April 15, 1969 J. E. FAWELL 3,438,510

WHEEL HANDLING APPARATUS

Filed Sept. 26, 1967 Sheet 1 of 5

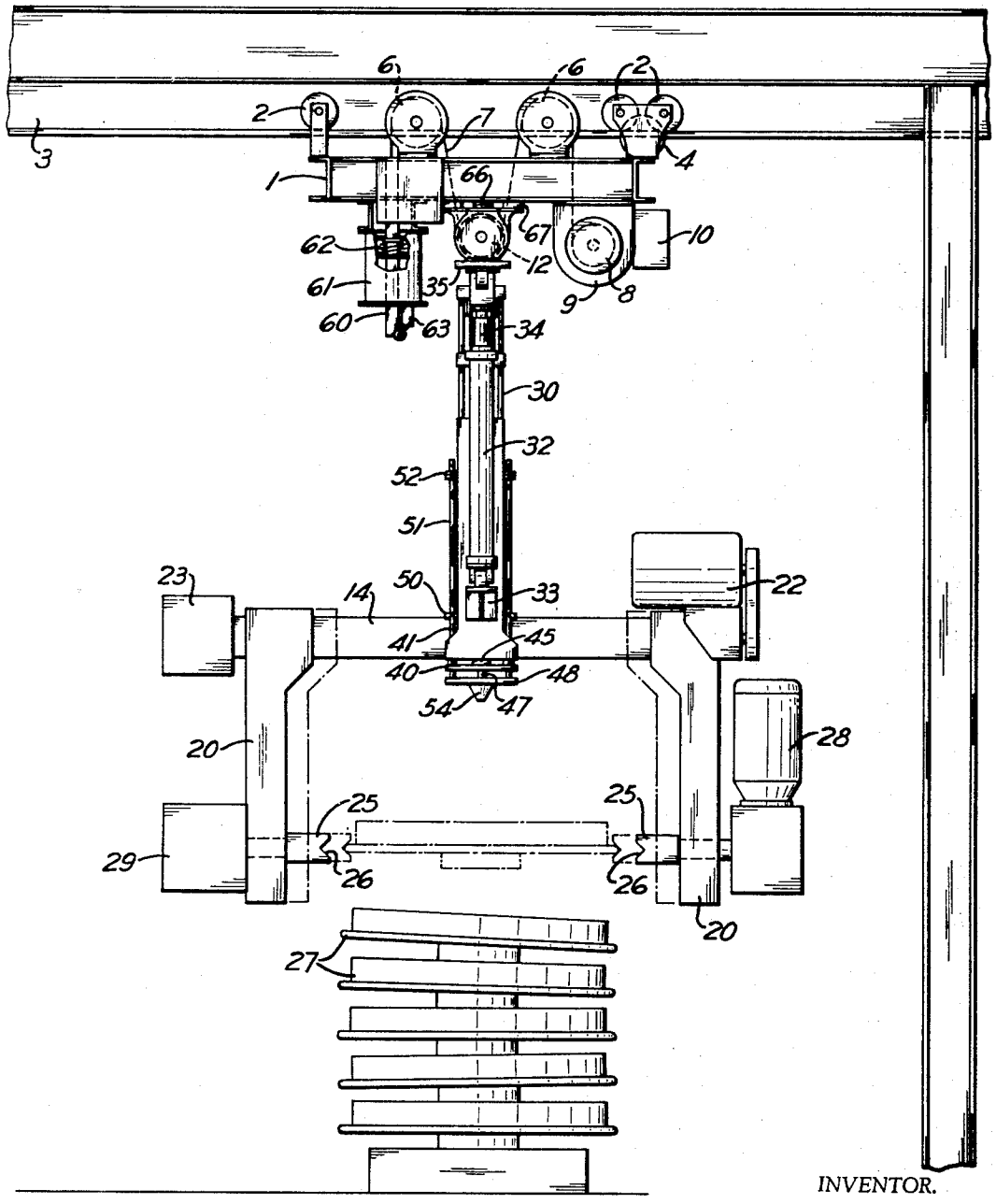

Fig. 1

