Sept. 4, 1962 C. A. WILMS ET AL 3,052,050

EXCAVATOR BUCKET ASSEMBLY

Filed Oct. 19, 1960 4 Sheets-Sheet 1

Fig. 1.

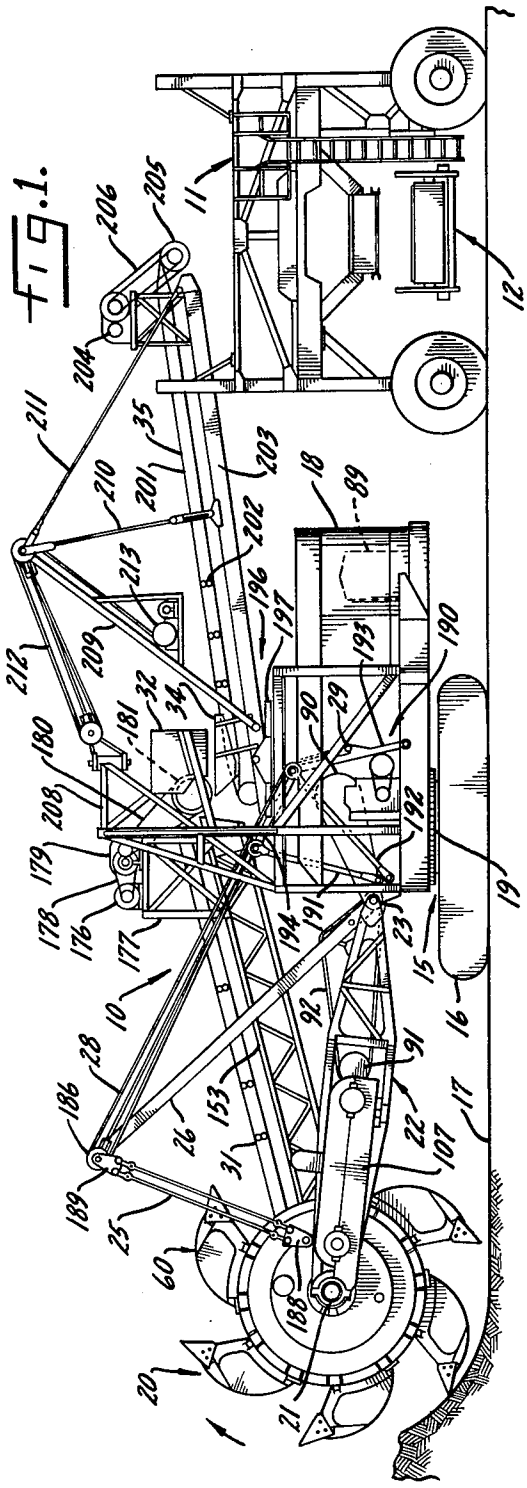
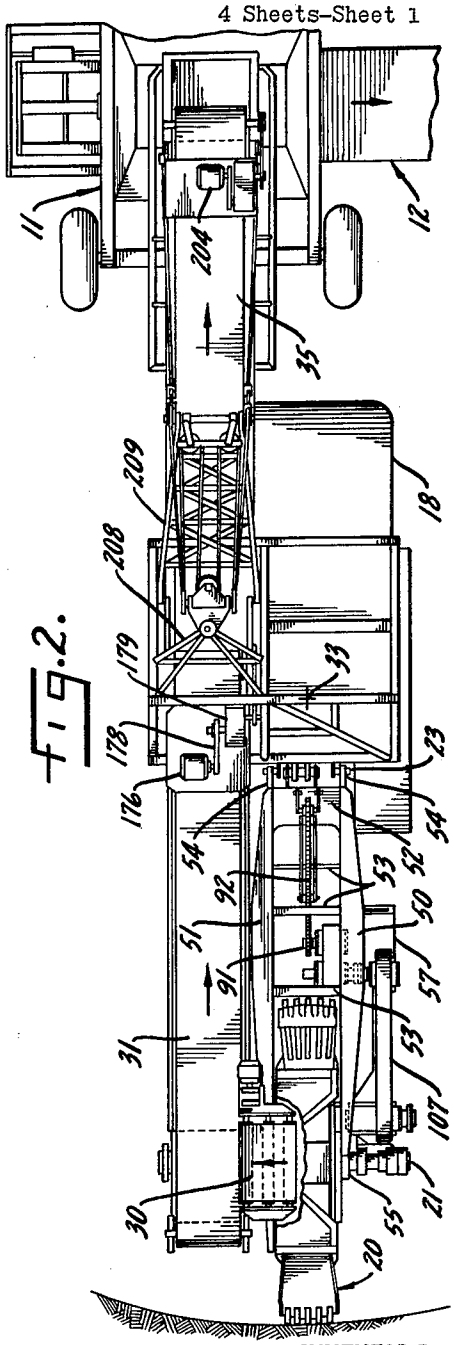


Fig. 2.



