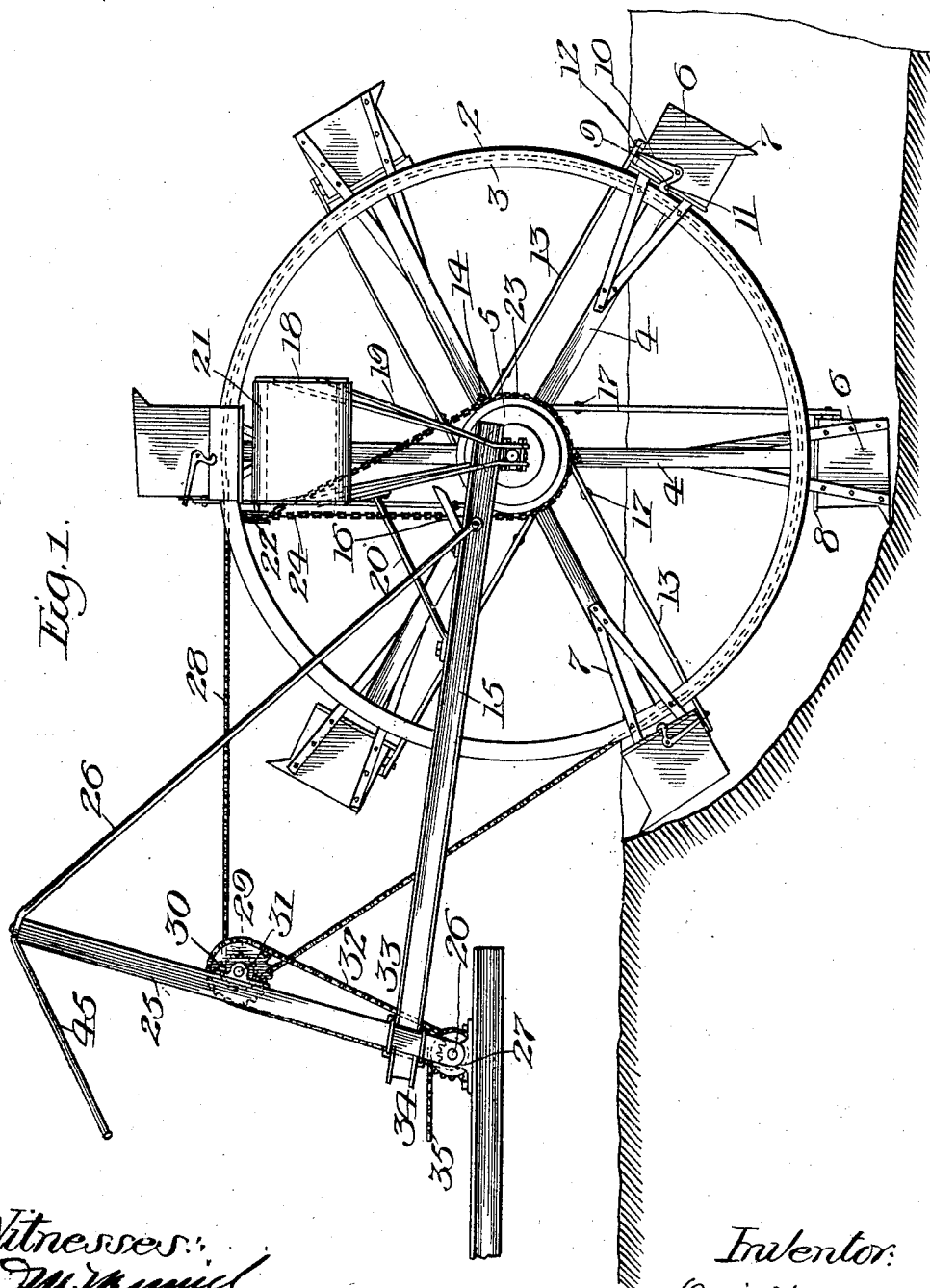


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EXCAVATING MACHINE.
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976,589.

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2 SHEETS-SHEET 1.



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EXCAVATING-MACHINE.

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To all whom it may concern:

Be it known that I, DAVID W. MILLER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Excavating-Machines, of which the following is a specification.

This invention relates to improvements in excavating machines of that type in which the excavator is embodied in the form of a rotary wheel which is supported and carried along by a traveling wagon and progressively excavates the ditch in the rear of the wagon.

This specification is a divisional application of an original application filed January 8, 1907, Serial No. 351,347.

