L. A. KRUPP.

EXCAVATING AND GRADING MACHINE.

APPLICATION FILED AUG. 18, 1919.

1,347,860.

Patented July 27, 1920.

3 SHEETS—SHEET 1.

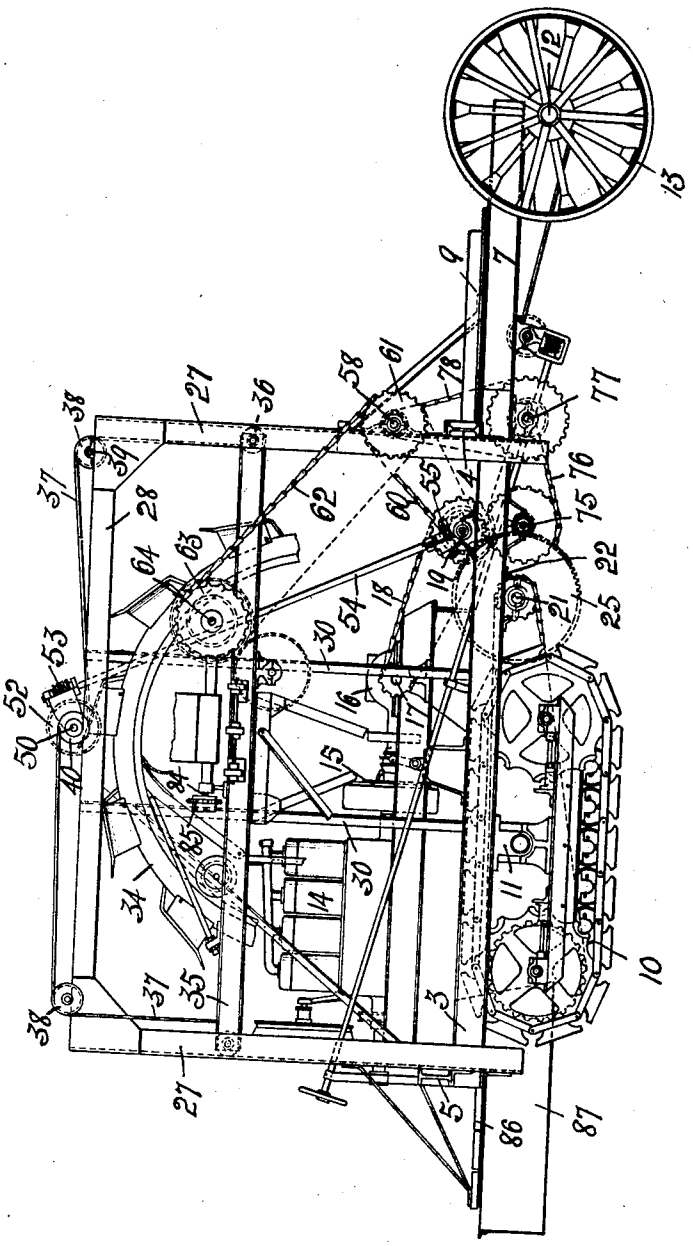


Fig. 1.