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WHEEL HANDLING APPARATUS

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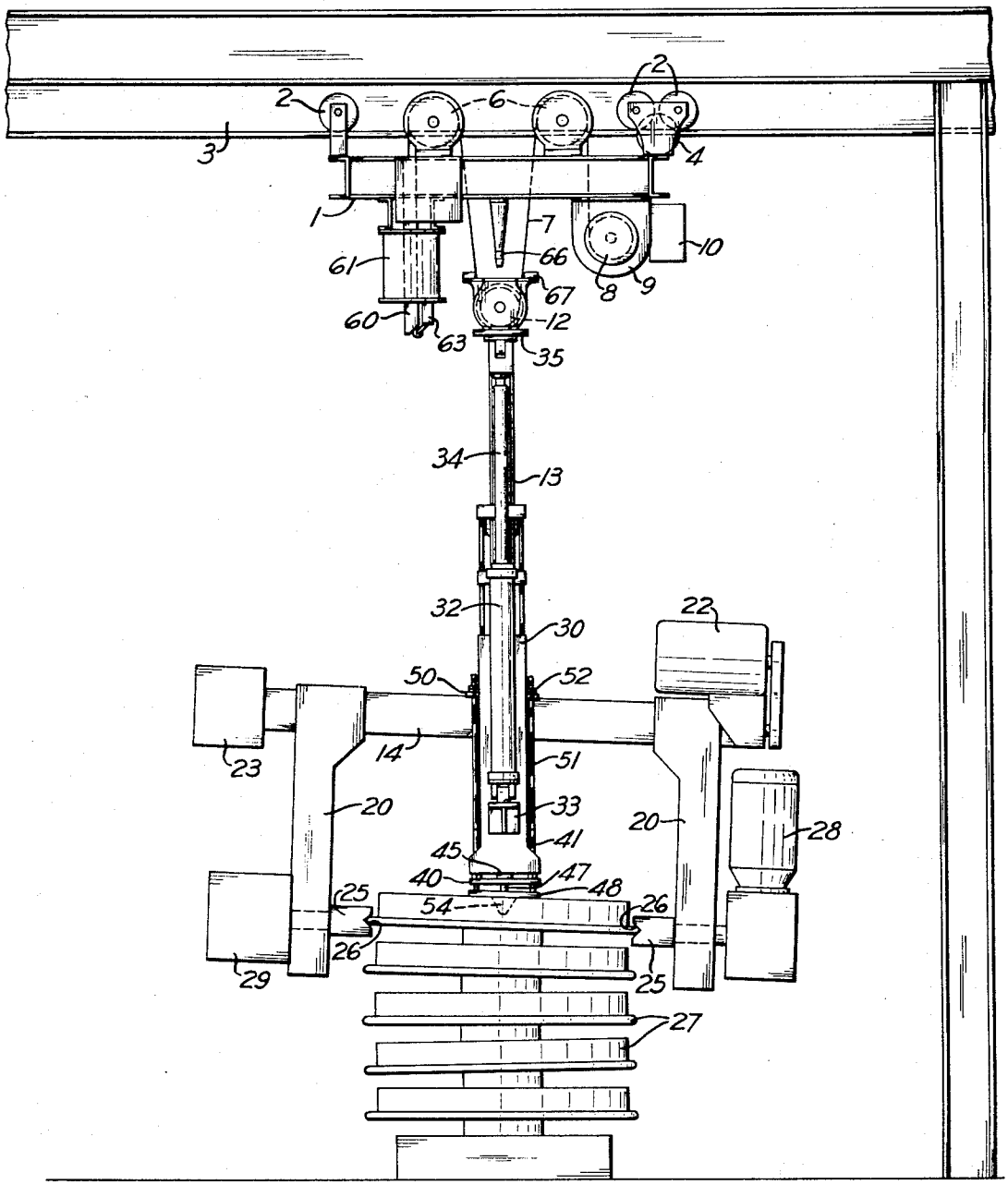

