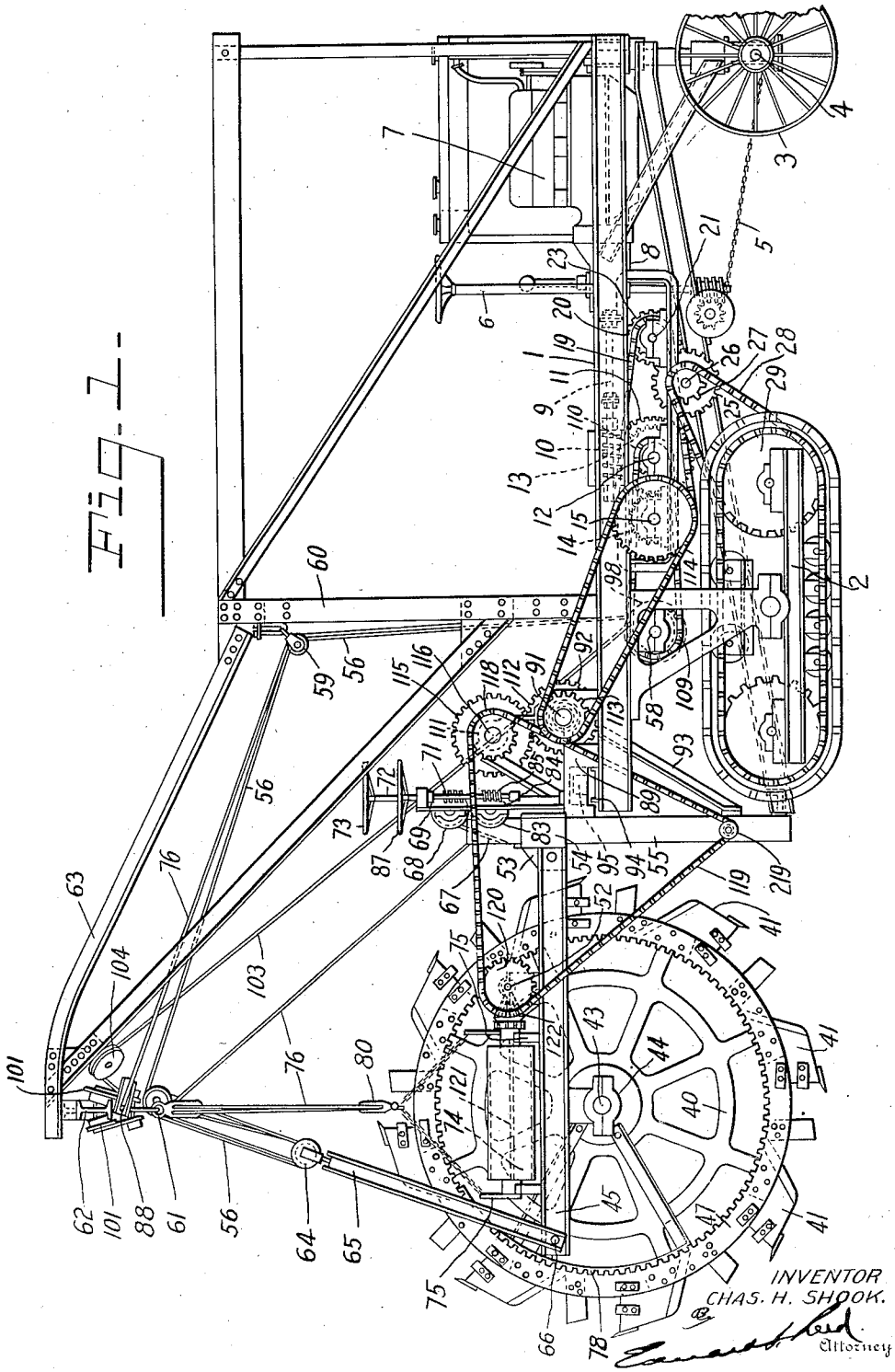
Dec. 4, 1923. 1,476,375

C. H. SHOOK

MATERIAL HANDLING MACHINE

Filed March 13, 1920 5 Sheets-Sheet 1



Dec. 4, 1923. 1,476,375

C. H. SHOOK

MATERIAL HANDLING MACHINE

Filed March 13, 1920 5 Sheets-Sheet 2

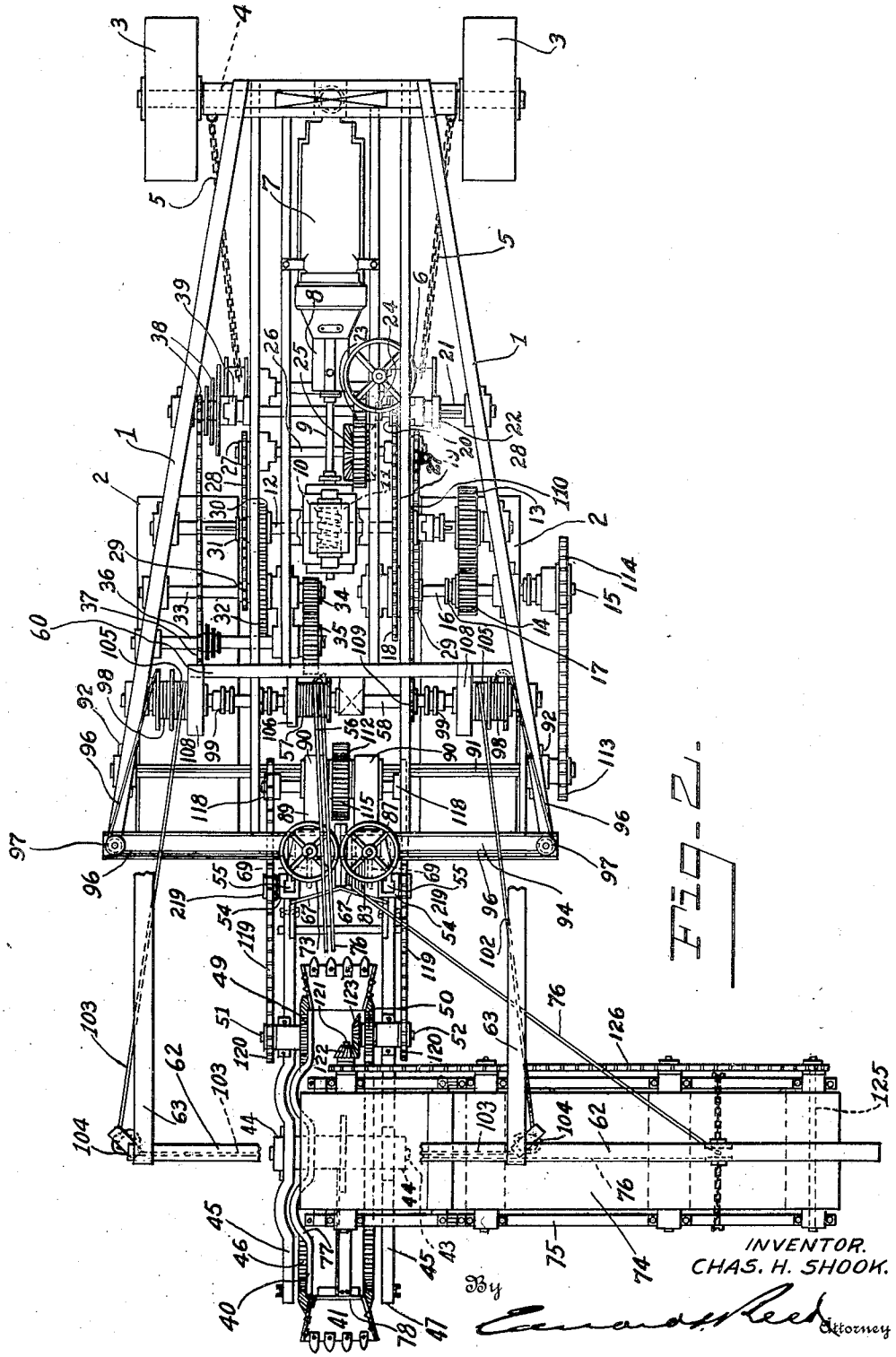


FIG. 2.

