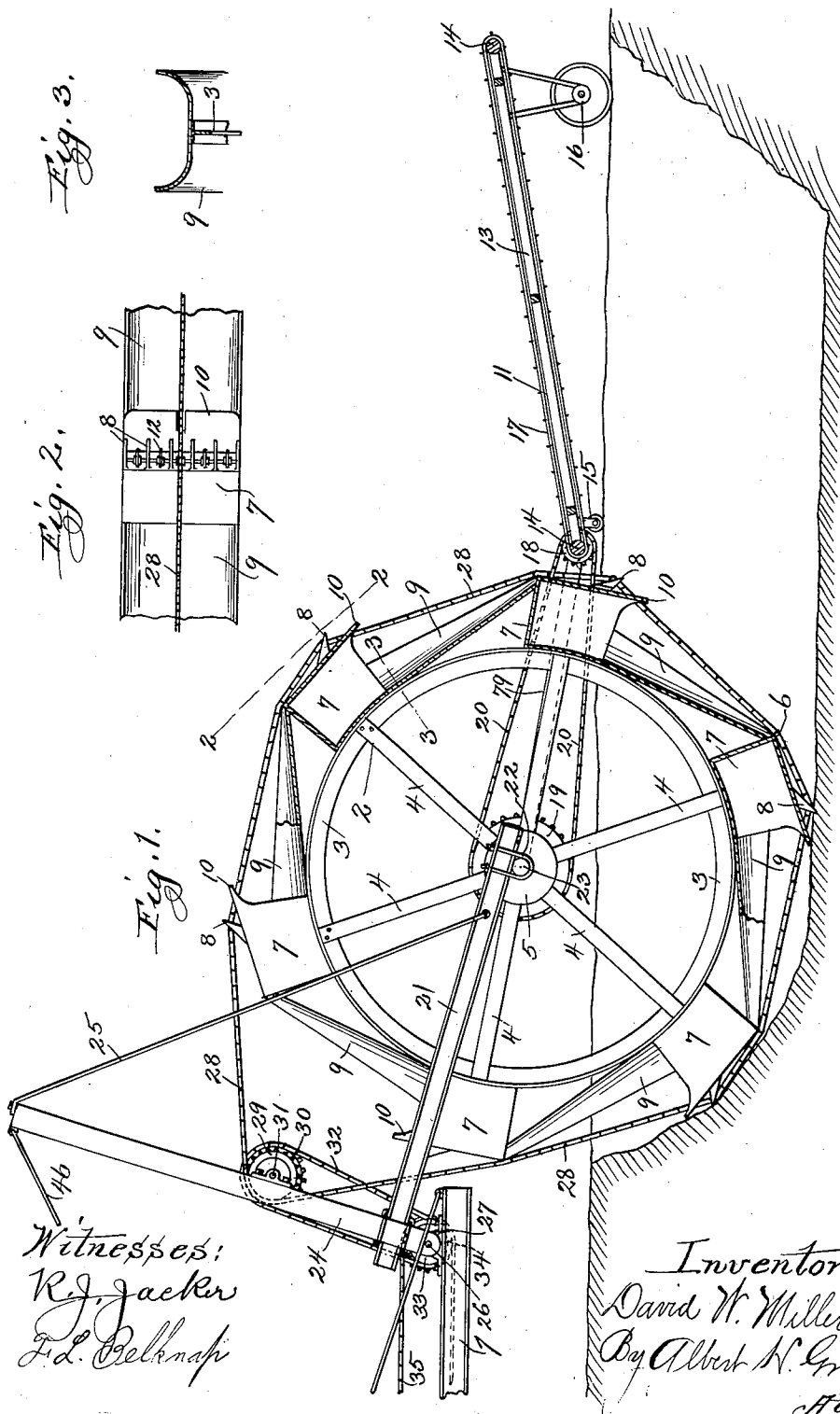


939,850.