Among the salient objects of the invention are to provide a machine of the character referred to, the excavator wheel of which carries a series of combined diggers and buckets arranged on either side of the wheel and which cooperate to loosen the soil and collect and carry it upwardly out of the ditch; to provide in a construction of the character referred to automatic tripping mechanism for delivering the soil from the buckets into the traveling conveyers and which automatically returns to normal inoperative position; to provide a construction in which the buckets may be mounted beyond the rim of the excavator wheel in order to vary the depth of the ditch and in which the size of the rim may be varied independently of the location of the buckets; to provide an improved form of conveyor for delivering the soil at either side of the ditch; to provide improved means for driving the conveyor belts directly from the excavator wheel; to provide a construction in which the excavator wheel and conveyor belts may be bodily raised and lowered and otherwise manipulated, the wagon and excavator propelled slowly and at a rate of speed suitable to excavate the ditch, and at a higher rate of speed when not excavating; all effected from one prime mover and suitable driving connections therewith; and in general to provide an improved construction of the character referred to.

To the above ends the invention consists in the matters hereinafter described and more particularly pointed out in the appended claims.

The invention will be understood from the following description reference being had to the accompanying drawings in which—

Figure 1 is a side elevation of my excavator wheel shown as connected to the rear end of a suitable supporting and driving mechanism. Figs. 2 and 3 are relatively a plan view and a side elevation of the preferred driving mechanism, parts being broken away to reduce the size of the drawing.

Referring to the drawings 1 designates as a whole a suitable wagon or operating truck, to which is operatively connected an excavator wheel designated as a whole 2. Describing first this excavator wheel, it comprises a rim 3, a series of spokes 4, connected to the rim and extending inwardly to the hub 5. Upon alternate sides of the rim are mounted a series of buckets 6, there being in the present instance three on each side. The arrangement is such that the driving chain or belt may extend around the rim of the wheel and, between the various buckets. These buckets are mounted beyond the rim of the wheel and are connected to the spokes by means of a pair of arms 7 rigidly bolted to the spokes 4 and the rim of the wheel. It will thus be seen that the respective buckets may be mounted at any desired distance beyond the rim of the wheel to vary the depth of the ditch while at the same time the size of the rim may be decreased. This may be accomplished by simply providing a smaller rim 3.

Upon the forward end of each of the buckets are rigidly secured diggers 7' in a well known manner. In operation diggers of any preferred type will be secured to the wheel in advance of the buckets in a well known manner, but these are not shown inasmuch as they form no part of the present invention. That face of the bucket which lies nearest to or tangentially to the wheel, is hinged to the bucket in such a manner as to open laterally and away from the side of the wheel. This hinged member 8, which may be termed the bottom of the bucket, is normally held closed by latches 9 on bell-crank levers 10, said latches engaging lugs 11 on the opening edges of the bucket bottoms. The open position of the bucket is shown at the top of the wheel in Fig. 1.

In order to provide means for automatically releasing the bottoms of the buckets at the proper time for delivering the soil to the conveyers I provide an unlatching mechanism which comprises preferably the bell-crank levers 10, and trip levers 12 mounted upon the buckets, and trip rods 13 passing through guides 14 carried by the wheel. Secured to each boom member 15, hereinafter more particularly described, is a fixed cam 16, which is arranged to depress in succession each trip rod 13 as the bucket pertaining to that rod arrives at the top of the wheel. To this end each trip rod is provided with a laterally projecting cam roller 17, arranged to be carried beneath the cam 16, and thereby, with its rod 13 depressed. This movement rocks the associated trip lever, which rocks the latch lever 10 and disengages the latch from the lug 11 of the hinged bucket member. Thereupon the latter drops and the contents of the bucket are dumped, in this case, upon the conveyor, hereinafter described. The hinged plate 8 is held open until the soil has all been emptied from the bucket and until a bucket is carried down to the position where it will close by its own weight, and when this occurs the latch lever, urged by the weight of the loosely-mounted slidable rod 13 will re-engage the lug 11 as shown in the lower right hand portion of the wheel in Fig. 1.