INVENTOR.
CHAS. H. SHOOK.

By Edmund Reed Attorney

Dec. 4, 1923. 1,476,375

C. H. SHOOK

MATERIAL HANDLING MACHINE

Filed March 13, 1920 5 Sheets-Sheet 3

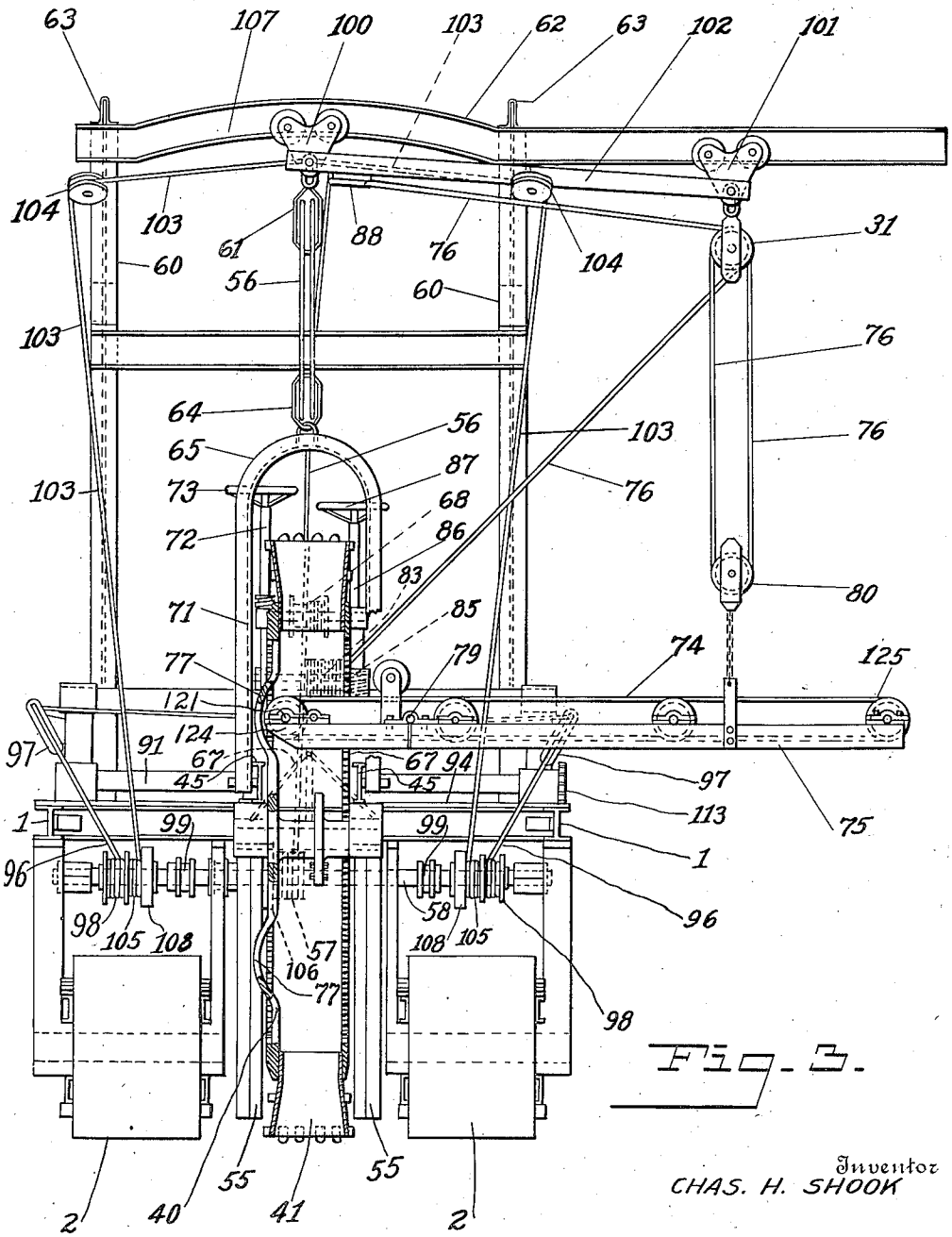


Fig. 3.