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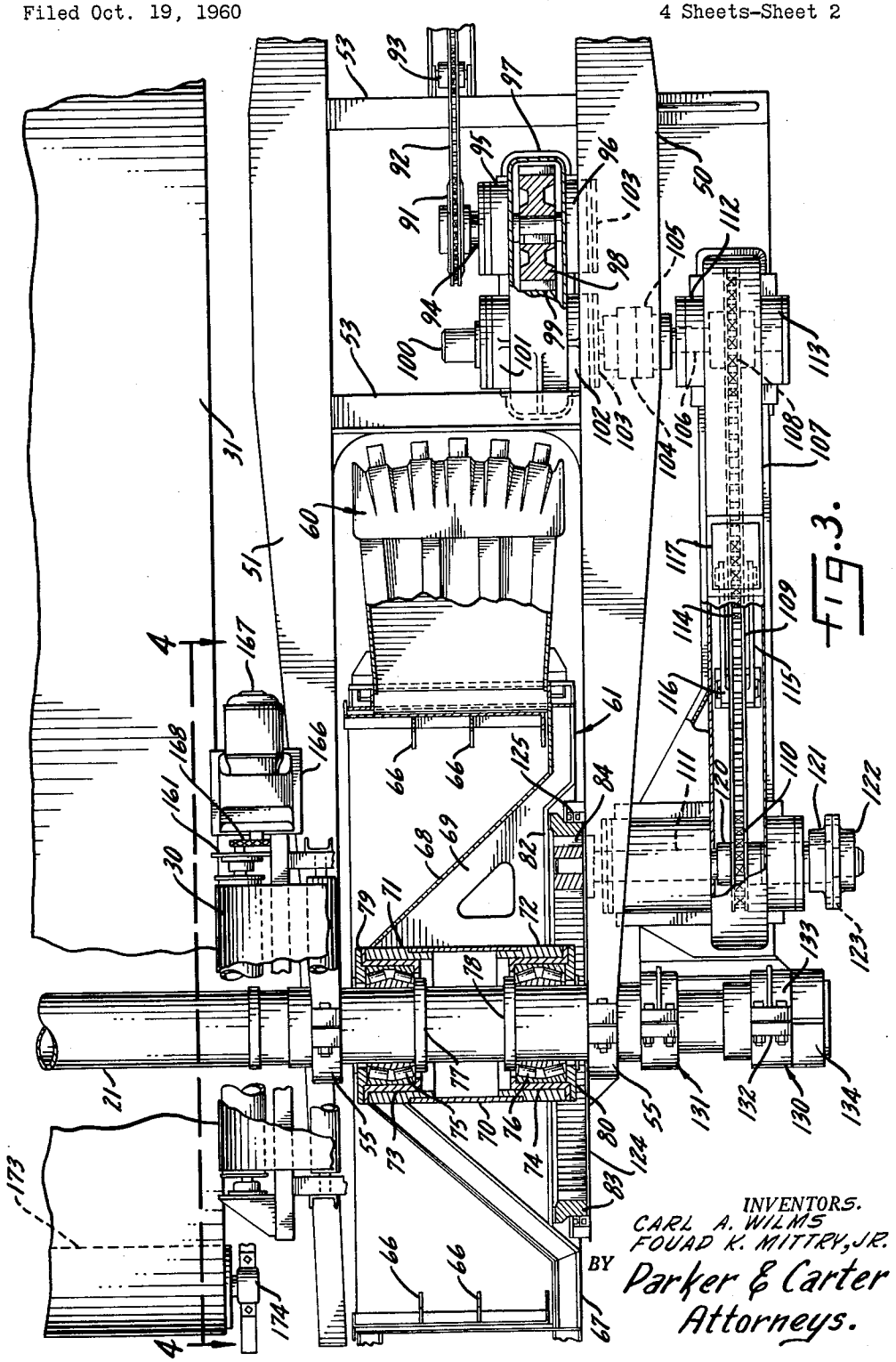


FIG. 3.