D. W. MILLER.
EXCAVATING MACHINE.
APPLICATION FILED FEB. 11, 1908.

Patented Nov. 9, 1909.
2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 4.

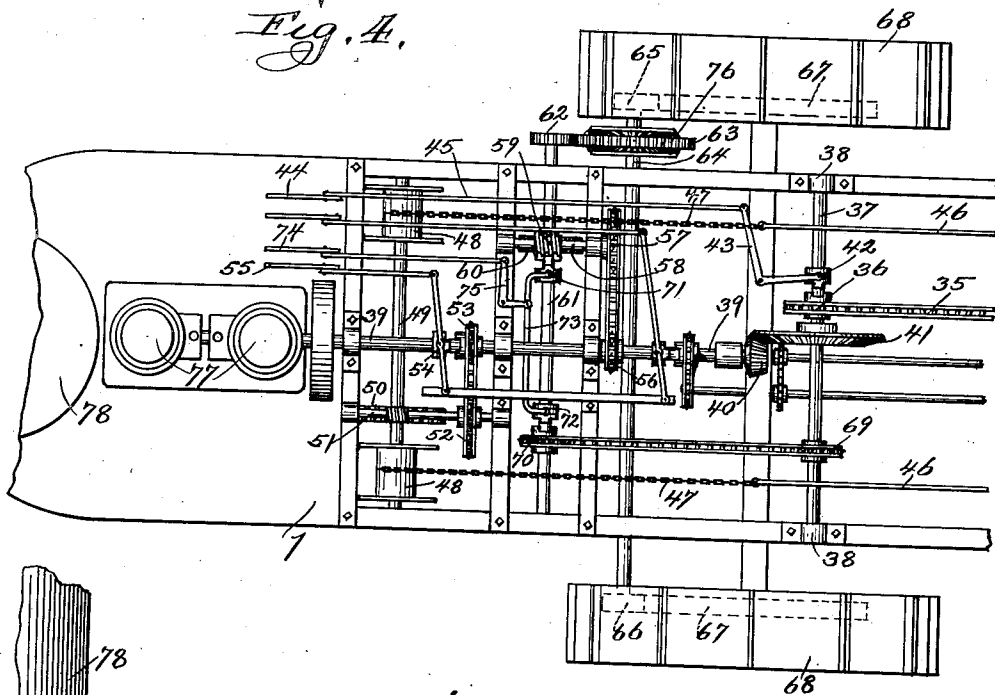
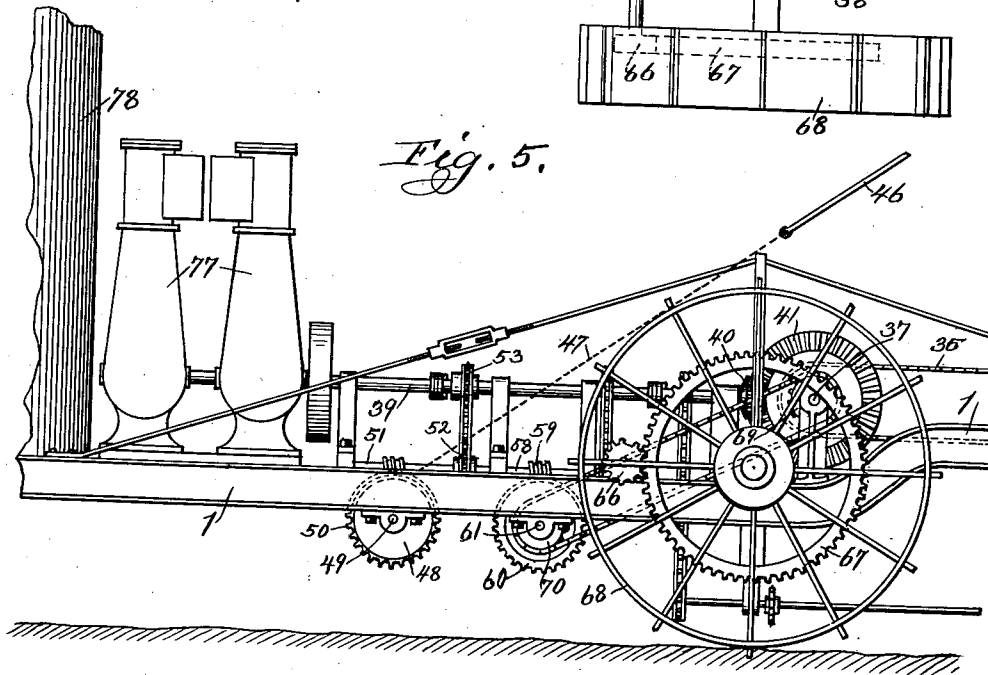