Inventor
CHAS. H. SHOOK

By Edward A. Reed

Attorney

Dec. 4, 1923. 1,476,375

C. H. SHOOK

MATERIAL HANDLING MACHINE

Filed March 13, 1920 5 Sheets-Sheet 4

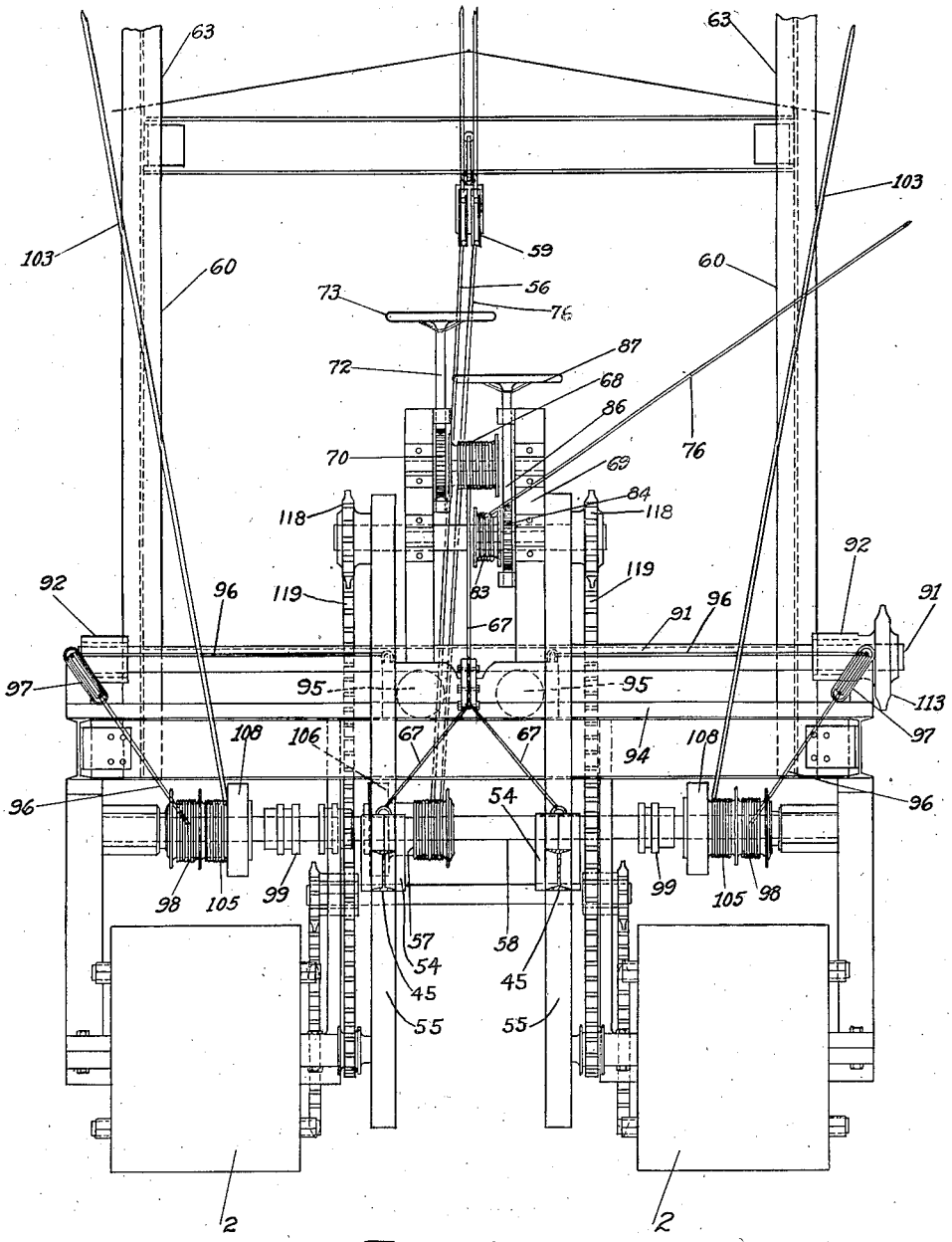


Fig. 4.

INVENTOR.
CHAS. H. SHOOK
BY Leonard Reed
ATTORNEY.

Dec. 4, 1923. 1,476,375

C. H. SHOOK

MATERIAL HANDLING MACHINE

Filed March 13, 1920 5 Sheets-Sheet 5

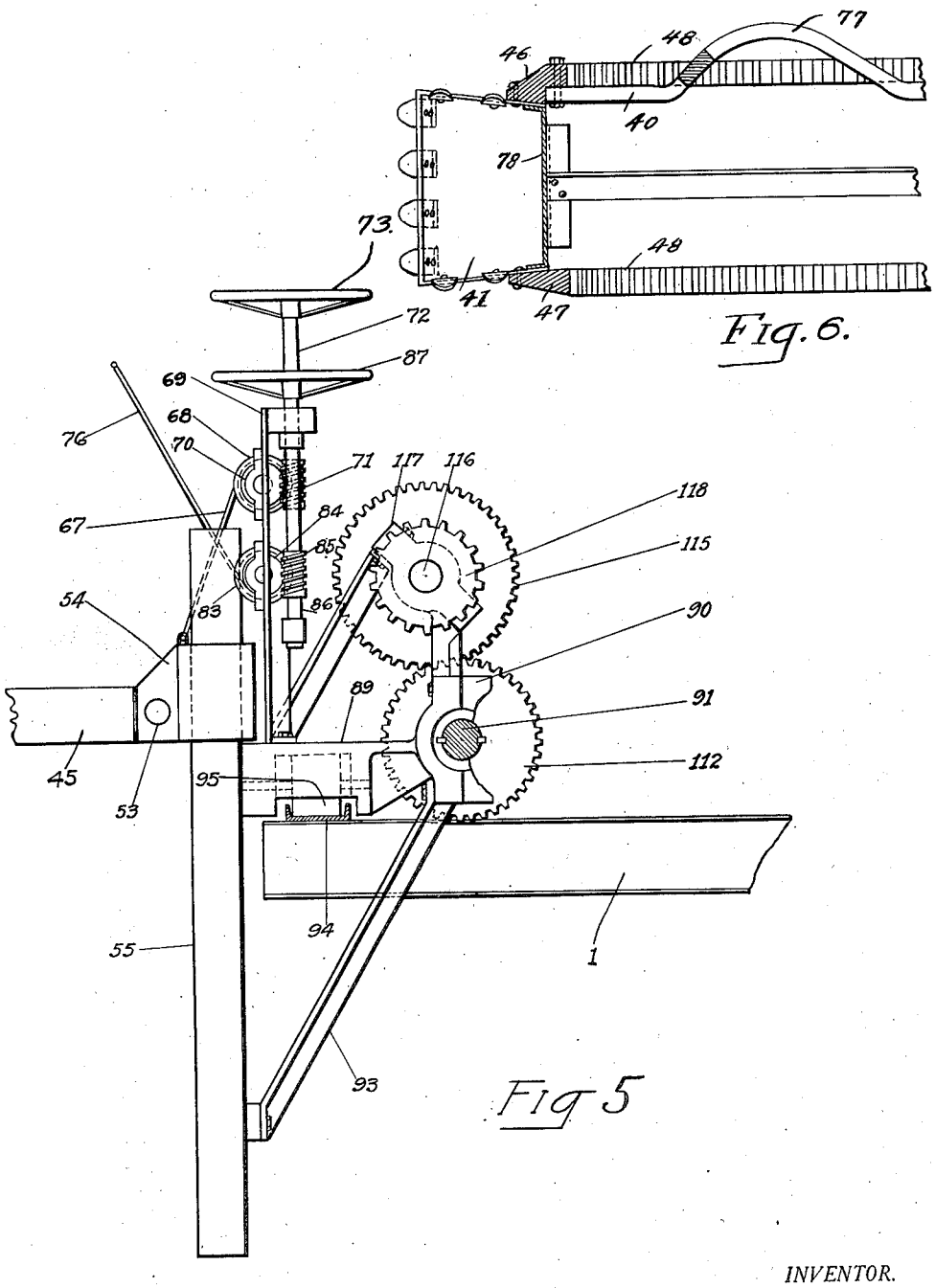


Fig. 6.

Fig 5

INVENTOR.
CHAS. H. SHOOK
BY Edward Reed
ATTORNEY.

Patented Dec. 4, 1923. 1,476,375

UNITED STATES PATENT OFFICE.

CHARLES H. SHOOK, OF DAYTON, OHIO.

MATERIAL-HANDLING MACHINE.

Application filed March 13, 1920. Serial No. 365,447.

To all whom it may concern:

Be it known that I, CHARLES H. SHOOK, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Material-Handling Machines, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to a material handling machine and the present application is a continuation of the application for patent filed by me March 12, 1919, Serial No. 282145, in so far as the subject matter is common to the two applications.

The object of the invention is to provide a machine of this character which will have a wide range of utility and will be capable of such operations as grading, trenching, miscellaneous excavating, loading and unloading, and the handling in general of bulk materials.

A further object of the invention is to provide such a machine having a vertically adjustable rotary excavating member which can be laterally adjusted to cause it to operate over a surface much wider than the width of the excavating member itself.

A further object of the invention is to provide such a machine from which the excavating mechanism may be removed and the remaining portion of the machine utilized as a tractor for hauling and the like.

Other objects of the invention will appear as the mechanism is described in detail.

In the accompanying drawings, Fig. 1 is a side elevation of a machine embodying my invention; Fig. 2 is a plan view of the same, Fig. 3 is a front end elevation thereof; Fig. 4 is a sectional view taken between the bucket wheel and the tractor; Fig. 5 is a side elevation on an enlarged scale of the carriage for the excavating mechanism; and Fig. 6 is a cross sectional view of the bucket wheel.

