the smooth outer surfaces of the shims 59—59 being carried upwardly thereon with a minimum of friction. During this movement the flanges act to maintain the roller surface 55 in continual contact with the surface 56 of the I beam and guide the carrier vertically upwardly without jamming. The upward movement of the carrier is permitted to continue until the carriage attains the position shown in Fig. 6 wherein it will be noted that the roller 71 is carried higher than the top of the smooth upper cross-piece 81 of gate 80. Each gate 80 is then rotated 90° toward the end truss as shown in Fig. 7 and latched in position in any suitable manner, thus causing one of the gates to extend directly across the downward return path of a roller 71 at each side of the cradle.

In the operations thus far described, it will be noted that the dominant upward pressure exerted by the rod 89 is directed to the rear of the axis of the carriage, a tendency being therefore existent to rotate the carriage in a counter-clockwise direction, as viewed in Figs. 5 to 8. Since no obstruction lies in the upward path of the roller 71 which would tend to interfere with its free movement along the guide bar 66 and since the roller 54 is freely and smoothly rotatable along the face 56 of the guide beam, said tendency of the carriage to rotate in a clockwise direction does not become effective.

When the gate 80 is locked in position beneath the roller 71 the pressure is released in the cylinders 88—88, the pistons are permitted to descend by reason of the weight of the reel and cradle, the remaining pressures of the cylinders 88—88 however being controlled to insure that the downward movement shall be exactly the same at one end of the carriage as at the other and not too rapid. In descending, the roller 71 comes in contact with the gate 80. Due to the fact that the flange plates 58—58 closely engage the shims 59—59 behind the face 56 of the I beam the roller 54 is not permitted to move away from the surface of the I beam and the continued descent of the pistons causes the roller 71 to roll to the left (Fig. 7) upon the smooth upper surface 81 of the gate, causing the axis of the carriage to move from its former vertical plane and toward the left and rotating the carriage in a clockwise direction. It will be noted in Figs. 6 and 7 that this movement causes the shaft 53 to alter its position with respect to shaft 70 from thereabove at an angle of 45° from the horizontal (Fig. 6) to zero, the axes of the shafts lying substantially in a horizontal plane when the downward movement is approximately half completed. Continuation of the downward movement of the pistons causes the roller 71 to be retracted along the top of the gate to the right until it comes to rest once more against the adjusting bar 66, this movement being concomitant with the continued vertically downward movement of the roller 54 and the completion of the revolution of the reel through the angle of 90° whereupon the axis thereof extends vertically. The entire frame may then be moved on the rollers 12, 12 to proximity with the lead extruding press referred to and the cable drawn therefrom in any desired manner. By reason of the fact that the reel now rotates horizontally or about a vertical axis, removal of the cable from the reel at a constant speed is feasible.

When the reel is empty, the operation described above may be reversed. The pressure is increased within the cylinders 88 to raise the pistons 89, causing the roller 71 to move to the left across the gate as the roller 54 approaches the horizontal with respect to the roller 71, the roller 71 reversing its travel and moving to the right as the roller 54 is carried above to the position shown in Fig. 6, wherein it will be noted that the carriage has been revolved 90° in a counter-clockwise direction and the axis of the reel restored to the horizontal, the distance moved upwardly slightly to remove the pressure of the roller 71 upon the top of the gate 80 which is then unlatched and swung outwardly. The gate being thus withdrawn from its path, the roller 71 upon release of the pressure in the cylinders rolls along the face of the adjusting bar 66. The truck 95 may be again inserted into the frame and the reel allowed to come to rest thereon by completion of the downward movement of the carriage. The gate 36 is then unlatched by removing the pin 40 and rotated about the pin 35 to permit removal of the reel and truck 95 from the frame. Apparatus, as described above, has been found efficient in a high degree in handling heavy reels carrying large quantities of heavy cables, and no reason is seen why it should not be readily adaptable for the handling of lighter reels and smaller cable or for the handling and discharge of any material which may be best accomplished by rotating it through an arc. The shims 59—59 and the adjusting bar 66, with its associated attaching members 68, have been found efficacious in determining the vertical course of the roller 54 and clamp plates 58—58 along the vertical guide beam 19 without freezing or jamming thereon, in order that movement of the reel in its predetermined path may be facilitated.

The foregoing description concerns an embodiment of the invention which has been found highly satisfactory in the environment in which it has been used; however, it is believed to be apparent that numerous departures may be made in the construction shown and described without departing from the essence of the invention and that same should be limited only by the scope of the appended claims.

What is claimed is:

1. In an apparatus for handling reels, a car-

riage for receiving the reel, stationary vertical guide members at either end of the carriage, a balance block vertically movable along each of the guide members, the carriage being mounted in the balance blocks, and means engaging the balance block during its vertical movement to rotate the reel.