Describing now the manner of conveying the dirt from the buckets to the sides of the ditch, an endless conveyor is mounted at either upper side of the wheel, each conveyor extending transversely beyond the sides of the ditch. Each conveyor comprises a traveling belt 21 trained around a belt frame 18 rigidly supported by arms or braces 19 which are suitably connected to the axle shaft of the wheel and other braces 20 secured to the sides of the frame 18 and the boom members 15. The cam members 16 are so arranged that they will operate the tripping mechanism and release the soil when the respective buckets reach a point adjacent to the belt 21. This belt may obviously extend out beyond the sides of the ditch. It is of course apparent that in case the wheel is driven at a sufficiently high rate of speed suitable means will be provided for preventing the soil from being carried beyond the traveling belt or apron. I prefer to drive the conveyor belts directly from the excavating wheel, in the novel manner shown; a suitable sprocket 22 on one of the conveyor shafts, and a sprocket 23, rotating with the excavating wheel, are connected by a driving chain 24. The operation will be obvious.

Describing now the manner of supporting the excavating wheel I employ a pair of boom members 15, heretofore referred to. These boom members are connected to a strut frame 25 and the upper portions of

said strut frame are connected with the respective boom members at points remote from the strut frame by means of tension bars 26. The lower end of the strut frame is formed by a transverse rock bar 26 which is journaled in suitable bearing supports 27 mounted upon the main side members of the wagon 1 near the rear end of the latter.

In order to drive the excavator wheel I provide an endless belt or chain 28 trained around sprocket teeth formed on the outer periphery of the rim 3 and also trained around a driving sprocket 29 mounted upon the strut frame. This drive sprocket is sleeved to a companion sprocket 30 and the two mounted upon a suitable shaft 31 extending across the rectangular strut frame 25. The sprocket 30 is driven by a belt 32 from another pair of sprockets 33, 34 similarly sleeved together and journaled upon the rock shaft 26. Sprocket 34 is driven by a belt 35 which leads forwardly to and is connected with a sprocket 36 mounted upon a transverse shaft 37 suitably journaled upon the wagon. Shaft 37 is driven from a main shaft 38 which is journaled to extend longitudinally of the wagon, the beveled gear 39 on said main shaft serving to transmit motion to a second beveled gear 40 on shaft 37. A clutch 41 controlled by a bell-crank-lever 42, hand lever 43, and connecting rod 44, serves to throw the sprocket 36 into and out of gear with shaft 37.

For raising and lowering the excavating wheel, so as to vary the depth of the cut or elevate the wheel for transportation, tension links 45 are connected with the upper end of the strut frame 25, and with the ends of these links are connected winding cables 46 which extend to and are wound upon a cross shaft 48 journaled in the main frame of the wagon. If desired the links 45 may be dispensed with and the cables 46 connected directly with the strut frame. Shaft 48 carries a worm gear 49, the upper periphery of which is engaged and actuated by a worm shaft 50, which is in turn driven by a sprocket 51 mounted thereon. Sprocket 51 is connected with another sprocket 52 on the main shaft by a sprocket belt, and the sprocket 52 is controlled by a clutch 53 and hand lever 54 for operating the same.

For propelling the machine along slowly, so as to excavate a ditch progressively, and for propelling the machine at a more rapid speed when transferring it from place to place, driving connections are provided as follows; upon the main shaft 38 is mounted a sprocket 55 which is belted to a sprocket 56 upon a worm shaft 57 carrying a worm 58. The worm actuates a gear 59 upon a transverse shaft 60, which latter is provided at one end with a pinion 61, which meshes with a gear 62 upon another transverse shaft 63. Shaft 63 carries at each end pinions 64,

65 which engage and drive relatively large spur gears 66 upon the main traction wheels 67. This is the low speed drive.

For propelling the machine more rapidly, shaft 60 is driven from the shaft 37 through the medium of a sprocket 68 mounted upon said shaft and belted to another sprocket 69 upon the shaft 60. The driving connections between gear 59 and shaft 60 and between sprockets 69 and shaft 60 are controlled by means of a pair of clutches 71 and 72, respectively, the movable members of these clutches being locked together as indicated at 73 and actuated by a bell-crank 75 and hand lever 74. The arrangement is such that the clutches are forced into gear alternatively, and when the clutches are in the intermediate position both are out of gear. A differential gear mechanism 76 is interposed in the shaft 63; the center member of this differential being connected and driven by the spur gear 61. The main shaft is rotated by a pair of reversible engines A and B mounted upon the wagon frame, and receive steam from a boiler C also carried by the wagon.

While I have herein shown one embodiment of my invention it is apparent that it may be varied in details of construction without in any manner departing from the spirit of the invention.