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EXCAVATOR BUCKET ASSEMBLY

Filed Oct. 19, 1960 4 Sheets-Sheet 3

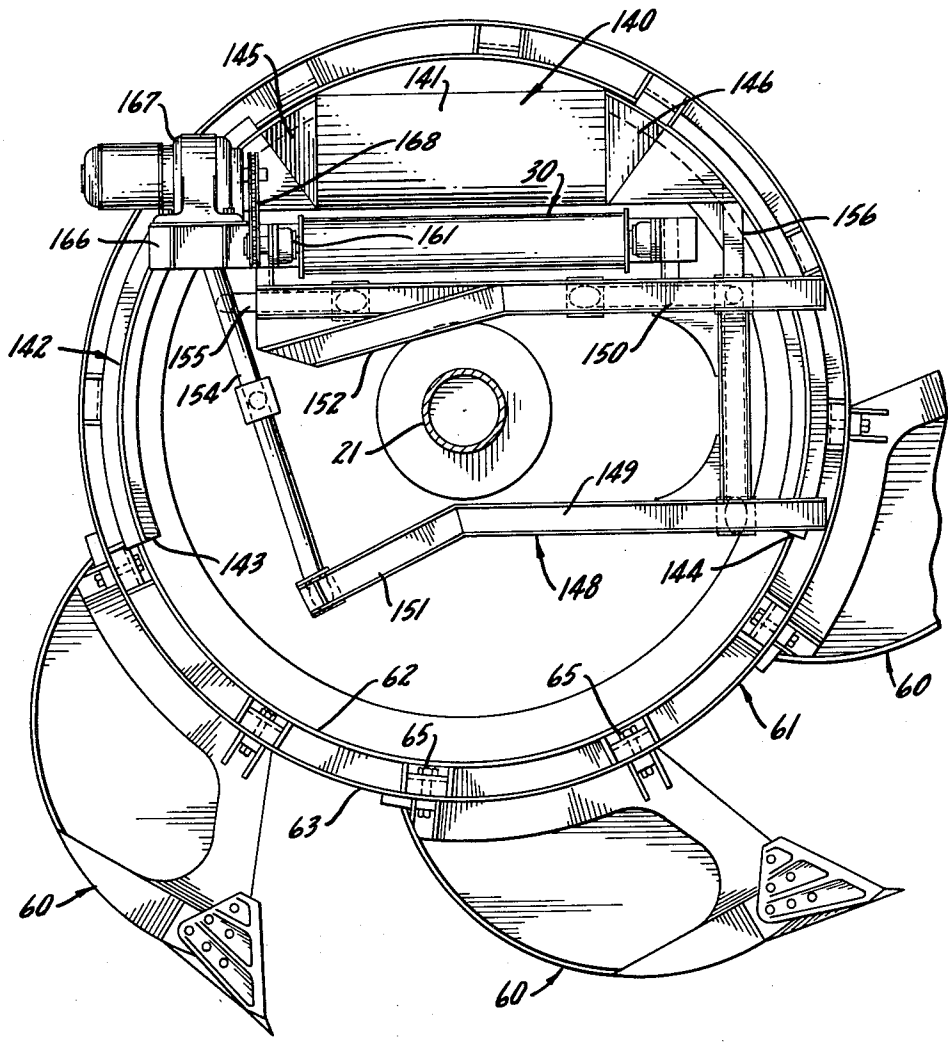


Fig. 4.

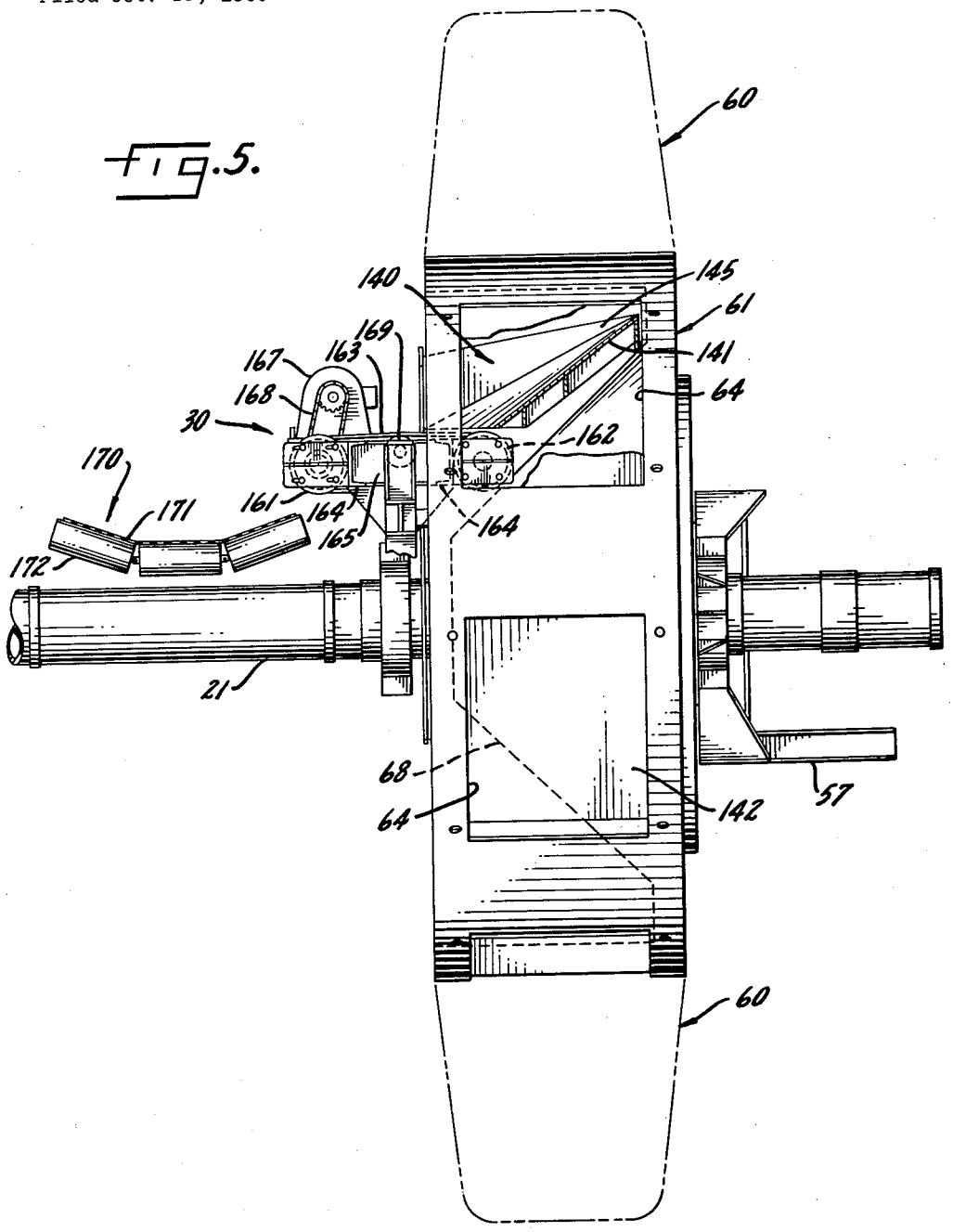
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EXCAVATOR BUCKET ASSEMBLY

Filed Oct. 19, 1960 4 Sheets-Sheet 4

Fig. 5.



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EXCAVATOR BUCKET ASSEMBLY

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3 Claims. (Cl. 37—190)

This application relates generally to excavating machines, and particularly to a wheel excavator having a very large capacity for its size.