Fig. 5.



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UNITED STATES PATENT OFFICE.

DAVID W. MILLER, OF CHICAGO, ILLINOIS.

EXCAVATING-MACHINE.

939,850.

Specification of Letters Patent.

Patented Nov. 9, 1909.

Original application filed January 8, 1907, Serial No. 351,347. Divided and this application filed February 11, 1908. Serial No. 415,310.

To all whom it may concern:

Be it known that I, DAVID W. MILLER, a citizen of the United States, residing in Chicago, 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; and is a divisional specification 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 buckets and diggers which operate to loosen the soil and to collect and carry it upwardly out of the ditch, thereafter discharging it at the rear of the wheel; to provide a construction in which the excavator wheel may be operated, raised and lowered, and otherwise manipulated, the wagon and excavator propelled slowly and at a rate suitable to the excavating of the ditch and at a higher rate of speed when not excavating; to provide an extremely durable and simple construction of the excavator wheel in which substantially all the parts are rigidly connected with each other; to provide an improved combined scraper and bucket construction which is adapted to carry the soil to the upper periphery of the wheel and there deliver it by gravity; to provide an improved form of conveyer mechanism adapted to receive the soil from the buckets and discharge it in the ditch being excavated at a relatively remote distance from the conveyer; to provide an improved form of delivery chute for delivering the soil from the buckets to the conveyer; to provide simple and reliable operating connections between the excavator wheel and driving engines; and in general to provide an improved construction of the character referred to.

The preferred embodiment of the excavator wheel here shown is more specially adapted for use where the pipe or tile is laid in the ditch during the progress of the excavator wheel but is not necessarily confined to such use.

To the above ends the invention consists of 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 view partly in side elevation and partly in section of the excavator wheel together with the traveling conveyer. Fig. 2 is a fragmentary plan view taken on line 2—2 of Fig. 1 and showing the bucket construction. Fig. 3 is a cross sectional view of one of the chutes showing the curved side thereof. Fig. 4 is a plan view of the preferred driving mechanism. Fig. 5 is a side elevation of the driving mechanism shown in Fig. 4.

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 of T beam form in cross section, a suitable series of spokes 4 connecting the rim 3 with the hubs 5 and a plurality of combined scraper and digger mechanisms designated as a whole 6 which are rigidly mounted upon the outer periphery of the rim 3. Each of the combined scraper and digger mechanisms comprises a bucket 7 of a series of teeth 8 and a delivery chute 9. The buckets 7 are closed except at their front sides and the front outer edge of each bucket terminates in a chisel like cutter or scoop as 10 which serves to direct the soil into the bucket. The buckets discharge during the downward descent at the rear side of the wheel and by the reversed position; gravity being depended upon to insure the emptying of the bucket. In order that the soil may be directed to a conveyer mechanism designated as a whole 11, mounted at the rear of the excavator wheel, each trough-like chute 9 is secured to extend from the front radially to the inner side of each bucket and tangentially forwardly to the outer rear corner of the next preceding bucket. The sides of these chutes are curved upwardly as shown in Fig. 3, and the depth of each chute is desirably greater at its junction with the mouth of the bucket than at its point of delivery.