In these drawings I have illustrated one embodiment of my invention but it will be understood that this particular embodiment has been chosen for the purpose of illustration only and that the invention may take various forms without departing from the spirit thereof.

In that embodiment of the invention here shown I have provided a suitable self propelled vehicle upon which the excavating mechanism and the operating and controlling devices therefor are mounted, and this vehicle will be hereinafter referred to as the tractor. The tractor, as here shown comprises a main frame 1, which is supported at one end, preferably the front end, that is the end adjacent to the excavating mechanism, by suitable traction devices, such as caterpillar tractors 2 of a well known construction. At its opposite, or rear, end the frame is supported by ground wheels 3 which are carried by an axle 4 mounted for pivotal movement about a vertical axis and connected by chains 5 with a steering post 6 by means of which the wheels 3 may be manipulated to steer the mechanism as the latter is advanced. The main frame 1 is of a width at its forward end sufficient to support the mechanism, as will be hereinafter described, and is preferably of a width equal to, or slightly greater than, the over all width of the caterpillar tractors 2. The side members of the frame converge rearwardly so that at its rear end the frame is of a width less than the distance between the two ground wheels 3, thus permitting these wheels to have a relatively large amount of vertical movement, about a longitudinal axis to accommodate the same to irregularities in the ground, or other supporting surface.

The tractor may be provided with a power generating device of any suitable character and in the present instance I have shown it as provided with an internal combustion engine 7 which is connected through a transmission mechanism, not shown but contained in the casing 8, with a shaft 9 extending forwardly from the engine and provided at its forward end with a worm 10 which meshes with a worm wheel 11 on a transverse shaft 12, which shaft is journaled in suitable bearings on the main frame 1. One end of this shaft has secured thereto a gear 13 which is adapted to mesh with a pinion 14 mounted on a shaft 15 also extending transversely to the main frame and to which the pinion 14 is connected by means of a feather 16. The pinion is provided with a grooved collar 17 to enable it to be connected with suitable shifting devices by means of which it may be moved into and out of mesh with the gear 13. Rigidly secured to the shaft 15, near the inner end thereof, is a sprocket wheel 18 which is connected by means of a sprocket chain 19 with a sprocket wheel 20

mounted on a shaft 21 and connected thereto by means of a clutch 22. The operating levers and the connecting devices between the same and the clutch 22 and the other clutches of this machine have been omitted from the drawings for the sake of clearness, but the clutches are shown as provided with the usual grooved collars by means of which they may be connected with controlling levers in the usual manner. Mounted on the shaft 21 is a pinion 23 which is connected to this shaft by means of a clutch 24 and which meshes with the external gear of a compensating device 25 mounted on a two part shaft 26. Secured to the ends of the shaft 26 are sprocket wheels 27 which are connected by means of sprocket chains 28 with the sprocket wheels 29 of the respective caterpillar tractors 2. In this manner it will be apparent that the tractor may be propelled by the engine and that the usual variable speeds may be had by use of the transmission mechanism 8. However, if these speeds are sufficiently high for use when the machine is travelling over the road they are too high for use for excavating purposes and I prefer therefore to provide other means for connecting the engine shaft with the compensating mechanism. To this end the shaft 12 is provided with a pinion 30 which is connected therewith by means of a clutch 31 and which meshes with a gear 32 on a shaft 33. The shaft 33 also has a pinion 34 which meshes with a gear 35 on a shaft 36. The shaft 36 has secured thereto a group of graduated sprocket wheels 37 which are adapted to be connected by means of a sprocket chain, not here shown, with a second group of graduated sprocket wheels 38 on the shaft 21, to which they are connected by means of a clutch 39. It will be apparent therefore that the machine may be propelled at road speed through the gears 13 and 14 and the sprocket chain 19, or that it may be propelled at a slower speed for excavating purposes through the gears 31, 32, 34 and 35 and the sprockets 37 and 38, and that during the interval of excavation when it is not desired to advance the machine bodily the driving mechanism may be entirely disconnected.

The excavating mechanism preferably comprises a rotary member, or wheel, 40 having arranged about its periphery a series of excavating elements, or buckets 41, so arranged that as the wheel rotates they will dig into the material and excavate a portion of the same. This rotary excavating mechanism, which will hereinafter be termed the bucket wheel may take various forms and may be supported in various ways, but in the present instance the wheel is mounted on a shaft 43 which is journaled in bearings 44 carried by the side members of a supporting frame 45 which is connected with the tractor frame and between the two members of which the bucket wheel is arranged. The buckets extend laterally from the wheel and are rigidly secured to the circumferential portion thereof. In the present instance I have mounted the buckets between two rings, or annular frame members, 46 and 47 which are respectively secured to the opposite sides of the buckets. The ring 46 is rigidly secured to the outer ends of the spokes of the wheel 40 so that the bucket structure, including the rings and the buckets, are rigidly secured to the wheel. The bucket wheel may be rotated about its axis in any suitable manner, but in the present construction I have employed gearing for this purpose and, as here shown, the rings 46 and 47 are provided with internal teeth 48 thereby constituting the same annular gears. These gears mesh respectively with pinions 49 and 50 carried by shafts 51 and 52 journaled in suitable bearings on the respective side members of the frame 45.

In order that the buckets of the bucket wheel may properly engage the material to be handled at different heights with relation to the tractor frame the wheel is so mounted that it is capable of vertical adjustment. In the present instance the frame 45 is pivotally supported, as shown at 53, upon slide blocks 54 mounted on vertical guides 55, which in turn are carried by the forward portion of the tractor frame. The frame 45 is supported in its adjusted positions, about its axis by means of a suitable cable 56 which is wound about a drum 57 on a shaft 58 journaled in the tractor frame, and extends upwardly about a guide, or sheave, mounted on a superstructure 60. This superstructure, in the present instance, constitutes a frame upon which the cabin for the tractor may be built but obviously it may be of any suitable character. The cable 56 extends forwardly from the sheave 59 about sheaves 61 supported from a transverse track, or bar, 62 which is carried by forwardly extending arms, or brackets, 63, which in turn are supported upon the frame 60. The cable is then passed about another guide, or sheave, 64 which is connected with a yoke 65 which straddles the upper portion of the bucket wheel and the two arms which are pivotally connected, as shown at 66, to the forward ends of the respective side members of the frame 45. Consequently the rotation of the drum 57 will raise the frame about its axis and thus elevate the wheel or will permit the wheel and the frame to move downwardly about said axis.

The frame 45 may be moved bodily in a vertical direction by sliding the blocks 54 upon the vertical guides 55 and while this may be accomplished in various ways I have here shown a cable 67 as connected with the

two slide blocks and as wound about a drum 68 supported in a supplemental frame 69 extending upwardly from the main tractor frame 1. This drum is in the present instance manually operated and to this end it has connected therewith a worm wheel 70 which is engaged by a worm 71 mounted on a shaft 72 provided at its upper end with a hand wheel 73.