Fig. 2

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WHEEL HANDLING APPARATUS

Filed Sept. 26, 1967 Sheet 3 of 5

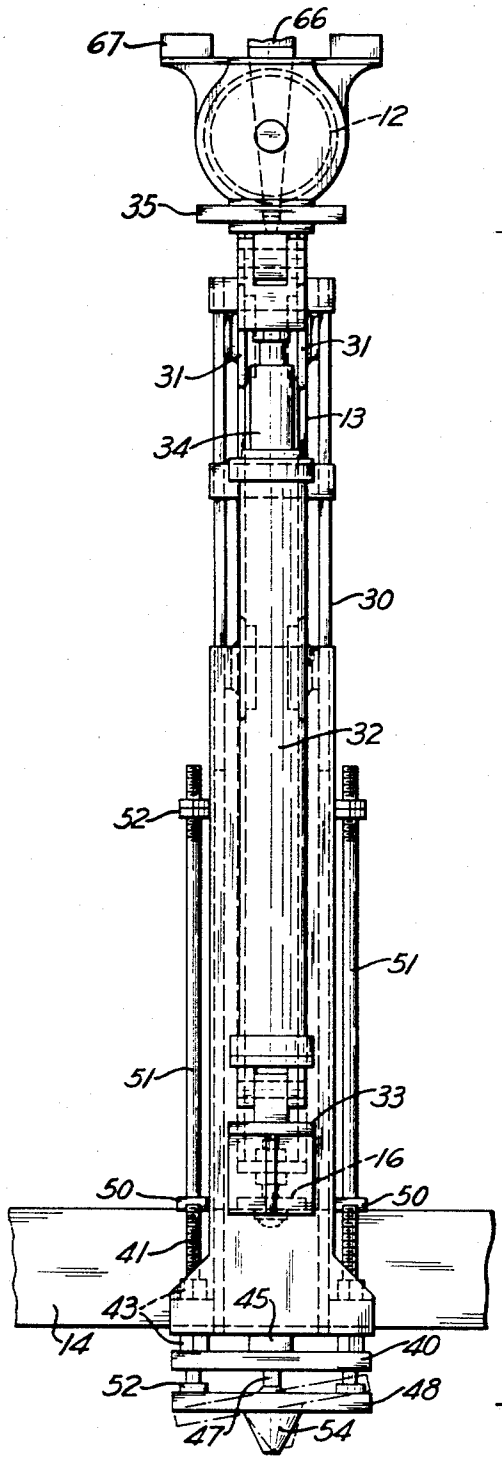

Fig. 3

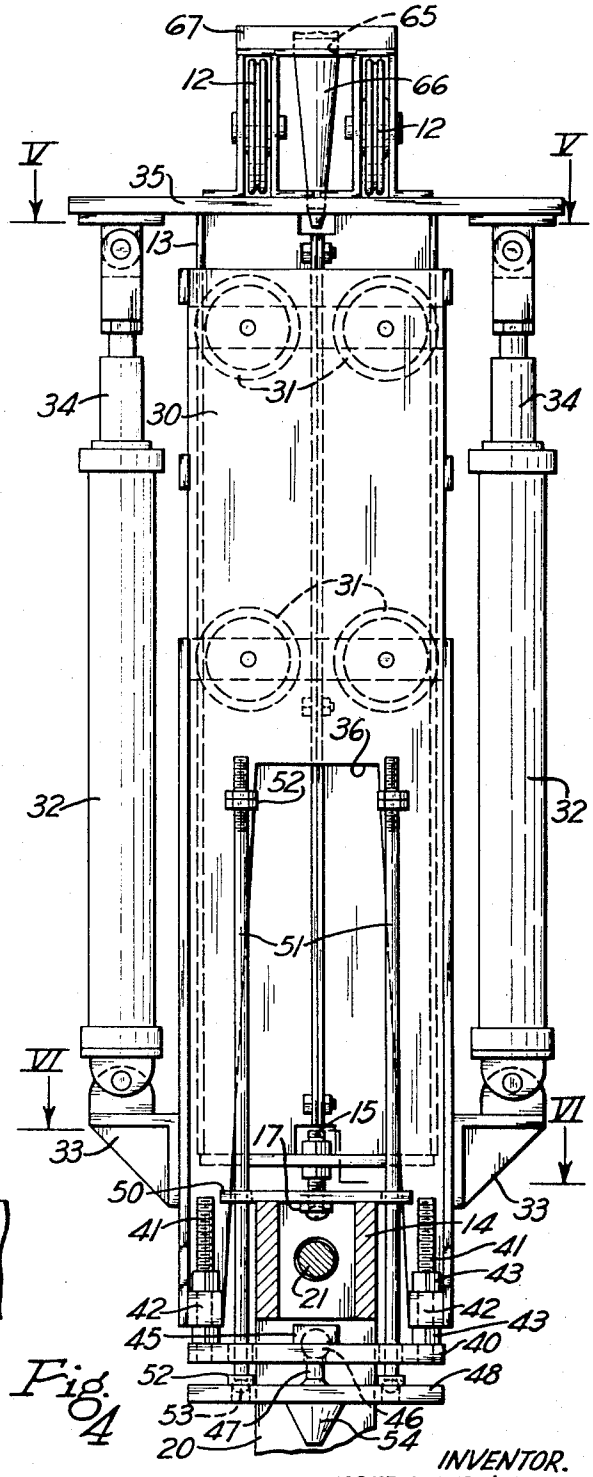

Fig. 4

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WHEEL HANDLING APPARATUS