2. In an apparatus for handling loaded cable core reels, a rigid frame, oppositely disposed triangular end portions thereon, a central spacer for bracing the end portions, a channel guide extending between the apex of each triangular portion and the base thereof, a movable carriage between the end portions for holding a reel, a guide block at each end of the carriage, a roller at each of two diametrically opposed corners of the block adapted when the carriage is in a horizontal position to engage between them the channel guide, a vertically movable member on the block and engaging the channel guide for maintaining one of said rollers in engagement with the channel guide, means for lifting the carriage while in the horizontal position, a gate pivotally mounted on the end portions adjacent the block and adapted to be swung beneath the free roller when said roller has been lifted thereabove and a horizontal portion on the gate for causing horizontal movement of the free roller thereon upon lowering of the carriage to tilt the carriage.

3. In an apparatus for handling material, a frame having a plurality of vertical guides, a carriage, a reel rotatably mounted therein, a plurality of supports each having one end secured to the carriage and an opposite end engaging one of the vertical guides, pivotal means affixed to the frame for engaging one end of one support after a predetermined vertical movement of the carriage to move that end of the support in a horizontal plane while the other end of the support moves in a vertical plane to rotate the carriage, and an actuating means for moving the carriage on the vertical guides.

4. In an apparatus for handling reels, a carriage, means on the carriage for mounting a reel therein so as to be rotatable upon its own axis, a gate, vertically reciprocable means to raise the carriage above the gate and to lower the carriage into contact with the gate, and pivotal means actuated by the lowering of the carriage in contact with the gate to rotate the reel about an axis intersecting its own axis.

5. In an apparatus for handling material, a reciprocable material supporting means, a plurality of guide members therefor, means to confine one of the members to a single path during the entire motion thereof, means to guide a second member in a path substantially parallel to the path of the first named member while the supporting means is moving in one direction of its motion, means to guide the second member in a divergent path while the supporting means is moving in the other direction of its motion, and means to reciprocate the supporting means.

6. In an apparatus for handling material, a reciprocable material supporting means, a plurality of guide members therefor, means to confine one of the members to a straight path during the entire motion thereof, means to guide a second member in a path parallel to the path of the first named member while the supporting means is moving in one direction of its motion, means to guide the second member in a path parts of which are divergent from the path of the first named member while the supporting means is moving in the other direction of its motion, and means to reciprocate the supporting means.

7. In an apparatus for handling reels, a frame, a reel supporting cradle mounted for reciprocative and rotative motion therein, a plurality of guide members on the cradle, guide means on the frame coacting with a first member to guide the member in a straight path during the entire motion thereof, second guide means on the frame coacting with a second guide member to guide the second member during one part of the motion thereof in a path divergent from the path of the first member whereby the cradle is rotated, and means to reciprocate the cradle.

8. In an apparatus for handling reels, a frame, a reel supporting cradle mounted for reciprocative and rotative motion therein, a plurality of guide members on the cradle, guide means on the frame coacting with a first member to guide the member in a straight path during the entire motion thereof, second guide means on the frame coacting with a second guide member to guide the second member during one part of the motion thereof in a path parallel to the path of the first member, third guide means on the frame coacting with the second guide member during another portion of the motion thereof to guide the second member in a path divergent from the path of the first guide member, and means to reciprocate the cradle.

9. In an apparatus for supporting reels, a frame, cradle supporting means mounted in the frame for reciprocation therein, means to reciprocate the supporting means, a cradle for holding a reel rotatably supported in the supporting means, a first guide member on the supporting means and first guide means on the frame coacting therewith to guide the supporting means during the entire reciprocation thereof, a second guide member on the cradle, second guide means on the frame to guide the second guide member in a path parallel to the path of the first guide member during the motion of the supporting means in one direction, adjustable third guide means on the frame interposable into the path of the second guide member to guide the same in a path divergent from the path of the first guide member during the motion of the supporting means in the other direction.

10. In an apparatus for supporting reels, a frame, a pair of spaced guide means thereon, a slide member reciprocably mounted on each guide means, a cradle for holding reels rotatably mounted in the two slide members for reciprocation therewith, a guide member on the cradle outside of the axis of rotation thereof, and means mounted on the frame and adjustable into and out of the path of the guide member and adapted when in the path thereof to divert the same into a path divergent from the path of the slide members.

11. In a reel handling apparatus, a pivotally mounted carriage, means for mounting a reel in the carriage with the axis of the reel lying at an angle to the axis of the carriage, a gate, and means for moving the carriage above the gate and for lowering the carriage into contact with the gate to rotate the carriage and revolve the reel upon the axis of the carriage.

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