Shovels, drag lines and wheel excavators are all widely used today for moving large quantities of earth, such as overburden in open pit coal mines. Although the wheel excavator is one of the most efficient of these machines, it is considerably more complicated and therefore higher in initial cost than either a drag line or shovel. Consequently, it is generally built in large sizes whereby it may be more economically owned and operated.

Because of the size and weight of present wheel excavators, it has heretofore been necessary to mount the excavator ladder or boom for reciprocation on the tractor. It has been found simpler and less expensive to crowd only the wheel forward rather than the wheel and the tractor.

Present wheel excavators, due to their size, generally utilize a plurality of motors and generators for powering the wheel and the other moving parts including the mast, swing drive and conveyors. In addition, it has not heretofore been thought practical to power the wheel by other than electrical motors due to the varying length of the wheel boom or ladder during operation.

Yet another disadvantage of many present wheel excavators of all sizes is the fact that overloading of the excavator often causes breakdowns which require extensive downtime. The structurally weakest point in the drive system, for example, is not always readily accessible. When a failure occurs at this point, considerable time is required to tear away and reassemble the surrounding structure.

Accordingly, a primary object of this invention is to provide a wheel excavator having an unusually large wheel for the size of the machine whereby a large output for the size of the machine is possible, good mobility at the job and from job-to-job is attained, operating and maintenance costs are low, the machine is relatively light in weight so that ground pressure is seldom a problem, and the machine is relatively economical to own and operate.

Yet another object is to provide a new and unique method of excavating with a wheel excavator in which the entire excavator including the tractor, and not just the shovel ladder and wheel, is crowded forward as contrasted to conventional methods of wheel excavating in which only the wheel advances.

Yet another object is to provide a wheel excavator having a ladder which is pivotally mounted and swings horizontally with the tractor in a fashion similar to that of the conventional shovel or dragline.

Yet another object is to provide a wheel excavator having a capacity up to seven times greater than that of conventional shovel excavators of similar size.

Yet another object is to provide a wheel excavator in which the special motors and generators usually required for powering the tractor and other moving parts of the excavator are eliminated, and the tractor power is utilized to drive the excavator wheel.

Yet another object is to provide a wheel excavator in which the wheel is mechanically driven as contrasted to the conventional electrically powered excavator wheel.

Yet another object is to provide a wheel excavator in which the direction of rotation of the wheel can be quickly reversed by merely pulling four bolts per bucket,

shifting a drive sprocket, and making one other simple adjustment.

Yet a further important object is to provide an excavator wheel attachment which can be readily built into a new machine designed specifically as a wheel excavator or just as readily attached to a conventional shovel or dragline.

Another important object is to provide a mechanical drive system for an excavator wheel in which a plurality of shear pins are used to transfer power from the source of power to the wheel, the shear pins being designed as the weakest point in the power linkage system and being exposed so that should the power linkage system break down at this point it can be quickly repaired.

Other objects will become apparent upon a reading of the following description of the invention.

The invention is illustrated more or less diagrammatically in the accompanying drawings, wherein:

FIGURE 1 is an elevational view (with parts omitted for clarity and others indicated only diagrammatically) of a conventional shovel which has been modified by the addition of an excavator wheel attachment of the present invention, and a steerable self-propelled mobile bin into which the wheel excavator discharges;

FIGURE 2 is a plan view of a portion of the wheel excavator of FIGURE 1 with parts broken away for clarity;

FIGURE 3 is a plan view to an enlarged scale of a portion of the excavator wheel and a portion of the associated wheel drive system;

FIGURE 4 is a side view, with parts omitted for clarity, of the discharge side of the wheel showing the relative position of the transfer conveyor with respect to the wheel; and

FIGURE 5 is a front view of the excavator wheel illustrating the relative position of the transfer and ladder belt conveyors.

Like reference numerals will be used to refer to like parts throughout the following description of the invention.

General Arrangement

The wheel excavator, indicated generally at **10** in FIGURE 1, is shown discharging into a steerable self-propelled mobile bin **11** which in turn discharges onto a removal conveyor **12**. Although the wheel excavator has been illustrated in conjunction with a mobile bin, it will be understood that the invention is not so limited in application and the bin is shown merely for purposes of description.

The wheel excavator, in this instance, is illustrated as a modified shovel. It consists essentially of a crawler truck unit **15** having a pair of conventional steel treads **16** resting on the ground **17**. A tractor **18** is mounted on any suitable turntable structure **19** on the crawler truck **15**.

An excavator wheel **20** rotates about a wheel shaft **21** carried at the end of wheel excavator ladder **22**. The ladder in turn is pivoted to the tractor as at **23**. The ladder and excavator wheel are supported from the tractor by suspension cables **25** which are secured to the outer end of a mast **26**. Vertical movement of the mast **26** about pivot point **23** is effected by a hoist cable **28** having one end secured to the tractor as at **29** and the other end to a reversible winch which will be described hereinafter.

Material dug from the ground by excavator wheel **20** is discharged at substantially right angles to the plane in which the wheel rotates onto a short transfer conveyor **30** which in turn discharges onto a removal ladder belt conveyor **31** positioned substantially at right angles to the transfer conveyor and parallel with the wheel ladder.

Material discharged onto conveyor 31 is carried rearwardly to a deflector 32. Suitable mechanism for driving the excavator wheel and conveyor 31 are provided which will be described in detail hereinafter. It will be understood that the excavator wheel ladder and the conveyor 31 move in parallel vertical planes with respect to one another and rotate in parallelism horizontally about the center of rotation 33.