The material elevated by the bucket wheel is preferably received by a conveyor which conveys the same laterally and disposes thereof at a point at one side of the line of travel of the mechanism. The material may be deposited by the conveyor in a wagon or in a car, or in a pile along the line of excavation. The conveyor, which is shown at 74, has its inner, or receiving, end extending into the bucket wheel so that it will lie beneath the buckets, which, as has been stated, project laterally from the wheel proper. To this end the conveyor is carried by a frame 75 which is mounted upon the frame 45 and the outer end of which projects laterally beyond the line of travel of the mechanism as a whole, and is supported by a suitable cable 76. To enable the receiving end of the conveyor to extend completely beneath the buckets and thereby receive the full load of each bucket as it is discharged therefrom, I have shown the spokes, or body portion, of the wheel 40 as provided with an outwardly curved portion 77 into which the inner end of the conveyor projects, as shown in Fig. 3. To retain the material in the buckets until it has been elevated to a point above the conveyor a guard plate 78 is mounted in a fixed position along the line of travel of the inner edges of the buckets and serves to close the open inner sides of the buckets until they have reached a point above the conveyor. To permit the outer end of the conveyor to be adjusted to different heights the frame is formed in two parts which are pivotally connected one to the other at 79. The conveyor must, of course, be adjusted vertically simultaneously with the vertical adjustment of the bucket wheel and the end portion thereof should also be capable of adjustment independently of the adjustment of the bucket wheel. In the present construction I utilize a single cable to effect both of these adjustments and to this end the cable 76 is passed about a block, or sheave, 80 connected with the conveyor frame near the outer end thereof and about a second block, or sheave, 81 which is suspended from the bar, or track, 62. One end of this cable extends from the block 81 to a drum 83 mounted on the supplemental frame 69 and actuated by a worm wheel 84 which is engaged by a worm 85 on a shaft 86 provided with a hand wheel 87. The other end of the cable 76 extends from the block 81 about a guide, or sheave, 88 rearwardly about a guide on the frame 60. In the present instance the cable 76 extends about the same sheave, 59, which carries the cable 56, said sheave being made double to accommodate both cables. From the sheave 59 the cable extends downwardly and is wound onto the drum 57 along with the cable 56. It will be apparent from this construction that when the drum 57 is operated to elevate the bucket wheel the conveyor will be elevated simultaneously therewith without disturbing the relative adjustment of the two parts and that the discharge end of the conveyor may be adjusted relatively to the bucket wheel by the manipulation of the hand wheel 87.

Means are provided for moving the bucket wheel transversely of the line of movement of the mechanism as a whole to enable it to operate over a path much wider than the width of the bucket wheel. To this end the supporting mechanism for the bucket wheel is so constructed and mounted that it can move transversely of the tractor frame. As here shown, the upright guides 55 are rigidly secured to rearwardly extending frame members 89 which are provided at their rear ends with bearings 90 which embrace a shaft 91 which in turn is journaled in bearings 92 on the tractor frame. These bearings 90 are so mounted on the shaft 91 that they are free to move axially thereof. Preferably the frame members 89 are provided with downwardly extending braces 93 which are secured at their lower ends to the guides 55. The guides 55 and the frame members 89 and their associated parts constitute a carriage which travels along a track 94 extending transversely of the tractor frame. This track is here shown as a channel iron and the carriage is provided with rollers 95 which travel in the track. Lateral movement may be imparted to the carriage, and consequently to the bucket wheel, by any suitable means, but in the present construction I have utilized cables for this purpose also and, as here shown, cables 96 are connected with the respective sides of the carriage and extend outwardly about guides, or sheaves, 97 at the outer ends of the track 94 thence rearwardly about drums 98 which are mounted on the shaft 58 and connected therewith by means of clutches 99.

The supporting mechanism for the outer end of the bucket wheel frame 45 and for the conveyor also move laterally with the bucket wheel and to this end the sheaves 61 and 81, which are suspended from the supporting bar, or track, 62 are carried, respectively, by roller carriers, 100 and 101, mounted to travel on the track 62. The two carriers are connected one to the other by a bar 102 so that movement imparted to one of them will be transmitted to the other. Cables 103 are connected with the opposite

sides of the carrier 100 and pass about guides or sheaves 104 mounted on the respective arms or brackets, 63 thence rearwardly and downwardly to drums 105 which are preferably rigidly secured to and form part of the drums 98 on the shaft 58. Consequently the operation of the drums 98 will also cause the operation of the drums 105 and the carriage for the bucket wheel and the carriers 100 and 101 will be moved simultaneously in the same direction and to the same extent. The cables 56 and 76, which support the bucket wheel frame 45 and the conveyor, are arranged centrally of the mechanism and are connected with the drum 57 which is held normally against rotation, by means of a suitable brake, which in the present instance, comprises a brake drum 106 with which cooperates a friction band not here shown. Therefore in order to prevent the lateral movement of the carrier 100 from altering the vertical position of the bucket wheel and the elevator, due to the shortening of the cable, I have provided the track 62 with a curved portion 107, the higher portion of which is at the center of the line of travel of the carrier 100. Consequently as the carrier moves in either direction from this central position and the cable is shortened due to the lateral movement of the carrier, the carrier moves downwardly along the curved surface of the track sufficiently to compensate for the shortening of the cable, thereby maintaining the bucket wheel and the elevator in their adjusted positions. Each double drum 98—105, is held normally against rotation by means of suitable brake mechanism, which, as here shown, comprises a brake drum 108 with which cooperates a friction band which is not shown but which may be of any suitable construction. It will be noted from an examination of Figs. 3 and 4 that the track 94 extends to points slightly beyond the outer edges of the caterpillar tractors, 2, so that the carriage for the bucket wheel can be moved for the full width of the mechanism, thereby enabling the latter to cut a path sufficiently wider than the mechanism to permit the same to travel therein, thereby enabling the mechanism to cut its own path. The drum shaft 58 may be driven in any suitable manner, but as here shown, it is provided with a sprocket wheel 109 which is connected by a sprocket chain with a sprocket wheel 110 on the shaft 12.

The shaft 91 to which the supplemental frame members 89 are anchored not only forms a guide for this supplemental frame but also serves as a driving shaft for the bucket wheel and to this end, a gear 112 is secured to this shaft between the bearings 90 of the supplemental frame so that it will have sliding movement on the shaft and will rotate therewith, this being preferably accomplished by connecting the gear to the shaft by means of a feather. Consequently, the gear can move laterally with the excavating mechanism and will receive rotatory movement from the shaft in all positions which it may assume. The shaft is rotated in the present construction by means of a sprocket wheel 113 secured to one end thereof and connected by a suitable sprocket chain with a sprocket gear 114 on the shaft 15, which shaft, as has been heretofore explained, is provided with a pinion 14 which may be moved into and out of mesh with the driving gear 13. The gear 112 on the shaft 91 meshes with a gear 115 mounted on a shaft 116 journaled in bearings 117 on the supplemental frame. The shaft 116 is provided with sprocket wheels 118 which are connected by means of sprocket chains 119 with sprocket wheels 120 on the shafts 51 and 52 which carry the gears 49 and 50 which mesh with the internal gears on the bucket wheel. Each sprocket chain 119 is preferably passed about a guide 219 arranged out of alinement with the axes of the two sprocket wheels so as to give the chain a triangular form which will permit the bucket wheel frame to be raised or lowered without affecting the tension of the chain. This mechanism not only rotates the bucket wheel but it also actuates the conveyor 74 and to this end the operating shaft of the conveyor, which is shown at 121, is connected by beveled gears 122 and 123 with the shaft 52. The conveyor shaft 121 carries the inner drum 124 and if desired positive rotation can be imparted to the outer drum 125 by means of a sprocket chain 126 passing about a sprocket wheel on the shaft 121 and a second sprocket wheel mounted on the shaft of the drum 125.