I claim as my invention:

1. In a wheel excavator, the combination of a wheel frame, a series of buckets secured to said frame, the radial inner face of each bucket being hinged thereto at one side edge thereof and arranged to open laterally when the bucket of which it forms a part arrives at or adjacent to the top of the wheel, a latch for holding the hinged member of each bucket in closed position until the bucket arrives at discharging position, and automatic means for successively retracting the latches, said hinged bucket members closing by gravity during the descent of the buckets and being automatically latched.

2. In a wheel excavator, the excavating wheel and its carrying frame, in combination with a series of excavator buckets mounted peripherally and alternately upon opposite sides of the wheel, the radial inner side of each bucket being hinged thereto and arranged to open laterally when the bucket of which it forms a part arrives at or adjacent to the top of the wheel, a latch for holding the hinged member of each bucket in closed position until the bucket arrives at discharging position, and automatic means for successively retracting the latches, said hinged bucket members closing by gravity during the descent of the buckets and being automatically latched.

3. In a wheel excavator, an excavating wheel, a series of buckets mounted upon said wheel, the radially inner face of each

bucket being hinged thereto at one side edge thereof and arranged to open laterally to discharge its contents therefrom, means for holding the hinged member of each bucket in closed position until the latter arrives at discharging position, automatic means for successively opening the hinged portions of said buckets, and means for automatically closing the same.

4. In a wheel excavator, an excavating wheel, a series of buckets mounted peripherally upon said wheel, the radially inner side of each bucket being hinged thereto at one side edge thereof and arranged to open laterally when the bucket arrives at discharging position, means for holding said hinged member normally closed, and automatic means for successively tripping the hinged members of said buckets.

5. In a wheel excavator, an excavating wheel, a series of excavator buckets peripherally mounted on said wheel, the radially inner side of each bucket being hinged thereto at one side edge thereof and arranged to open laterally, a latch for normally holding said hinged member in closed position, and automatic tripping mechanism arranged to successively trip open said hinged members when the buckets arrive at their discharging position.

6. In an excavator wheel, a series of buckets mounted peripherally on said wheel, an endless conveyer mounted adjacent to the top of said wheel and extending outwardly laterally beyond the side of the excavation and means for driving said conveyer by the rotation of said excavating wheel.

7. In a wheel excavator, the combination of a supporting frame, an excavator wheel mounted on bearings carried by said frame, an endless conveyer mounted adjacent to the top of said wheel and carried by said supporting frame and means for driving said conveyer by the rotation of said excavator wheel.

8. In a wheel excavator, the combination with a supporting frame, an excavating wheel mounted on bearings carried by said frame, an endless conveyer mounted adjacent to the upper periphery of said wheel, brace rods connecting said conveyer frame with the axis of said excavator wheel and other brace members connected to said conveyer and extending thence to said supporting frame at points remote from the axis of said wheel.

9. In a wheel excavator, a supporting frame, an excavator wheel journaled in said supporting frame, an endless conveyer mounted adjacent to the upper periphery of said wheel and extending thence laterally outwardly beyond the side of the excavation, brace rods supporting said conveyer and extending thence radially inwardly to

said supporting frame, and other brace members connected to said conveyer and connected to said supporting frame at points remote from the axis of said excavator wheel.

5 10. In a wheel excavator, the combination with a supporting frame, an excavator wheel mounted in bearings carried by said supporting frame, an endless conveyer carried by said supporting frame and extending
10 thence laterally outwardly beyond the side of the excavation, a sprocket member sleeved to the hub of said excavator wheel, a second sprocket member carried by said conveyer, an endless belt or chain trained around said
15 sprocket members whereby said conveyer is driven by the rotation of said excavator wheel.

11. In a wheel excavator, the combination with a supporting frame, of an excavator
20 wheel mounted thereon, an endless conveyer mounted on either side of said excavator wheel and extending laterally beyond the respective sides of the excavation, and means for driving said conveyers.

25 12. In a wheel excavator, the combination with a supporting frame, of an excavator

wheel mounted in the bearings carried by said supporting frame, an endless conveyer mounted on either side of said excavator wheel and carried by said supporting frame, 30 said conveyers extending from points adjacent to the top of said excavator wheel beyond the respective sides of the excavation.

13. In a wheel excavator, the combination of a wheel frame, the perimeter of which 35 is formed by a ring, a series of pairs of brace arms secured to the wheel frame inside of the periphery thereof extending radially outward beyond the ring and secured to the latter, and buckets secured upon the outer 40 ends of each pair of brace arms.

14. In a wheel excavator, the combination of a wheel frame, the periphery of which is formed by a ring, buckets secured to said excavator wheel and means for supporting 45 said buckets beyond the periphery of said wheel.

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