Material from deflector 32 drops downwardly into an apron 34 located at the tail end of tail conveyor 35. Conveyor 35 extends rearwardly a suitable distance and discharges into the self-propelled mobile bin 11.

Wheel Ladder

The ladder consists essentially of a pair of sideframes 50, 51 of substantially identical construction. The sideframes are maintained a fixed distance apart by rear plates 52 and a series of cross braces 53. Only three cross braces are illustrated for purposes of clarity. The forwardmost cross brace 53 is located at approximately the mid portion of the ladder. The forward halves of the sideframes carry no cross members so as to provide no obstruction to the passage of the excavator wheel therebetween. A pair of pivot plates 54 are welded to the rear end of the ladder to receive pivot shaft 23 about which the ladder and excavator wheel pivots vertically. A pair of yokes 55, seen best in FIGURE 3, are welded to the forward end of the ladder to receive wheel shaft 21 about which the excavator wheel rotates. A platform 57 extends outwardly from the left side of the ladder to support the chain drive housing which will be described in detail hereinafter.

Excavator Wheel

The excavator wheel includes a plurality of buckets 60, in this instance six, bolted to a wheel frame 61. The wheel frame is composed essentially of a pair of overlapping radially spaced plates 62, 63 having apertures 64 aligned with the bases of the buckets. It will be understood that the buckets are formed with an open base so that excavated material will fall from the buckets through the aligned apertures and onto the slope sheet to be described hereinafter. Any suitable means may be utilized to secure the buckets to the rotating wheel frame. In this instance, four heavy bolts 65 have been utilized to secure each bucket to outer plate 63. Suitable spacers 66 maintain the inner and outer plate 62, 63 of the rotating wheel frame a fixed distance apart. In order to reverse the position of the buckets, the four bolts are pulled, the bucket is turned 180 degrees, and the bolts retightened.

The wheel frame is open on its inner or right side but is closed on its outer or left side by an annular plate structure 67 which terminates in an inwardly extending cone 68. A plurality of triangular braces 69 extending about the cone are welded along their hypotenuse to the cone and along their inner legs to a plate 70 which in turn is welded to a pair of collars 71, 72. The collars and plate 70 form in effect a hub for the wheel shaft 21. A pair of roughly Z-shaped bushings 73, 74 receive the hub. The bushings in turn receive a pair of roller bearings 75, 76 which surround the shaft 21. Suitable collars 77, 78 on the shaft and end plates 79, 80 keep the roller bearings in place.

The short legs of braces 69 are welded to another annular plate 82 to which a bull gear 83 is welded. Bull gear 83 is driven by a suitable pinion 84 from a power source to be later described.

Excavator Wheel Drive

Power to drive the excavator wheel is supplied by a diesel engine which is geared to the hoist drum drive through the regular shovel drive machinery. The diesel generator set indicated at 89 is an additional power source providing electric power for the conveyor drives and any auxiliary drives needed. Although the diesel generator set 89 is shown located to the rear of cab, it will be understood that within the scope of the invention it may be located in any convenient place. In the specific embodiment shown, this location of the diesel generator set acts as a counterweight for the wheel.

Power is transferred from the power source to a hoist drum drive sprocket, indicated generally at 90, by any suitable means. It will be understood that a chain or a shaft drive with direction changing gears may be utilized. Since the exact arrangement of the power drive from the diesel generator to the hoist drive drum is not essential to an understanding of the invention, it is not further illustrated.

Power is transferred from hoist drum drive 90 to a reversing gear box sprocket 91 by a pair of chains, terminating with chain 92. Chain 92 may optionally pass over a takeup or clearance sprocket 93 which is carried by the ladder.

Reversing sprocket 91 is fixed to a first shaft 94 received in bearings 95, 96, which are indicated diagrammatically only for purposes of illustration. The bearings in turn are supported by any suitable means in a gear case 97 which is welded to the ladder. A first gear 98 is keyed to shaft 94 and meshes with another identical gear 99 carried on a second shaft 100. Shaft 100 is similarly supported in bearings 101, 102. It will be understood that the diameters of shafts 94 and 100 are substantially identical so that reversing sprocket 91 may be received on either shaft depending upon the desired direction of rotation of the wheel. Suitable bearing caps, including cap 103, close the gear case to make it oil tight.

The output end of shaft 100 is received in the input side 104 of a shaft coupling. The output side 105 of the coupling is connected to a wheel chain drive assembly input shaft 106.

The wheel chain drive assembly consists essentially of a wheel chain drive housing 107 which contains an input sprocket 108 connected by chain 109 to an output sprocket 110. Housing 107 is divided into an upper and a lower half so that it may be readily removed for inspection and maintenance. Power is transferred from sprocket 110 to drive pinion shaft 111 by the arrangement to be described hereinafter.

Input shaft 106 is rotatably supported by bearings 112, 113 in any suitable manner at the rear of the chain drive assembly housing 107. Chain 109 extends forward to output sprocket 110 and then back over takeup sprocket 114 to the input sprocket 108. Takeup sprocket 114 is carried at the outer end of a takeup arm 115 which in turn is pivotable around a suitable takeup base 116. Consequently, takeup arm 115 may be secured to either the bottom or top of the chain drive assembly housing depending upon the direction of wheel rotation. In order to alter the vertical position of takeup sprocket 114, a takeup assembly indicated generally at 117 is provided.