The operation of the mechanism will be readily understood from the foregoing description of the several parts thereof and it will be apparent that when an excavation is to be made, or material to be handled, the mechanism is advanced to bring the bucket wheel into a proper position with relation to the material and the bucket wheel is then adjusted vertically to the desired height. The forward movement of the tractor is then interrupted and the shaft 91 is operated to impart rotatory movement to the bucket wheel and at the same time the drums 98 and 105 on that side of the mechanism opposite the side on which the excavating wheel is located are operated to move the excavating wheel transversely to the tractor frame and consequently to the line of the excavation, thus causing the bucket wheel to make a cut transverse to the line of excavation. When the bucket wheel has reached the limit of its movement in one direction, which may be determined either by the width of the cut or the length of the track 94, the tractor is

operated to advance the mechanism as a whole and the drums 98 and 105 which have been operating are disconnected from the shaft and the other pair of drums 98 and 105 are connected therewith so that the bucket wheel is moved laterally in the opposite direction. If the machine is utilized for digging a trench, or for other work which does not require a cut of greater width than the width of the bucket wheel, the bucket wheel is set to the desired height and is fixed against transverse movement. A slow forward movement is then imparted to the tractor so that the bucket wheel will be forced into the material as the tractor advances. It will be apparent that the operation of the mechanism is of such a character that the machine can be used for the purpose of grading roads or the like, for miscellaneous excavations, as a trench machine, for the purpose of loading wagons or cars or the like, or as a back filler. Further, it will be apparent that by placing the mechanism upon an open top car that the mechanism may be used for unloading purposes. Further by removing the excavating mechanism, which can be done by removing the carriage for the bucket wheel frame 45, disconnecting the arms 63 from the frame 60 and disconnecting the cables, there remains a tractor which can be used for hauling or other uses to which the tractor may be put, and that this tractor will be provided with hoisting mechanism. This feature of converting the excavating machine into a tractor is an important one because in many places, as for example, in the oil fields there is a certain amount of miscellaneous excavating and trenching work to be done and there is also much hauling and moving of heavy parts to be done and by making the mechanism convertible, as I have, a single machine can be used for all these purposes.

While I have shown and described one embodiment of my invention I wish it to be understood that I do not desire to be limited to the details thereof as various modifications may occur to a person skilled in the art.

Having now fully described my invention what I claim as new and desire to secure by Letters Patent is:

1. In a mechanism of the character described, the combination with a supporting structure and means for advancing the same, of a bucket wheel rotatable about an axis transverse to the line of movement of said supporting structure, and means mounted on said supporting structure, for moving said bucket wheel bodily in a direction parallel with its axis of rotation.

2. In a mechanism of the character described, the combination with a supporting structure and means for advancing the same, of a bucket wheel rotatable about an axis transverse to the line of movement of said supporting structure, means for rotating said bucket wheel about its axis, and means mounted on said supporting structure for moving said bucket wheel in a direction parallel with its axis during its rotation about said axis.

3. In a mechanism of the character described, the combination with a supporting structure and driving mechanism mounted thereon, of a carriage mounted on said supporting structure for transverse movement relatively to said supporting structure and said driving mechanism, a bucket wheel connected with said carriage and rotatable about an axis parallel with the line of movement of said carriage, and means for simultaneously rotating said bucket wheel and actuating said carriage.

4. In a mechanism of the character described, the combination with a supporting structure and driving mechanism mounted thereon, of a carriage mounted on said supporting structure for transverse movement relatively to said supporting structure and said driving mechanism, a frame extending forwardly from said carriage, a bucket wheel rotatably mounted on said frame, and means carried by said supporting structure to support the outer end of said frame, said means being of such a character as to permit said frame to be moved transversely to said carriage.

5. In a mechanism of the character described, the combination with a supporting structure and driving mechanism mounted thereon, of a carriage mounted on said supporting structure for transverse movement relatively to said supporting structure and said driving mechanism, a frame, a bucket wheel rotatably mounted on said frame, said frame being so connected with said carriage as to permit said bucket wheel to be adjusted vertically relatively thereto, and means for actuating said bucket wheel.

6. In a mechanism of the character described, the combination with a supporting structure and driving mechanism mounted thereon, of a carriage mounted on said supporting structure for transverse movement relatively to said supporting structure and said driving mechanism, a frame pivotally mounted on said carriage, a bucket wheel rotatably mounted on said frame, and means mounted on said supporting structure and operatively connected with said bucket wheel for actuating the same.

7. In a mechanism of the character described, the combination with a supporting structure and driving mechanism mounted thereon, of a carriage mounted on said supporting structure for transverse movement relatively to said supporting structure and said driving mechanism, vertical guides carried by said carriage, blocks slidably mounted on said guides, a frame connected with

said blocks, a bucket wheel rotatably mounted on said frame, and means for actuating said bucket wheel.

8. In a mechanism of the character described, the combination with a supporting structure and driving mechanism mounted thereon, of a carriage mounted on said supporting structure for transverse movement relatively to said supporting structure and said driving mechanism, vertical guides carried by said carriage, slidable blocks mounted on said guide, a frame pivotally mounted on said slide blocks, a bucket wheel rotatably mounted on said frame, and means for actuating said bucket wheel.

9. In a mechanism of the character described, the combination with a supporting structure and means for advancing the same, of a carriage mounted on said supporting structure for movement transversely thereto, a bucket wheel connected with said carriage for rotation about an axis parallel with the line of movement thereof, actuating mechanism for said bucket wheel mounted on said carriage, a driving member mounted on said supporting structure, and means for maintaining an operative connection between said driving member and said actuating means during the transverse movement of said carriage.

10. In a mechanism of the character described, the combination with a supporting structure and means for advancing the same, of a carriage mounted on said supporting structure for movement transversely thereto, a bucket wheel connected with said carriage and capable of rotation about an axis parallel with the line of movement of said carriage, a transverse shaft mounted on said supporting structure, means for rotating said shaft, and actuating mechanism for said bucket wheel mounted on said carriage and comprising a member slidably mounted on said shaft and held against rotation relatively thereto.

11. In a mechanism of the character described, the combination with a supporting structure and means for advancing the same, of a carriage mounted on said supporting structure for movement transversely thereto, a frame connected with said carriage and capable of vertical adjustment relatively thereto, a bucket wheel rotatably mounted on said frame, a sprocket wheel mounted on said frame and operatively connected with said bucket wheel to rotate the same, a sprocket wheel mounted on said carriage, a sprocket chain connecting said sprocket wheels one to the other, a gear connected with said last mentioned sprocket wheel, a shaft mounted on said supporting structure, means for rotating said shaft, and a gear slidably mounted on said shaft, held against rotation relatively thereto and meshing with the first mentioned gear.

12. In a mechanism of the character described, the combination with a supporting structure and means for advancing the same, of a transverse shaft mounted on said supporting structure, means for rotating said shaft, a carriage mounted on said supporting structure for movement parallel with said shaft and having bearings slidably mounted on said shaft, a gear slidably mounted on said shaft between said bearings and held against rotation relatively to said shaft, a frame connected with said carriage, a bucket wheel rotatably mounted on said frame, and actuating mechanism mounted on said frame and said carriage and comprising a gear meshing with the first mentioned gear.