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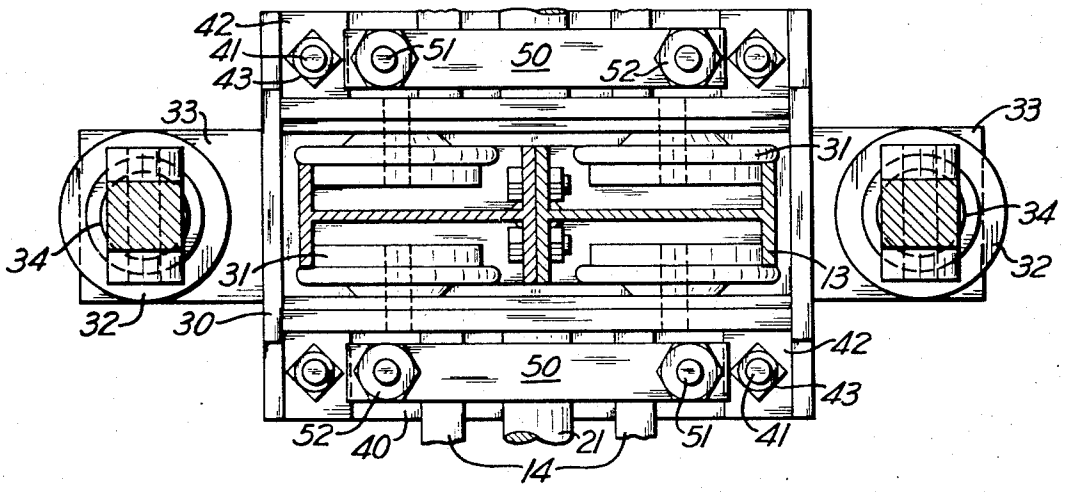

Fig. 5

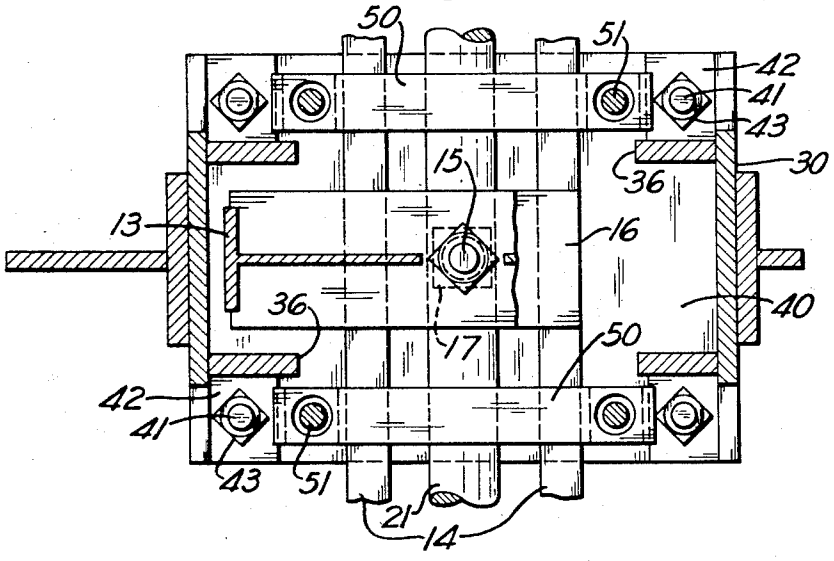

Fig. 6

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April 15, 1969 J. E. FAWELL 3,438,510

WHEEL HANDLING APPARATUS

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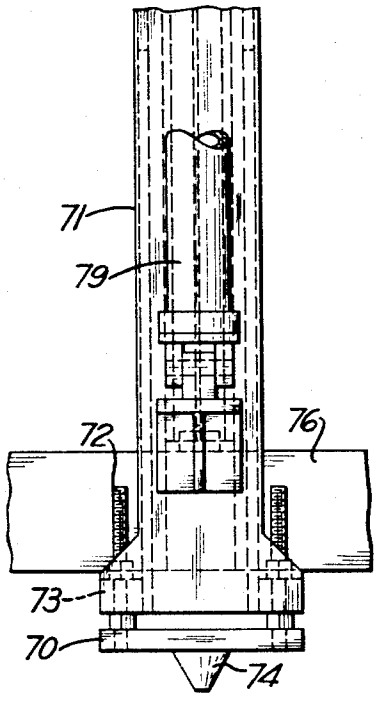