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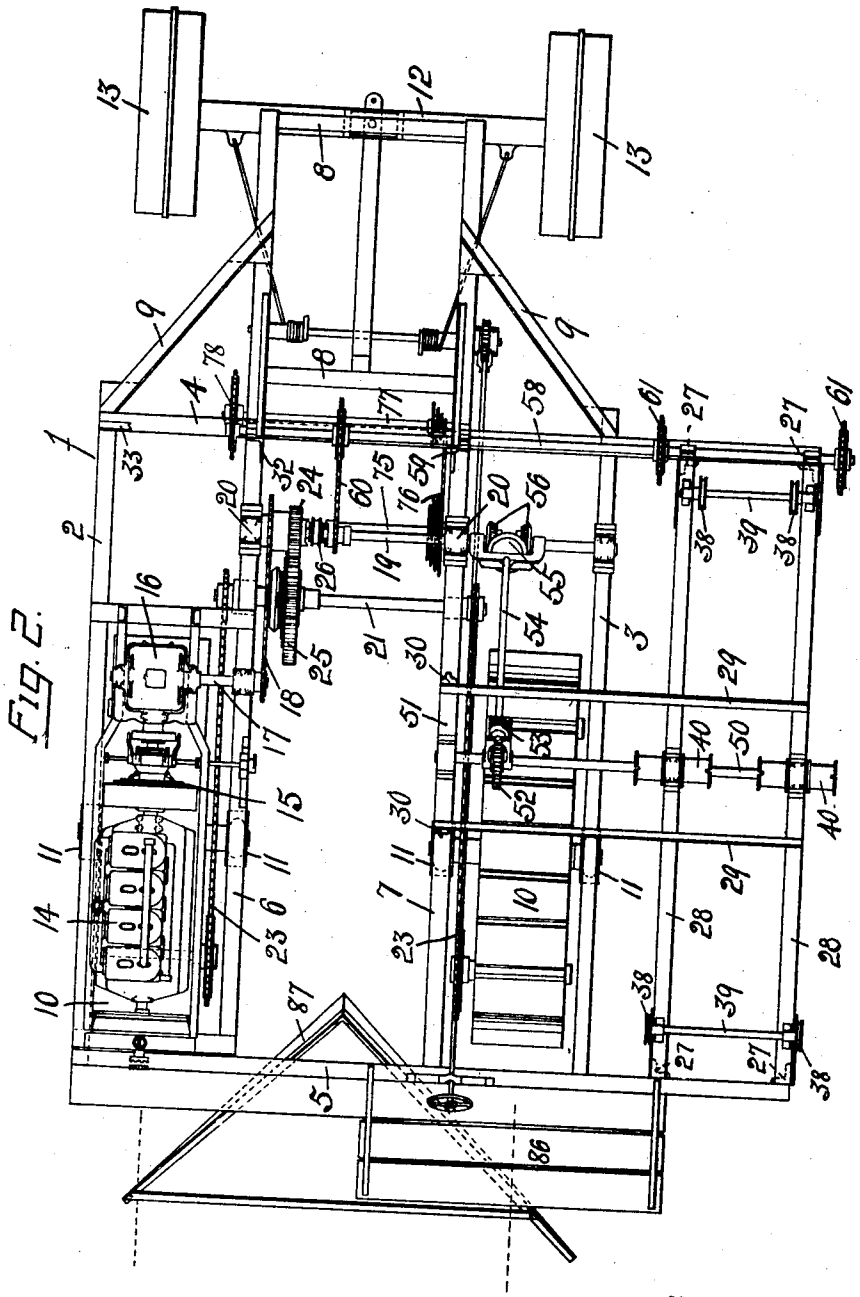


Fig. 2.

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3 SHEETS—SHEET 3.

Fig. 3.