The takeup assembly may be of any suitable construction. In one embodiment for example a takeup screw is mounted for vertical reciprocable movement. The vertical screw carries a crosshead at its upper end from which a pair of depending links extend downwardly to the shaft carrying takeup sprocket 114. When the position of base 116 is varied, it is a simple matter to adjust the vertical position of the takeup sprocket by simply screwing the takeup screw up or down, depending upon the desired position.

Output sprocket 110 is keyed or otherwise suitably secured to drive pinion shaft 111 by the following arrangement.

Sprocket 110 is welded to a sleeve 120 which is rotatably received over the drive pinion shaft. The outer end of the sleeve is received in and secured to the inner half 121 of a shear pin coupling. Inner coupling half 121 is then secured to a corresponding mating outer half 122 by a plurality of shear pins 123. The shear pins are spaced circumferentially about the mating, overlying flanges of

the coupling halves. Outer coupling half **122** is then secured to the drive pinion shaft **111** so that power must be transmitted through the shear pins. By a suitable design of the shear pins, this particular part of the power drive linkage system can be made the weakest point and consequently should the excavator wheel be overloaded, breakage will occur at this point. When a breakage occurs, the pins will shear but no further damage to the machine can result because the inner coupling half **121** and the power transmission system back to the diesel generator will continue to rotate under no load while the balance of the system is stalled. Repair is therefore extremely easy because the shear pin flanges are located in an exposed position.

Drive pinion shaft **111** is connected by suitable bearings and seals to drive pinion **84** which in turn meshes with bull gear **83** as described. Plate **124** overlies the conical opening to prevent excavated material from falling into the gearing. The cover plate **124** is bolted or otherwise suitably secured to the internal surface of yoke arm **50** and provided with a circular seal **125** adjacent the external periphery of the bull gear **83**. The bull gear then rotates relative to the cover plate **124**.

A pair of extensions **130, 131** project outwardly from the forwardmost end of the wheel chain drive assembly housing platform **57**. Each extension is formed by a pair of yoke members **132, 133** which, when assembled, form a two point support for the left end of wheel shaft **21**. A collar **134** at the outermost end of the shaft forms a housing for suitable bearings.

Transfer conveyor

Material which has been removed by the wheel excavator is conveyed rearwardly to a tail conveyor **35** by a ladder conveyor **31**. Conveyor **31** is supported at its forward end by the wheel shaft **21**, as illustrated diagrammatically in FIGURES 3 and 5, and at its rear or discharge end by any suitable framework on the tractor **18**. It will be understood that the discharge end of conveyor **31** is pivotally mounted to the framework on the tractor and swings with it and it is likewise pivotally, rotatably mounted on the wheel shaft **21** so that as the excavator wheel is swung upwardly and downwardly from the position of FIGURE 1 the position of the conveyor is correspondingly altered. In effect, the movement of conveyor **31** and the wheel ladder is much like the opening and closing of the blades of a pair of scissors about wheel shaft **21** as a pivot.

Excavated material is transferred from the excavator wheel to conveyor **31** by structure which will now be described in detail.

Cross Conveying Assembly

A plug and slope sheet assembly is indicated generally at **140**. The assembly consists essentially of a plug or slope sheet **141** which is secured to and continuous with a plug structure indicated generally at **142**. The ends of the plug are indicated at **143** and **144** respectively and, as can be seen best in FIGURE 4, the plug extends around about two-thirds of the circumference of the wheel. Triangular side plates **145, 146** provide what is in effect a continuous chute for discharging material dropped downwardly through the openings in the wheel plates **62, 63**. As can best be seen from FIGURE 5, the plug and slope sheet are set into the body of the wheel and overline the cone **68**.

The plug and slope sheet are supported within the excavator wheel by a support structure illustrated at **148** in FIGURE 4. In this instance, the plug support consists of a plurality of generally horizontal wide flange beams **149, 150** from which a pair of slightly downwardly inclined beams **151, 152** extend. Beams **151, 152** in turn are welded to a ladder conveyor truss **153**, shown best in FIGURE 1. Plug **142** is actually secured to the wide flange beams by rearwardly and upwardly inclined plug supports. The plug supports comprise tubular members **154, 155, 156** which are welded at their lower ends to the wide flange beams and at their upper ends to the plug **142**.

In order to more expeditiously transfer excavated material from the slope sheet to conveyor **31**, a short transfer conveyor or belt feeder **30**, seen best in FIGURE 5, is provided. Belt feeder **30** consists of a head or drive pulley **161** and a tail pulley **162** about which a flexible conveyor belt **163** is trained. The drive and tail pulleys are supported in a belt feeder frame which consists essentially of a pair of wide flange beams **164** to which are welded end plates **165**. The pulleys in turn are journaled in the end plates. A platform **166** extends rearwardly, or to the left as viewed in FIGURE 4, from the conveyor support structure. An electric motor **167** is supported on the platform and furnishes power to drive pulley **161** by means of a chain and sprocket arrangement **168** best illustrated in FIGURES 4 and 5. An impact idler **169** is located roughly midway between the drive and tail pulleys. Experience has indicated that belt wear can be considerably reduced by placing a roller in this location.