Across the bottom of each bucket is arranged a series of digger teeth 8, the points

of which project radially beyond the points of the cutters 10, so that the teeth dig up the earth in advance of the cutters. These diggers are shaped much like the spring harrow tooth in common use and are so arranged that the teeth of one scraper are offset or out of circumferential alinement with those of the succeeding scraper. In order to guard against breakage of expensive parts of the machine when excavating stones or large roots, these digger teeth are secured in position by means of breakable pins 12, (see Fig. 3); one breakable pin being arranged to extend through the locking aperture for each tooth of a transverse set. These breakable pins are of wood or other suitable material which will shear off in case the tooth encounters a non-yielding obstruction.

The conveyer 11 comprises a conveyer frame 13 consisting of parallel bars spaced apart by means of suitable cross bars, carrying at each end belt rollers 14, and provided at its front and rear ends with wheel leg frames or trellis frames 15 and 16. The conveyer frame is of suitable width to straddle the ditch excavated by the wheel, so that the wheels thereof travel on each side of the ditch, and the frame is of such length as to carry the other rearwardly to a considerable distance, say from ten to twenty feet in the rear of the excavator. The conveyer belt 17 is mounted upon the conveyer frame, and the roller 14 adjacent to the excavating wheel is positively driven by means of a sprocket 18 which is connected to a sprocket 19 by a sprocket belt 20.

The excavator wheel is supported by means of a pair of boom members 21, each member 21 carrying at its rear end a journal box 22 within which extends the corresponding end of the axle 23 of the wheel. At their opposite ends these boom members are connected with the upstanding strut-frame 24, and the upper portions of said strut-frame are connected with the respective boom members 21 at points adjacent to the wheel hub by means of tension bars 25. 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 frame members of the wagon 1 near the rear end of the latter. The strut-frame, and with it the excavator wheel supported thereby, is oscillated by means of mechanism hereinafter described.

The excavator wheel is rotated by means of a sprocket belt 28 trained around the periphery of the wheel and around a drive sprocket 29 mounted upon the strut-frame 24. The chain 28, instead of directly engaging the periphery of the excavator wheel, engages sprocket projections formed or mounted upon the outer face of the several buckets. The drive sprocket 29 is sleeved to a companion sprocket 30 and the two are

mounted upon a suitable shaft 31 extending across the strut-frame 24. The sprocket 30 is driven by a belt 32 from another pair of sprockets 33 and 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 the transverse shaft 37 suitably journaled at 38—38 upon the wagon. Shaft 37 is driven from a main shaft 39 which is journaled to extend longitudinally of the wagon; the bevel gear 40 upon said shaft serving to transmit motion to a second bevel gear 41 on the shaft 37. The clutch 42 controlled by a bell-crank-lever 43, hand lever 44 and connecting rod 45, serves to throw sprocket 36 into and out of gear with shaft 37. In order to raise and lower the excavating wheel, so as to vary the depth of the cut or elevate the wheel for transportation, tension links 46 are connected with the upper end of the strut-frame 24, and with the ends of these links are connected winding cables 47 which extend to, and are wound upon a pair of windlass drums 48 mounted upon a cross shaft 49 journaled on the main frame of the wagon. Shaft 49 carries a worm-gear 50, the upper periphery of which is engaged and actuated by worm-shaft 51, which is in turn driven by a sprocket 52 mounted thereon. Sprocket 52 is connected with another sprocket 53 on the main shaft by a sprocket belt, and the sprocket 53 is controlled by clutch 54 and hand lever 55 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 transporting it from place to place, driving connections are provided as follows: upon the main shaft 39 is mounted a sprocket 56 which is belted to a sprocket 57 upon the worm-shaft 58 carrying a worm 59. The worm actuates a gear 60 upon a transverse shaft 61 which latter is provided at one end with a pinion 62 which meshes with the gear 63 upon another transverse shaft 64. Shaft 64 carries at each end pinions, as 65, 66, which engage and drive relatively large spur gears 67 upon the main traction wheels 68. This is the low speed drive.