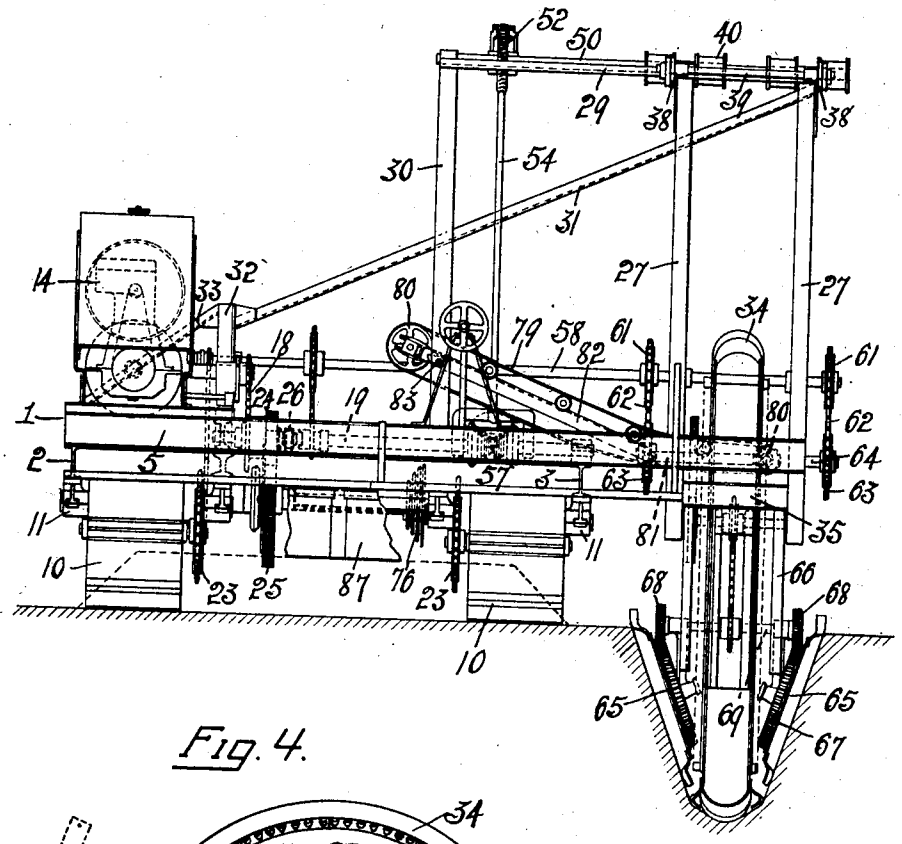
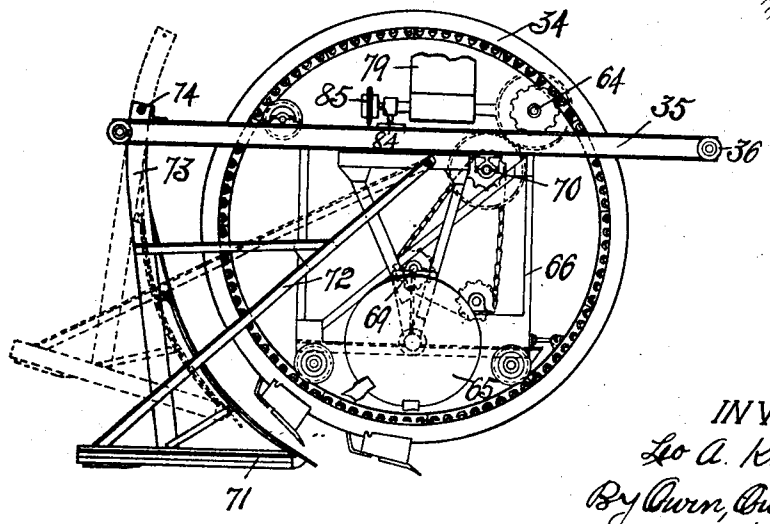


Fig. 4.



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UNITED STATES PATENT OFFICE.

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EXCAVATING AND GRADING MACHINE.

1,347,860. Specification of Letters Patent. Patented July 27, 1920.

Application filed August 18, 1919. Serial No. 318,174.

To all whom it may concern:

Be it known that I, LEO A. KRUPP, a citizen of the United States, and a resident of Findlay, in the county of Hancock and State of Ohio, have invented a certain new and useful Excavating and Grading Machine; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

This invention relates to excavating machines and has for its primary object the provision of a ditch excavating machine in connection with a grading machine whereby a ditch is dug or enlarged and the excavations therefrom delivered to the surface of a road at the side of a ditch and graded or spread thereover by a single machine.

Further objects and advantages of the invention will be apparent from the following detailed description.

While the invention in its broader aspect is capable of embodiment in numerous forms, a preferred embodiment thereof is illustrated in the accompanying drawings, in which,—

Figure 1 is a side elevation of a machine embodying the invention with parts broken away. Fig. 2 is a top plan view thereof with parts removed and parts broken away. Fig. 3 is a rear end elevation of the machine with the excavating wheel lowered in operative ditch digging position and with parts broken away and parts removed, and Fig. 4 is a side elevation of the excavating mechanism and associated shoe removed from the machine and with parts broken away and removed.

Referring to the drawings, 1 designates the main frame of the machine, which frame, in the present instance, is substantially rectangular in form and comprises the opposed longitudinally extending side beams 2 and 3 (Fig. 3) and the front and rear cross-beams 4 and 5 (Fig. 2). The frame 1 is also provided intermediate the side beams 2 and 3 with longitudinally extending beams 6 and 7, which are spaced equally at opposite sides of the tractive center of the machine. The beams 6 and 7 extend forward from the front beam 4 and are connected at intervals in front of said cross-beam by cross-members 8. The forward extended ends of the beams 6 and 7 are transversely braced relative to the cross-beam 4 by diagonal brace members 9.