13. In a mechanism of the character described, the combination with a supporting structure and means for advancing the same, of a transverse shaft mounted on said supporting structure, means for rotating said shaft, a carriage mounted on said structure for movement parallel to said shaft and having bearings slidably mounted on said shaft, a gear slidably mounted on said shaft between said bearings and held against rotation relatively to said shaft, a frame mounted on said carriage for vertical adjustment relatively thereto, a bucket wheel rotatably mounted on said frame, a sprocket wheel mounted on said frame and having operative connection with said bucket wheel, a second sprocket wheel mounted on said carriage, a gear connected with said second sprocket wheel and meshing with the first mentioned sprocket gear, a guide supported by said carriage and arranged out of alinement with the axes of said sprocket wheels, and a sprocket chain extending about said sprocket wheels and said guide.

14. In a mechanism of the character described, the combination with a supporting structure and means for advancing the same, of a bucket wheel mounted on said supporting structure for adjustment both vertically and transversely thereto, a drum mounted on said supporting structure, means for rotating said drum, a sheave supported above said bucket wheel, a cable wound about said drum, extending over said sheave and connected with said bucket wheel to support the same in different vertical positions without interfering with the transverse movement thereof, and means for actuating said bucket wheel.

15. In a mechanism of the character described, the combination with a supporting structure and means for advancing the same, of a bucket wheel mounted on said supporting structure for adjustment both vertically and transversely thereto, a drum mounted on said supporting structure, means for rotating said drum, a sheave supported above said bucket wheel, a cable wound about said

drum, extending over said sheave and connected with said bucket wheel to support the same in different vertical positions without interfering with the transverse movement thereof, and means to compensate for the taking up of said cable as said bucket wheel moves transversely relatively to said drum, and means for actuating said bucket wheel.

16. In a mechanism of the character described, the combination with a supporting structure and means for advancing the same, of a drum mounted on said supporting structure, a carriage mounted on said supporting structure for movement transversely relatively to said drum, a frame mounted on said carriage for vertical adjustment relatively thereto, a bucket wheel rotatably mounted on said frame, means for rotating said bucket wheel, a track arranged above said bucket wheel parallel with the line of movement of said carriage, a carrier mounted on said track, a sheave connected with said carrier, and a cable wound about said drum, extending over said sheave and connected with the outer end of said frame.

17. In a mechanism of the character described, the combination with a supporting structure and means for advancing the same, of a drum mounted on said supporting structure, a carriage mounted on said supporting structure for movement transversely relatively to said drum, a frame mounted on said carriage for vertical adjustment relatively thereto, a bucket wheel rotatably mounted on said frame, means for rotating said bucket wheel, a track arranged above said bucket wheel parallel with the line of movement of said carriage, a carrier mounted on said track, a sheave connected with said carrier, a cable wound about said drum, extending over said sheave and connected with the outer end of said frame, said track having an upwardly curved portion to compensate for the taking up of said cable due to the transverse movement of said carrier relatively to said drum.

18. In a mechanism of the character described, the combination with a supporting structure and means for advancing the same, of a drum mounted on said supporting structure, a carriage mounted on said supporting structure for movement transversely relatively to said drum, a frame mounted on said carriage for vertical adjustment relatively thereto, a bucket wheel rotatably mounted on said frame, means for rotating said bucket wheel, a track arranged above said bucket wheel parallel with the line of movement of said carriage, a carrier mounted on said track, a sheave connected with said carrier, a cable wound about said drum, extending over said sheave and connected with the outer end of said frame, means for rotating said drum, and means for normally holding said drum against rotation.

19. In a mechanism of the character described, the combination with a supporting structure and means for advancing the same, of a track mounted on said supporting structure and extending transversely thereto, a carriage mounted on said track, a frame connected with said carriage, a bucket wheel rotatably mounted on said frame, a second track carried by said supporting structure and arranged above said bucket wheel parallel with the first mentioned track, a carrier mounted on said second track, a supporting connection between said carrier and said frame, and mechanism mounted on said supporting structure and connected with said carriage and said carrier to move the same along their respective tracks.

20. In a mechanism of the character described, the combination with a supporting structure and means for advancing the same, of a track mounted on said supporting structure and extending transversely thereto, a carriage mounted on said track, a frame connected with said carriage, a bucket wheel rotatably mounted on said frame, a second track carried by said supporting structure and arranged above said bucket wheel parallel with the first mentioned track, a carrier mounted on said second track, a supporting connection between said carrier and said frame, guides arranged near the opposite ends of both tracks, cables connected with said carriage and said carrier on opposite sides thereof and extending about the respective guides, and winding drums mounted on said supporting structure to actuate said cables.

21. In a mechanism of the character described, the combination with a supporting structure and means for advancing the same, of a track mounted on said supporting structure and extending transversely thereto, a carriage mounted on said track, a frame connected with said carriage, a bucket wheel rotatably mounted on said frame, a second track carried by said supporting structure and arranged above said bucket wheel parallel with the first mentioned track, a carrier mounted on said second track, a supporting connection between said carrier and said frame, guides arranged near the opposite ends of both tracks, cables connected with said carriage and said carrier on opposite sides thereof and extending about the respective guides, two double drums mounted on said supporting structure, cables connected with said carriage and said carrier on one side thereof and wound about the respective parts of one double drum, and cables connected with said carriage and said carrier on the other side

thereof and wound about the respective parts of the other double drum, and means for operating said double drums independently of each other.

22. In a mechanism of the character described, the combination with a supporting structure and means for advancing the same, of a bucket wheel carried by said supporting structure and comprising an annular member having internal gear teeth, and a plurality of excavating buckets secured to said annular member and extending laterally from the plane thereof, a pinion meshing with said internal gear teeth, and means mounted on said supporting structure for rotating said pinion.

23. In a mechanism of the character described, the combination with a supporting structure and means for advancing the same, of a bucket wheel carried by said supporting structure and comprising a single rotatory member having an internal gear, and a plurality of excavating buckets secured to the periphery of said rotatable member and projecting laterally in the plane thereof, a ring secured to the sides of said buckets opposite said rotatable member and independently thereof and having an internal gear, pinions meshing with the respective gears, and means for actuating said pinions.

24. In a mechanism of the character described, the combination with a supporting structure and means for advancing the same, of a frame mounted on said supporting structure and comprising side members, a bucket wheel rotatably mounted on said frame and arranged between the side members thereof, said bucket wheel comprising a single rotatable member having an internal gear, and excavating buckets secured to said rotatable member and projecting laterally from the plane thereof, a second internal gear rigidly secured to the sides of said buckets opposite to and independent of said rotatable member, shafts journaled on the respective side members of said frame, pinions mounted on said shafts and meshing with the respective internal gears, sprocket wheels secured to the respective shafts, other sprocket wheels mounted on said supporting structure, a sprocket chain to connect the first mentioned sprocket wheels with the last mentioned sprocket wheels, and means for rotating said last mentioned sprocket wheels.

25. In a mechanism of the character described, the combination with a supporting structure and means for advancing the same, of a bucket wheel rotatably mounted on said supporting structure and comprising a rotatable member and a series of buckets secured to the periphery of said rotatable member and projecting laterally therefrom, means for rotating said bucket wheel, and a conveyor supported adjacent to said bucket wheel with its receiving end projecting into the same so as to lie beneath said buckets when the latter are in their discharge positions, said rotatable member having an annular recess into which the end of said conveyor projects.