Fig. 7

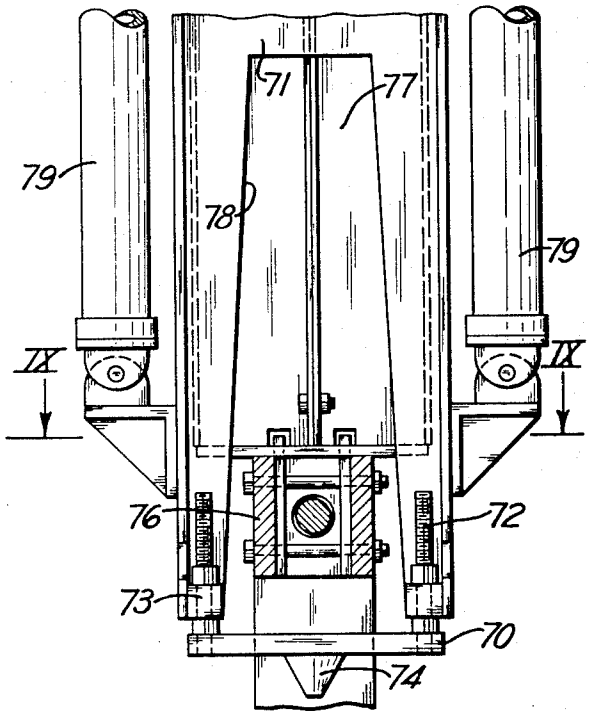

Fig. 8

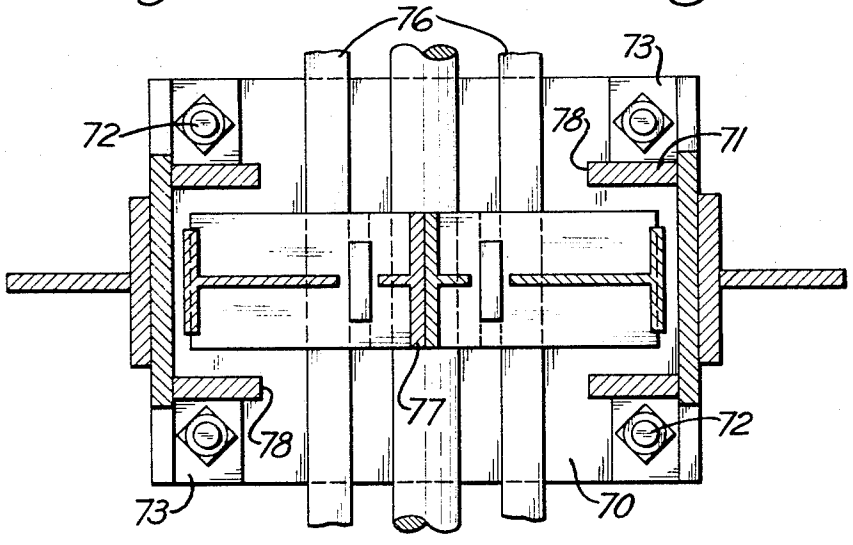

Fig. 9

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United States Patent Office 3,438,510 Patented Apr. 15, 1969

3,438,510

WHEEL HANDLING APPARATUS

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Int. Cl. B66c 19/00, 1/10
U.S. Cl. 212—128 14 Claims

ABSTRACT OF THE DISCLOSURE

A mast is suspended from a cable hanging from a traveling crane frame on which there is a hoist for lowering and raising the cable. A wheel grab is carried by the lower end of the mast. The mast also carries a grab-positioning member, which can be moved down the mast and the grab a predetermined distance for engaging the top of a reclining wheel when the descending mast lowers the grab to wheel-gripping level. Means are provided for stopping the descending mast when the positioning member is stopped by contact with a wheel.

In the manufacture of railroad car wheels the present practice is to transport the wheels as they leave the flange finishing department to a location where they are stacked in piles. A machine inverts the piles of wheels, which are then taken to a combination hub finishing and boring machine. An operator feeds the wheels manually to this machine with the help of a conventional monorail crane. No provision is made for removing the chips formed during boring and hub finishing. The necessarily slow manual feeding of the wheels to the hub finishing and boring machine has prevented operation of that machine at full capacity.

It is among the objects of this invention to provide apparatus for handling wheels during their manufacture, which is much faster than the apparatus now in use, which eliminates some manual steps, which is dependable in operation, and in which the mast is not subjected to severe lateral strain.

The invention is illustrated in the accompanying drawings, in which

FIG. 1 is a side view showing the apparatus in its upper position;

FIG. 2 is a side view showing the apparatus lowered to pick up a wheel;

FIG. 3 is an enlarged fragmentary side view of the apparatus;

FIG. 4 is a view turned 90° from FIG. 3;

FIGS. 5 and 6 are enlarged horizontal cross sections taken on the lines V—V and VI—VI, respectively, of FIG. 4;

FIGS. 7 and 8 are fragmentary views, similar to FIGS. 3 and 4, of a modification; and

FIG. 9 is an enlarged horizontal cross section taken on the line IX—IX of FIG. 8.