The frame is supported, in the main, by a pair of tractor units 10, preferably of the caterpillar type, one of which is disposed between the beams 2 and 6, while the other is disposed between the beams 3 and 7, and each has its frame carrying trunnions journaled in bearings 11 depending from the respective beams, as well understood in the art. The forward extended end of the frame, which is formed by the extended ends of the beams 6 and 7, cross pieces 8 and brace members 9, is supported by an axle member 12, which is pivoted thereto for horizontal turning or steering movements and carries wheels 13 at its ends in advance of the respective tractor units 10.

A motor 14 is mounted, in the present instance, over the left hand tractor unit 10 being supported by the beams 2 and 6 and suitable cross-beams. The motor shaft is in separate sections with a manually controlled clutch connection 15 therebetween. The outer shaft section is in geared connection within a case 16 with a counter-shaft 17, having a sprocket-wheel and chain connection 18 with a second counter-shaft 19 that is journaled at its ends in bearings 20 mounted on the beams 6 and 7 adjacent to the front end of the frame. A jack-shaft 21 is disposed below and at the rear of the counter-drive-shaft 19 being journaled at its ends in suitable bearings 22 on the under sides of the beams 6 and 7, and each end of this shaft is in sprocket-wheel and chain connection 23 with the respective tractor unit 10. The drive shaft 19 carries a loose gear 24 in mesh with a larger gear 25 that is fast on the jack-shaft 21, and when it is desired to drive the tractor units at a greater speed than when digging, or when the machine is being transferred from one place to another, a clutch member 26 that is feathered on the drive shaft 19 is shifted into clutch engagement with the gear 24 so that the shaft 21 is then driven from the shaft 19 through the gears 24 and 25. A slower or digging speed is imparted to the jack-shaft 21, as hereinafter described.

The cross-beams 4 and 5 are extended at

the right of the machine beyond the frame beam 3 and each has a pair of uprights 27, which are spaced longitudinally of the respective beam and rise therefrom. The outer and inner sets of uprights are connected at their tops by transversely spaced beams 28, 28, which extend longitudinally of the frame. A pair of cross-beams 29 connect the beams 28 in spaced relation adjacent to the centers of said beams and extend inwardly therefrom to a point over the frame beam 8 where they are supported by respective standards 30 rising from the beam 7. The front uprights 27 are braced by an inclined member 31, which is connected at its lower left hand end to a short upright 32 rising from the frame beam 6, which upright is in turn braced by a member 33 extending to the adjacent outer side of the frame 1. The superframe formed by the uprights mentioned and by the beams 28 and 29 not only serves to guide the raising and lowering movements of the excavating wheel but also carries a portion of the means for raising and lowering the wheel.

The excavating wheel 34 is mounted within a rectangular vertically movable carrying frame 35, which carries rollers 36 at the ends of its side beams for guiding contact with the respective uprights 27, which, in the present instance, are of angle iron form. The manner of mounting the excavating wheel 34 in the frame 35 is well understood in the art and will therefore not be described. The wheel carrying frame 35 is suspended from the top of the superframe by four cables 37, which extend upward from the respective corners of the frame 35 thence over sheaves 38 on shafts 39 journaled on the beams 28 and thence inward to and wind around respective drums 40 on a shaft 50 that is journaled on the beams 28 and on a cross-beam 51, which connects the inner ends of the beams 29. It will be understood that the cables 37 at opposite ends of the wheel carrying frame 35 wind in opposite directions around the drums 40. The shaft 50 is provided adjacent to its inner end with a worm-wheel 52 with which a worm 53 on an inclined shaft 54 meshes. The lower end of the shaft 54 carries a bevel gear 55 in mesh with two bevel gears 56 loose on the drive shaft 19, whereby the shifting of a clutch member 57 (Fig. 3), which is feathered on the shaft intermediate the gears 56, into driving engagement with either gear 56 causes a driving of the shaft 50 in one direction or the other, as the case may be, to raise or lower the wheel carrying frame 35.

A shaft 58 is journaled above the plane of the frame 1 in suitable bearings on the forward uprights 27 and uprights 32 as well as an intermediate upright 59 rising from the beam 7, and the shaft 19 has a driving chain-and-sprocket connection 60 with the shaft 58 with the sprocket member thereof which is mounted on the shaft 19, loose on said shaft and engaged thereto by means of the shiftable clutch member 26, which may be moved to engage either the gear 24 or the sprocket wheel of the connection 60, but not both at the same time. The shaft 58 is provided adjacent to but at opposite sides of the front upright 27 of the superframe with sprocket-wheels 61, 61 which are in chain connection 62 with respective sprocket-wheels 63 that are carried at the outer ends of a shaft 64. This shaft is journaled in bearings on top of the wheel carrying frame 35 and extends transversely thereof through the excavating wheel 34 with which it has driving connection, as well understood in the art.