Ladder Belt Conveyor

Conveyor **31** consists essentially of a truss or framework **153** which supports a flexible belt conveyor indicated generally at **170** (FIGURE 5). Although any suitable conveyor may be utilized, in the illustrated embodiment there is shown a flexible conveyor which consists essentially of a flexible belt **171** supported by a plurality of troughing idler assemblies **172**. The idler assemblies are generally regularly spaced along the truss. It will be understood that it may be convenient to space the troughing idler assemblies closer together at the tail end of the conveyor, that is, the left end as viewed in FIGURES 1 and 2, in order to provide more impact resistance to material discharged from the belt feeder **30**. Belt **171** is trained around a tail pulley **173** which is supported by any suitable structure, such as the pillow blocks **174** bolted to the conveyor truss. The return reach of the conveyor belt passes directly beneath the conveying reach. It may, for example, be convenient to train the return reach over return roller assemblies which are mounted within the truss.

Any suitable means may be utilized to mount the transfer conveyor truss to the wheel shaft **21**. In one practical embodiment, the head end of the truss was formed by a pair of vertical plates, each plate being formed with an elongated slot which received the wheel shaft **21**. As the included angle between the wheel ladder and truss vary, the wheel shaft merely slides along the elongated slot in the end plates.

Power to drive conveyor belt **171** is furnished by a motor **176**, shown best in FIGURE 1, mounted on a framework **177** which is bolted at its lower ends to the conveyor truss **153**. Power from the output side of motor **176** is transferred by a V-belt **178** to a speed reducer **179**. Another belt **180** transfers power to the head or drive pulley **181** about which the belt is trained.

Hoist Mechanism

The excavator wheel ladder and conveyor **31** are elevated in a vertical plane by the hoisting mechanism next to be described.

A mast **26** is pivoted at its lower end about the same axis as the ladder **22** and terminates at its upper end in a pair of sheaves or pulleys **186**. The suspension cables **25** are secured at both their lower and upper ends to triangular gusset plates **188, 189** which in turn are pivotally mounted to the ladder and the upper end of the mast respectively.

A gantry assembly is indicated generally at **190**. The assembly includes a linkage comprising individual arms **191, 192, 193**, each of which is pivoted to the tractor at its lower end. A link **194** pivotally connects link **191** to

links 192 and 193. The hoist cable 28 is anchored to rearmost link 193 as at 29, and extends back and forth between sheaves (not shown) located adjacent the upper ends of mast 26 and link 191. The free end of hoist cable 28 is received on a suitable winch carried in the tractor which is actuated by any suitable drive mechanism, not shown. Since such a gantry assembly is conventional in this art, it is not thought necessary to further illustrate it in detail.

Tail Conveyor

Tail conveyor 35 is pivotally mounted to the tractor by a pivot frame assembly indicated generally at 196. In this instance, a turntable 197 has been shown but it will be realized that within the scope of the invention any suitable structure for providing rotation of the discharge conveyor about a center of rotation on the tractor may be utilized. A tail conveyor 35 consists essentially of a conveyor belt 201 supported by a plurality of troughing idler assemblies 202 which in turn are supported from the conveyor truss 203. Any suitable source of power such as an electric motor 204 carried by a framework at the outer end of the conveyor truss provides driving power to head or drive pulley 205 through drive belt 206.

A gantry frame for raising and lowering the discharge conveyor is indicated generally at 208. The frame includes conveyor mast 209 which is pivotally mounted at its lower end to the tail conveyor framework 203 and extends upwardly to a point above approximately the mid portion of the conveyor. Suspension cables 210, 211 extend from the upper end of the mast to the mid portion and forwardmost end of the framework respectively. A hoist cable 212 is anchored at one end to any suitable point and then is wrapped back and forth over sheaves carried by the gantry frame and mast to a winch 213. A motor, unnumbered, supplies winding power to the winch to thereby raise and lower the discharge conveyor. The winch and motor are supported on a framework welded to the tail conveyor mast.

The use and operation of the invention is as follows:

To excavate material, the excavator wheel 20 and the tractor are crowded forward simultaneously. By a suitable control mechanism, not shown, the excavator wheel ladder transfer conveyor and cab may be swung about the center of rotation 33. As the wheel rotates, the individual buckets bite into the ground and carry the excavated material upwardly until the buckets reach a point a few degrees to the left of the vertical as viewed in FIGURE 1. The material in the buckets then drops downwardly through the aligned openings in the base of the buckets and the excavator wheel and onto the plug or slope sheet 141, shown best in FIGURE 5. From there the material drops by gravity onto the belt feeder 30 which carries it to conveyor 31. Conveyor 31 in turn conveys the material up to the tail end of tail conveyor 35 and conveyor 35 then deposits the material into any suitable surge hopper such as the steerable self-propelled mobile bin indicated at 11.

During operation, the excavator wheel and conveyor 31 will make varying angles with the tail conveyor 35 but it will be understood that the arrangement of parts is such that deflector 32 will always discharge into apron 34. In a machine designed as a wheel excavator from the ground up, it will be understood that the conveyor pivot and center of rotation may coincide so that the conveyor 31 may be incorporated into the ladder 22.

In one commercial installation a thirty cubic yard bin has been used. The bin in turn discharges into a conveyor 12 which carries the material to a remote processing station. Since conveyors 35 and 31 are pivotally mounted on the excavator, it is possible to move the entire excavator a considerable distance around the mobile bin. In other words, the position shown in FIGURES 1 and 2 in which the conveyors are aligned, is not the only position in which the excavator can be operated.