26. In a mechanism of the character described, the combination with a supporting structure and means for advancing the same, of a bucket wheel carried by said supporting structure and comprising spokes and excavating buckets projecting laterally from the plane of said spokes, said spokes having portions curved outwardly to form an annular groove, and a conveyor supported adjacent to said bucket wheel and having one end extending into said annular groove.

27. In a mechanism of the character described, the combination with a supporting structure and means for advancing the same, of a bucket wheel rotatably supported by said supporting structure, a conveyor carried by said supporting structure and arranged to receive the material from the buckets of said bucket wheel, and means for simultaneously moving said bucket wheel and said conveyor relatively to said supporting structure and transversely to the line of movement thereof.

28. In a mechanism of the character described, the combination with a supporting structure and means for advancing the same, of a bucket wheel rotatably supported by said supporting structure, a conveyor carried by said supporting structure and arranged to receive the material from the buckets of said bucket wheel, means for simultaneously moving said bucket wheel and said conveyor relatively to said supporting structure and transversely to the line of movement thereof and means for adjusting said bucket wheel and said conveyor vertically relatively to said supporting structure.

29. In a mechanism of the character described, the combination with a supporting structure and means for advancing the same, of a bucket wheel rotatably supported by said supporting structure, a conveyor carried by said supporting structure and arranged to receive the material from the buckets of said bucket wheel, means for simultaneously moving said bucket wheel and said conveyor relatively to said supporting structure and transversely to the line of movement thereof, means for adjusting said bucket wheel and said conveyor vertically relatively to said supporting structure, and means for adjusting said conveyor relatively to said bucket wheel.

30. In a mechanism of the character described, the combination with a supporting structure and means for advancing the same, of a frame mounted on said supporting structure for vertical adjustment, a bucket wheel rotatably mounted on said frame, a conveyor having one end supported on said

frame in a position to receive material from said bucket wheel, said supporting structure having a part overhanging said bucket wheel, a cable connected with the outer end of said frame and extending over a guide carried by said part of said supporting structure, a second cable connected with the outer end of said conveyor and extending about a guide carried by said part of said supporting structure, and a drum mounted on said supporting structure about which both of said cables are wound.

31. In a mechanism of the character described, the combination with a supporting structure and means for advancing the same, of a track mounted on said supporting structure and extending transversely thereto, a carriage mounted on said track, a frame connected with said carriage, a bucket wheel rotatably mounted on said frame, a conveyor having one end mounted on said frame and arranged to receive material from said bucket wheel, a second track supported by said supporting structure and arranged above said bucket wheel, a carrier mounted on said second track, a guide carried by said carrier, a cable connected with said frame and extending about said guide, a second carrier mounted on said track, a guide carried by said second carrier, a cable connected with the outer end of said conveyor and extending about the last mentioned guide, a drum mounted on said supporting structure with which both of said cables are connected, and means for moving said carriage and said carriers simultaneously along their respective tracks.

32. In a mechanism of the character described, the combination with a supporting structure and means for advancing the same, of a track mounted on said supporting structure and extending transversely thereto, a carriage mounted on said track, a frame connected with said carriage, a bucket wheel rotatably mounted on said frame, a conveyor having one end mounted on said frame and arranged to receive material from said bucket wheel, a second track supported by said supporting structure and arranged above said bucket wheel, a carrier mounted on said second track, two guides carried with said carrier, a cable connected with said frame and extending about one of said guides, a second carrier mounted on said second track, a guide carried by said second carrier, a cable connected with the outer end of said conveyor and extending about the guide on said second carrier and about the other guide on the first mentioned carrier, a drum mounted on said supporting structure with which both of said cables are connected, other cables connected with said carriers and said carriage, and drums mounted on said supporting structure and connected with said last mentioned cables to move said carriage and said carriers along their respective tracks.

33. In a mechanism of the character described, the combination with a supporting structure and means for advancing the same, of a track mounted on said supporting structure and extending transversely thereto, a carriage mounted on said track, a frame connected with said cariage, a bucket wheel rotatably mounted on said frame, a conveyor having one end mounted on said frame and arranged to receive material from said bucket wheel, a second track supported about said bucket wheel, a carrier mounted on said second track, two guides connected with said carrier, a cable connected with said frame and extending about one of said guides, a second carrier mounted on said second track, a sheave carried by said second carrier, a sheave connected with the outer end of said conveyor, a drum mounted on said supporting structure, means for rotating said drum, a cable connected with said drum and extending about the sheave on said second carrier, about the sheave connected with said conveyor then passing again about the sheave on said second carrier and about the other guide on the first mentioned carrier, and a second drum on said supporting structure with which both of said cables are connected, and means for moving said carriage and said carrier along their respective tracks.

34. In a mechanism of the character described, a supporting structure comprising traction devices and means for actuating said traction devices, of a bucket wheel carried by the forward end of said supporting structure, and means for moving said bucket wheel transversely to said supporting structure for a distance greater than the distance from the outer edge of one traction device to the outer edge of the other traction device, and means for actuating said bucket wheel.

35. In a mechanism of the character described, a supporting structure comprising traction devices and means for actuating said traction devices, of a track mounted on the forward end of said supporting structure and extending transversely thereto to points adjacent to the outer edges of the respective traction devices, a carriage mounted on said track and movable from one end thereof to the other, a bucket wheel connected with said carriage for movement therewith, and means for actuating said bucket wheel and said carriage.

36. In a mechanism of the character described, a supporting structure comprising traction devices, a bucket wheel mounted on said supporting structure, a shaft journaled on said structure, a motor having driving connection with said shaft, a second shaft mounted on said structure and operatively

connected with said traction devices, two separate trains of gearing for connecting the first mentioned shaft with the second shaft, one of said trains of gearing comprising variable speed mechanism, means for disconnecting one train of gearing from said second shaft when the other train of gearing is connected therewith, and means operated by the first mentioned shaft for actuating said bucket wheel.

37. In a machine of the character described, a carriage, power mechanism mounted on said carriage, a supporting structure mounted on said carriage for movement transversely thereto, a bucket wheel mounted on said supporting structure for rotation about an axis parallel with the line of movement of said supporting structure, and operative connections between said power mechanism, said supporting structure and said bucket wheel to rotate the bucket wheel and to impart transverse movement to said supporting structure, said bucket wheel comprising spokes and buckets projecting laterally therefrom, an endless conveyor extending laterally from said bucket wheel and having one end extending into the wheel beneath the point of discharge of said buckets to receive the material therefrom, and a driving connection between said endless conveyor and the operating mechanism for said bucket wheel, said conveyor being supported for transverse movement with said bucket wheel.

38. In a machine of the character described, a carriage, power mechanism mounted on said carriage, a supporting structure mounted on said carriage for movement transversely thereto, a bucket wheel mounted on said supporting structure for rotation about an axis parallel with the line of movement of said supporting structure, operative connections between said power mechanism, said supporting structure and said bucket wheel to rotate the bucket wheel and to impart transverse movement to said supporting structure, said bucket wheel comprising spokes and buckets projecting laterally therefrom, an endless conveyor extending laterally from said bucket wheel and having one end extending into the wheel beneath the point of discharge of said buckets to receive the material therefrom, a driving connection between said endless conveyor and the operating mechanism for said bucket wheel, said conveyor being supported for transverse movement with said bucket wheel, and a relatively fixed guard acting as a base over which the buckets move during a portion of their movement with the bucket wheel.

In testimony whereof, I affix my signature hereto.

CHARLES H. SHOOK.