Referring to FIG. 1 of the drawings, the rectangular frame **1** of a traveling crane has wheels **2** supporting it from an overhead track 3. The wheels may be driven by an electric motor 4 mounted on the frame. Supported at the top of the frame between its center and its opposite ends are vertical sheaves 6. Preferably there are two parallel sheaves in each location so that two parallel hoisting cables 7 can be used for greater hoisting capacity. These cables are attached at one end to a hoist 8 suspended from one end of the frame and driven by a reversible electric motor 9 operated by a suitable well-known controller 10, by which the drum can be rotated in either direction. The cables are dead ended at their opposite end in a manner that will be described presently.

Between the two sets of sheaves on the traveling frame

the cables hang down below it and support a third pair of sheaves **12** mounted on the upper end of a mast **13** that is several feet tall. This mast may be formed in different ways, one way being to join two vertical I-beams together side by side with their webs in the same plane as shown in FIGS. 4 and 5. Supported by the lower end of this mast is the central portion of the horizontal beam **14** of a conventional wheel grab. As shown in FIG. 4, the beam is supported by a stud **15** rigidly mounted in the lower end of the mast and extending through an enlarged hole in a plate **16** (FIGS. 3 and 6) welded to the top of the beam. The lower end of the stud has a spherical head that fits in a socket **17** secured to the bottom of the plate, whereby the beam can be tilted in all directions.

Suspended from beam **14** at opposite sides of the mast are legs **20** that can be moved toward and away from each other by a feed screw **21** (FIGS. 4 and 6) journaled in the beam and driven by a driving unit **22** mounted on one end of the beam. The weight of this unit is counterbalanced by a counterweight **23** attached to the opposite end of the beam. Near its lower end, each leg supports an inwardly projecting wheel grip **25** provided with a notch **26** for receiving the flange of a reclining railroad car wheel **27**. Both of these grips are rotatably mounted on a horizontal axis in the adjoining legs, and one of the grips can be turned when desired by means of a motor **28** operatively connected with it and supported by the adjoining leg. A wheel clamped between the grips therefore can be turned over. If the motor is at the same end of the grab as driving unit **22**, it can be balanced by a counterweight **29** on the other leg.

If the apparatus described this far were to be used to pick up wheels, great care would have to be exercised to make sure that the wheel grab grips are lowered to exactly the correct level for gripping a wheel flange and that they are positioned substantially equidistant from the center of the wheel. Also, the grab would have to be tilted by a separate operation if the wheel is not resting level. By the use of this invention, however, the grips will be automatically centered relative to a wheel and located at the correct level and in the right position.

Accordingly, a vertically movable grab-positioning member is carried by the mast. This member preferably includes a sleeve **30** that surrounds the mast and that can slide up and down it. For easy operation, the side of the sleeve may be provided with two vertically spaced sets of wheels **31** that roll on the side flanges of the mast. The sleeve normally is held in an upper position on the mast by means of a pair of vertical pneumatic cylinders **32**. These cylinders are connected at their lower ends to brackets **33** projecting from the opposite sides of the lower portion of the sleeve. The piston rods **34** that extend out of the upper ends of the cylinders are connected to the overlying ends of a plate **35** that forms the top of the mast and supports the sheaves **12**. Air pressure admitted to the cylinders above the pistons therein normally holds the cylinders in their upper positions on the piston rods. As shown in FIG. 4, the sides of the sleeve between the brackets are provided with upwardly extending slots **36** so that the lower portion of the raised sleeve can straddle the wheel grab beam and project a short distance below it.

The bottom of the grab-positioning member is formed by a flat base plate **40** that has threaded studs **41** extending upwardly from its four corners and slidable through lugs **42** projecting from the four corners of sleeve **30**. Nuts **43** screwed on these studs above and below the lugs permit the plate to be adjusted vertically. The center of the base plate is provided with an opening, the upper end of which forms the lower half of a spherical socket, the upper half of which is formed by a recessed block **45** welded to the top of the plate. This socket contains a ball **46** on the upper end of a short stem **47** that con-

nects it to the top of a sensor plate **48** a short distance below the base plate. The stem is somewhat smaller than the base plate opening so that the stem can tilt therein. The swivel thus formed permits the sensor plate to tilt in all directions relative to the base plate.

Near the opposite sides of the sleeve a pair of cross bars **50** are welded to the top of the grab beam and project from its opposite sides. The projecting ends of these bars are provided with holes that loosely receive long vertical rods **51**. The upper ends of the rods are threaded and carry lock nuts **52**. The rods extend down through enlarged holes through base plate **40** and also through blocks **52** welded to the top of the sensor plate around openings in that plate. The bottoms of these blocks are provided with spherical sockets that receive spherical heads **53** on the lower ends of the rods. A tapered pin or cone **54** extends downwardly from the center of the sensor plate for insertion in the axial bore of a wheel.