At each side of the lower portion of the excavating wheel are provided slope cutting wheels 65, which have their stub shafts journaled in bearings in the respective sides of a sub-frame 66. This frame depends from the frame 35 and coöperates therewith to guide the rotation of the excavating wheel. Slope cutting wheels 65 are provided on their inner sides with bevel gears 67 with which beveled drive pinions 68 engage, said pinions being carried by a cross shaft 69 in the subframe 66 and having chain and sprocket connection with a shaft 70 which is elevated with respect thereto and is in geared connection with the shaft 64, all of which is well understood in the art. It is thus evident that both the excavating wheel 34 and slope cutting wheels 65 are driven from the shaft 58 which in turn is driven from the drive shaft 19.

A scraper shoe 71 is suspended from the wheel carrying frame 35 at the rear of the excavating wheel 34 for the purpose of gathering any soil which may fall back into or be left in the trench being dug, as is common in machines of this type. This shoe has its supporting frame or structure provided with forwardly and upwardly extending arms 72, one at each side of the cutting wheel, and these arms are pivoted at their upper ends, in the present instance, to the upper portion of the subframe 66 for vertical swinging movements to permit a raising or lowering of the shoe relative to the wheel and frame 35. The shoe structure is also provided with one or more upstanding arms 73, which extend up through the adjacent end portion of the wheel carrying frame 35, and when the excavating wheel is in lowered position and advancing in a trench being dug, the shoe is secured in operative relation to the bottom of the trench by a bolt 74 which is projected through the arm 73 and a part of the frame 35. When the cutting wheel is being lowered into the ground and is gradually cut-

ting itself down to the desired depth the bolt 74 is removed so that the shoe 71 when resting on the surface of the ground at the rear of the cutting wheel or when following the wheel down an incline being cut as the wheel advances and descends to the desired depth, the shoe will be permitted to swing upward relative to the cutting wheel and thereby prevent the frame 34 being supported at one end and prevented from lowering by reason of the shoe 71 resting on an elevated portion of the ground. This is an important feature in connection with a machine of this type.

The driving or advancing speed of the machine is very materially reduced during the digging of a trench by driving the large gear 25 on the jack-shaft 21 from a similar pinion (not shown) on a shaft 75 in advance of the jack-shaft and the shaft 75 is in chain and sprocket connection 76 with a shaft 77 that is journaled in suitable bearings beneath the frame beams 6 and 7 and is in turn driven from the shaft 58 through the chain and sprocket connection 78. The chain and sprocket connection 76 between the shafts 75 and 77 is provided with a plurality of stepped sprocket wheels on each shaft, as shown in Fig. 2, so as to enable the advancing speed of the machine to be changed by changing the sprocket chain from one set to another of the sprocket wheels.

The soil raised by the excavating wheel 34 when in operation is discharged therefrom at the upper portion of the wheel and falls onto a conveyer apron 79 which projects at one end within the wheel over the wheel carrying frame 35 and has its opposite end projected over the open space in the machine frame 1 between the two beams 6 and 7 so that the excavations are delivered to the surface of the ground at the side of the ditch being dug and between the tractor units 10. The conveyer apron 79 passes around guide rollers 80 at opposite ends of a frame, which, in the present instance, is in two sections 81 and 82 with the section 81 rigidly mounted in horizontal position on the frame 35 and with the section 82 pivoted at its inner end to the inner end of the section 81 for vertical pivotal movement relative thereto to adapt the frame section 81 to raise and lower with the wheel carrying frame 35 without materially affecting the elevation of the outer end of the section 82 which for such purpose is pivotally supported at its outer end by a rod 83 extending between the two uprights 30. The rod 83 projects through slots in the frame section 82 to permit a limited longitudinal movement of the frame section relative to the rod. The conveyer has a shaft 84 in geared connection with the shaft 64 and carrying a sprocket wheel 85, which is in driving connection through the medium of a sprocket chain (not shown) with a sprocket wheel on the shaft with the rear apron guide roll 80. This conveyer in itself is old and nothing is claimed therefor apart from its use as an element in the combination.