One of the most unique features of the invention is the provision of a mechanical drive system for the excavator wheel as contrasted to the conventional electric motor system. In this instance, the diesel engine which normally supplies the power to move the tractor forward has been arranged to also provide driving power for the excavator wheel. The power is transferred from the diesel to the sprocket at the base of the ladder and from there to the reversing gear assembly 97. Power transfer shafts 100 and 106 then transfer the power laterally to input sprocket 108 of the chain drive housing. From sprocket 108 the power is transmitted to output sprocket 110 and then to pinion drive shaft 111. Pinion 184 at the end of drive shaft 111 meshes with bull gear 83 secured to the excavator wheel.

To reverse the direction of rotation from the direction indicated by the arrows in FIGURE 1, sprocket 91 is removed from shaft 94 and placed on shaft 100. Takeup sprocket 114 is then adjusted by moving pillow block 116 from the position shown to the top of the chain drive housing. The position of buckets 60 is easily reversed by merely pulling the four bolts 65 by which each bucket is secured to the rotating wheel.

Another unique feature of the invention is the fact that an overload will cause a failure at a location which is easily accessible for repair and maintenance. Thus, shear pins 123 which transfer power from sprocket 120 to drive pinion shaft 111 through the mating halves 121 and 122 of the shear pin coupling are so designed as to be the weakest link in the power system from the source on the cab to the buckets. If the machine is crowded forward too far or extremely compact material is encountered, the pins will shear and no further damage will occur because power input to drive pinion shaft 111 will be terminated. It is then a simple matter to remove the sheared ends of the pins, install a new set of pins, and resume operations.

Although a preferred embodiment of the invention has been illustrated and described, it will be understood that the scope of the invention should not be so limited.

For example, the invention has been illustrated in a structure in which the excavator wheel and its associated support structure and conveyors have been designed as a separate unit to be connected to a conventional shovel. The principles of the mechanical power transmission from the tractor to the whel and the shear pin system, among others, may be just as readily incorporated into machines built from the ground up as a wheel excavator.

In addition, the excavator can be made more mobile by substituting a two-way spout at the end of the tail conveyor for the steerable mobile bin shown in the drawings. The tail conveyor may then discharge directly into trucks. As a consequence, there is never any need to slow down or shut down operation of the excavator, as is sometimes necessary when the limit of the removal conveyor is reached.

Accordingly, the scope of the invention should only be limited by the scope of the following appended claims.

We claim:

1. In a wheel excavator, a crawler truck, a tractor mounted for swinging movement in a horizontal plane about the truck as a base, an excavator wheel, an excavator wheel ladder, said wheel being rotatably mounted on the ladder at its outboard end, said ladder being connected to the tractor for swinging movement therewith in a horizontal plane and pivotally connected to the tractor for movement in a vertical plane whereby the wheel moves with the tractor as the tractor crowds forward, backtracks, and swings in a horizontal plane, and moves independently of the tractor in a vertical plane, power means for rotating the wheel, powering the crawler truck and swinging the tractor, ladder and wheel with respect to the truck, said power means including a single power plant carried by the tractor, and power transmission means extending from the tractor to the wheel, said power transmission means

being a mechanical drive comprising a chain drive extending outwardly along the ladder to a sprocket carried by one of two meshing gears in a gear assembly, a third sprocket driven by the gear assembly, and a second chain drive extending outwardly to and driving the wheel, said wheel including a bull gear rotatable with the wheel, said bull gear being driven by a pinion supported by the ladder and driven from the second chain drive, said pinion being carried by a pinion shaft mounted on the ladder, said second chain drive terminating at a sprocket secured to a sleeve which in turn surrounds the shaft, said sleeve being operatively connected to the pinion shaft by a coupling assembly, one-half of the coupling assembly being carried by the pinion shaft and the other half being operatively connected to the pinion sleeve, said coupling halves being connected by a plurality of shear pins, said pins being so dimensioned as to be the structurally weakest part of the power transmission system whereby failure of the power transmission system due to an overload on the wheel will break the shear pins, said wheel including a plurality of buckets mounted about the periphery thereof, and means for discharging excavated material at a point remote from the wheel.

2. In a wheel excavator, a crawler truck, a tractor mounted for swinging movement in a horizontal plane about the truck as a base, an excavator wheel, an excavator wheel ladder, said wheel being rotatably mounted on the ladder at its outboard end, said ladder being connected to the tractor for swinging movement therewith in a horizontal plane and pivotally connected to the tractor for movement in a vertical plane whereby the wheel moves with the tractor as the tractor crowds forward, backtracks, and swings in a horizontal plane, and moves independently of the tractor in a vertical plane, power means for rotating the wheel, powering the crawler truck and swinging the tractor, ladder, and wheel with respect to the truck, said power means including a single power plant carried by the tractor, power transmission means extending from the tractor to the wheel, said wheel including a mechanical drive comprising a chain drive extending outwardly along the ladder to a sprocket carried by one of two meshing gears in a gear assembly, a third sprocket driven by the gear assembly, and a second chain drive extending outwardly to and driving the wheel, said gear assembly sprocket being receivable on either one of the two meshing gears whereby the direction of rotation of the second chain drive, and consequently the wheel, may be reversed by changing the gear assembly sprocket from one meshing gear to the other, said wheel including a plurality of buckets mounted about the periphery thereof, and means for discharging excavated material at a point remote from the wheel.

3. The wheel excavator of claim 2 further characterized in that the buckets are bolted to the wheel whereby, upon reversal of the direction of wheel rotation, the buckets can be rotated 180 degrees by removal and reinstallation of the bolts.

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2,926,438	Kolbe	Mar. 1, 1960