The crane described thus far is used for removing railroad wheels, one at a time, from a pile formed from wheels taken from a flange finishing machine. One or more of the reclining wheels in each pile may be tilted slightly due to the outer end face of the hub not yet having been machined perpendicular to the axis of the wheel, but this will not interfere with the operation of the crane as will be seen later.

The crane is run along the overhead track to a predetermined point where the mast **30** is directly over the center of the pile of wheels. Then the cables are paid out by hoist **8** to allow the mast to start descending. At about the same time the air pressure in vertical cylinders **32** is reversed so that the grab-positioning member is moved rapidly downward on the mast until stopped by the lock nuts on the upper ends of rods **51** engaging the top of the cross bars **50** on the horizontal grab beam. The mast and positioning member continue their descent together until the latter is stopped by engagement of sensor plate **48** with the top wheel on the pile after the centering cone **54** has entered the bore through the wheel. At substantially the same time descent of the mast and grab are stopped by means that will be described presently.

Assuming that the top wheel is horizontal, contrary to the way it is shown in FIGS. 1 and 2, the sensor plate will come down flat against it. As the grab-positioning member descends rather rapidly, it will strike the top wheel with considerable force. Nevertheless, this will not damage the grab because the air cylinders will act as shock absorbers which will allow the mast and grab to continue their downward movement a short distance as the air in the cylinders is compressed. Then the air pressure in the cylinders will force the grab upwardly again until its cross bars **50** engage the lock nuts on rods **51**. This will locate the grips **25** of the grab at the proper level for moving in to receive the wheel flange.

As soon as the downward movement of the grab-positioning member is arrested by the pile of wheels, part of the load on the hoist cables is removed and this condition is made use of to shut off the hoist. Thus, as shown in FIG. 1 and in my Patent 3,233,746, the dead ends of the cables are suitably connected to the upper end of a vertical rod or bar **60**. This bar extends down through a cylinder **61** that is rigidly supported by the crane frame. The elements inside the cylinder may be similar to those shown in my patent. At least, they include a spring **62** that normally is compressed by the weight on the cables and that urges the bar downwardly. When the load on the cables is reduced in the manner that has just been described, continued paying out of the cables permits this spring to expand and move the bar down just far enough for it to open an electric switch **63** mounted on the bottom of the cylinder. This switch is electrically connected to the down drive circuit of the hoist, which is thereupon stopped. As mentioned above, this occurs when the grab is supported by the mast in wheel-gripping position, the mast being supported at that time by the hoist cables and by the air cylinders **32**.

The next step is to move the legs of the grab toward each other to cause the grips to clamp onto the flange of the top wheel as shown in FIG. 2. The hoist now is operated to cause the cables to lift the mast, and the air cylinders are reversed to run the sleeve **30** up the mast. As the mast is returned to its upper position shown in FIG. 1, a receptacle **65** (FIG. 4) on its upper end snugly receives a tapered positioning pin **66** shown in FIG. 2 and rigidly supported by the crane frame to guide the rising mast into proper position relative to the frame and to help prevent the mast from swaying while the crane is traveling along the track from one station to another. In order to permit rapid raising of the mast without damaging the crane, shock-absorbing or cushioning members can be mounted on top receptacle **65** and the adjoining sheave housings. These members may be blocks **67** of composition material such, for example, as those sold under the trademark Fabreeka. They permit the upper end of the mast to strike the bottom of frame **1** without too much shock.

The loaded raised crane then is run along the track to the next station and stopped. Now that the crane is clear of the pile of wheels, with the grab-positioning member raised, the grip motor **28** is operated to rotate the grips 180° and thereby turn the wheel bottom side up. The crane then carries the wheel to a machine where the hub is finished and the center bore is enlarged and machined. During this finishing operation the crane is moved back to pick the next wheel off the pile.

If the top wheel on the pile is not level, which is the situation shown in FIGS. 1 and 2, one edge of the sensor plate **48** will strike the wheel and stop while the mast continues to descend in order to insert cone **54** fully in the wheel bore and to cause the sensor plate to tilt until it engages flat against the wheel as shown in FIG. 2. This tilting of the sensor plate causes the rods **51** at one side of the sleeve to pull the grab beam **14** down at that side, whereby the horizontal beam of the grab is tilted to the same angle as the sensor plate and the wheel. This tilting of the grab positions the grips for proper engagement with the tilted wheel. As the crane starts to move upwardly with the wheel, the grab beam returns to its normal horizontal position as shown in dotted lines in FIG. 1.