The machine frame 1 is provided at its rear end with a platform 86 on which the operator stands and a plow or grading member 87 of V-form is suspended from the rear portion of the frame and platform in position to level the soil which has been delivered to the ground or road between the tractor units 10, 10 and to distribute the soil evenly over a space which in width is substantially equal to the space between the longitudinal centers of the tractor units, as indicated by dotted lines in Fig. 3.

This machine is intended particularly for excavating a ditch at a side of a road bed or intended road bed and to deliver and spread the excavations from the ditch over substantially one-half of the road, the other half of the road having the soil delivered thereto for surfacing purposes by the machine upon its return trip at which trip the ditch at the opposite side of the road is excavated and the soil therefrom delivered to and leveled over the half of the road surface which was not covered by the excavations from the first ditch. In the use of a machine of this class it is important that one-half of the road only be obstructed at a time by the machine so that traffic may be carried on along the unobstructed side, and for this reason the machine is adapted to level the diggings from the ditch at the adjacent side of the road over only substantially one-half of the road or the portion thereof over which the machine is operating.

In the use of this machine, the operator in starting a cut, the excavating wheel being in elevated position, lowers the same by throwing the clutch member 57 on the shaft 19 into engagement with the proper bevel-gear 56 thereby imparting rotation in the desired direction to the windlass shaft 50 to unwind the cables 37 therefrom and lower the frame 35 and cutter and digging means. He also throws the clutch member 26 into engagement with the sprocket-wheel and chain connection 60 which imparts a digging movement to the excavating and slope cutting wheels, and driving of the conveyer apron, and also communicates a slow forward feeding movement to the machine by reason of the slow driving connection between the shaft 58 and jack-shaft 21 which is connected to the two tractor units. The operator also removes the bolt 74 from the scraper shoe frame to permit the shoe to swing upward as the cutter wheel works downward and forward into the soil. When the cutter wheel has advanced a sufficient distance to

obtain the desired depth of cut and to carry the scraper shoe 71 free from the inclined cut just made, the bolt 74 is replaced to rigidly connect the frame 35 and shoe arm 73 to retain the latter in its lowered position, as shown in full lines in Fig. 4. The diggings from the ditch are raised by the excavating wheel and delivered to the conveyer apron 79, which in turn discharges them over the adjacent road between the tractor units 10, 10 and at a desired distance from the ditch. As the machine advances over the excavations delivered onto the road the scraper 87 levels and distributes the same over substantially one-half of the road at the rear of the tractor units. Upon the return trip the same operation is repeated for digging the ditch at the opposite side of the road and for delivering the diggings to and spreading them over the surface of the adjacent half of the road.

I wish it understood that my invention is not limited to any specific construction, arrangement or form of the parts, as it is capable of numerous modifications and changes without departing from the spirit of the claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is,—

1. In a machine of the class described, a frame, transversely spaced tractor means supporting the frame with the frame extending at one side beyond said means and provided with an opening between said means, an excavating means carried by the extended side of the frame at a side of said means and capable of being raised and lowered relative to the frame, mechanism for operating said excavating means and imparting movement to the tractor means, and means for delivering the diggings of the excavating means to a point between the tractor means and through the frame opening.

2. In a machine of the class described, a frame, transversely spaced tractor means supporting the frame, with the frame extending at one side beyond said means, an excavating means carried by the extended side of the frame and capable of being raised and lowered relative thereto, means for delivering the diggings of said excavating means to a point between the tractor means, and means carried by the frame for leveling and spreading the diggings delivered to the ground between the tractor means.

3. In a machine of the class described, a frame, transversely spaced tractor means supporting the frame, the frame being extended at one side beyond the tractor means and having a superstructure, an excavating wheel mounted in said superstructure for vertical movements therein, means for raising and lowering the excavating wheel in said superstructure, means for driving the excavating wheel, means for delivering excavation received from the wheel transversely of the frame to a point between the tractor means, and means carried by the frame for spreading and leveling the diggings delivered to the soil between the tractor means.

In testimony whereof I have hereunto signed my name to this specification.

LEO A. KRUPP.