As soon as the hub and bore of a wheel have been finished in the machine to which this crane delivered the wheel, the finished wheel is removed by a second crane traveling on the same overhead track. The construction and operation of this second crane is the same, for the most part, as the one just described, so only the part that has been modified is illustrated in FIGS. 7, 8 and 9. Since the hub faces of the wheels that the second crane handles have been finished and therefore are perpendicular to the wheel axes so that the wheels will rest level, it is unnecessary to provide for tilting the sensor plate and the grab. Therefore, a tilting sensor plate is omitted and a rigidly mounted sensor plate **70** is used instead. This plate is adjustable vertically relative to the sleeve **71** of the grab-positioning member by means of threaded studs **72** extending up through lugs **73** projecting from the four corners of the sleeve. At the center of the sensor plate there is a downwardly projecting cone **74** for insertion in a wheel bore. The horizontal beam **76** of the grab is rigidly secured to the lower end of the mast **77** as no provision for tilting has to be made. The height of the slots **78** in the opposite sides of sleeve **71** is such that their upper walls will strike the top of the beam to limit downward movement of the sleeve on the mast by air cylinder **79**. This second or modified crane picks up finished wheels in the same ways as the one first described picks up unfinished wheels, and then moves to a station where the grab-positioning member is run upwardly on the mast by the air cylinders so that the wheel can be turned over to dump the shavings and chips formed in the machining operation. The wheel then is turned back to its original

position and delivered to a predetermined station where it is deposited to form part of a pile of wheels.

One of the advantages of this invention is that, since the mast is not rigidly connected at its upper end to the traveling frame but is suspended from cables, lateral stress against the lower end of the apparatus does not adversely affect the mast and frame because the cables permit the mast to swing and tilt.

According to the provisions of the patent statutes, I have explained the principle of my invention and have illustrated and described what I now consider to represent its best embodiment.

I claim:

1. Wheel handling apparatus comprising a laterally movable crane frame, a cable suspended from the frame, a mast suspended from the cable, a hoist on the frame for lowering and raising the cable to move the mast vertically, a wheel grab carried by the lower end of the mast and having downwardly extending legs at opposite sides of the mast provided with wheel grips, a vertically movable grab-positioning member carried by the mast normally in an upper position thereon, said member being movable down the mast and grab a predetermined distance so that it can engage the top of a reclining wheel when the descending mast lowers said grips to wheel-gripping level, and means for stopping the descending mast when said positioning member engages a wheel.

2. Wheel handling apparatus according to claim **1**, in which said mast-stopping means include means connected to said positioning member exerting upward pressure on the mast.

3. Wheel handling apparatus according to claim **2**, in which said pressure-exerting means include air pressure cylinders.

4. Wheel handling apparatus according to claim **2**, in which said pressure-exerting means include air pressure cylinders adapted to move said positioning member up and down the mast.

5. Wheel handling apparatus according to claim **1**, in which said mast-stopping means include means for stopping said hoist.

6. Wheel handling apparatus according to claim **5**, in which said hoist-stopping means include an electric switch and means for actuating the switch responsive to reduction of the load on the cable due to said positioning-member engaging a wheel.

7. Wheel handling apparatus according to claim **1**, in which said mast-stopping means include means connected to said positioning member exerting upward pressure on the mast, an electric switch for stopping said hoist, and means for actuating the switch responsive to reduction of the load on the cable due to said positioning-member engaging a wheel.

8. Wheel handling apparatus according to claim **1**, in which said positioning member includes a tapered pin at the lower end for insertion in the hub of a wheel to center said member thereon.

9. Wheel handling apparatus according to claim **8**, in which said positioning member includes at the lower end a vertically adjustable sensing plate supporting said pin.

10. Wheel handling apparatus according to claim **1**, in which said frame and the upper end of the mast are provided with a cooperating vertical pin and socket that register with each other when the mast is in its upper position.

11. Wheel handling apparatus according to claim **1**, in which the top of the mast is provided with cushioning means for engagement with the bottom of said frame.

12. Wheel handling apparatus according to claim **1**, in which said wheel grab includes a horizontal beam connected centrally with the lower end of the mast and supporting said legs, and said positioning member includes a sleeve surrounding the mast and provided with upwardly extending slots permitting the sleeve to straddle said beam.

13. Wheel handling apparatus according to claim **12**, in which said beam is tiltably connected with the mast, and also in which said positioning member includes a sensing plate, means tiltably connecting the plate with the lower end of said sleeve, a tapered pin carried by the center of the plate for insertion in the hub of a wheel to center the plate thereon, and means secured to said plate for tilting said beam when the plate is tilted.

14. Wheel handling apparatus according to claim **13**, in which said tilting means include rigid members secured to said beam and projecting from its opposite sides, upright rods secured to said plate and slidably connected with said rigid members, and stops on the upper ends of the rods for engaging the tops of said rigid members and limiting downward movement of the sleeve on the mast.

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U.S. Cl. X.R.

294—86