For propelling the machine more rapidly, shaft 61 is driven from the shaft 37 through the medium of a sprocket 69 mounted upon said shaft and belted to another sprocket 70 upon the shaft 61. The driving connections between gear 60 and shaft 61 and between sprocket 70 and shaft 61 are controlled by means of a pair of clutches 71 and 72, respectively; the movable means of these two clutches being linked together as indicated at 73 and actuated by a bell-crank 75 and hand lever 74. The arrangement is such that the clutches are thrown into gear alter-

nately, and when the clutches are in the intermediate position both are out of gear. A differential gear mechanism 76 is interposed in the shaft 64; the center member of this differential gear being engaged and driven by the spur gear 62. The main shaft 39 is rotated by a pair of engines 77 mounted upon the wagon frame which receives steam from the boiler 78 also carried by the wagon.

The operation of the apparatus as described has been fully and clearly indicated in connection with the description of the mechanism, and need not therefore be repeated. It may be noted however that as each bucket begins to excavate during its rearward and downward progress, the soil will be gradually discharged therefrom into the corresponding chute, which will serve to direct the soil onto the belt of the conveyer. The conveyer is connected by links 79 to the excavating wheel so as to trail along with the latter, and the soil is carried rearwardly and discharged into the ditch at a point far enough from the excavating wheel to enable the tile, or structure to be embedded, to be placed in the ditch as a progressive operation, so that the entire process of excavating the ditch, laying the tile, and filling the ditch, is completed as fast as the machine progresses. It is obvious that the rear end of the conveyer 11 must be elevated as shown in order to insert the tile within the ditch. In some cases, however, it may not be desired to fill the ditch immediately, or it may be impossible to lay the pipe or tile directly behind the excavator; and it may be preferred to discharge the soil at the side of the ditch. This may readily be accomplished by providing a pair of laterally extending conveyers in place of the one shown. The frames of such conveyers may be supported and attached to the main excavator frame in any suitable manner.

I claim as my invention:

1. The combination with an excavating wheel, of a conveyer comprising a frame extending rearwardly in the rear of the wheel, links connecting the conveyer frame with said wheel, and ground wheels carried by and supporting the frame of the conveyer.

2. The combination with an excavating wheel, of a conveyer comprising a frame portion, ground wheels carried by and supporting said frame portion, an endless traveling belt conveyer upon said frame, means connecting said conveyer with said wheel, and means connecting said endless traveling conveyer with said wheel whereby the rotation of the latter drives said endless carrier.

3. The combination with an excavating wheel, a conveyer comprising a frame extending rearwardly in the rear of said wheel, links connecting the conveyer frame with the wheel, ground wheels carried by

and supporting the frame of the conveyer, an endless traveling carrier upon said conveyer frame, a driving belt operatively connecting said carrier with the wheel whereby the rotation of the latter drives the carrier.

4. The combination, with an excavating wheel, of a conveyer comprising a frame extending rearwardly from the rear of said wheel and inclining upwardly and rearwardly, links connecting the conveyer frame with the wheel, and ground wheels carried by and supporting the frame of the conveyer, said ground wheels straddling the excavation formed by the excavating wheel.

5. The combination with an excavating wheel, of a conveyer, a series of rigidly mounted buckets secured to said wheel and discharging rearwardly upon said conveyer.

6. The combination with an excavating wheel, of a conveyer linked to said wheel, an endless traveling carrier upon the conveyer frame, means for driving said carrier by the rotation of said wheel, a series of rigidly mounted buckets carried by said wheel and discharging rearwardly upon said carrier and troughlike chutes mounted upon said wheel and adapted to convey the excavated soil from said buckets to said carrier.

7. The combination with an excavating wheel, of a conveyer at the rear of said wheel, a series of buckets rigidly mounted on said wheel and open at their forward ends, a troughlike chute extending from the front side of each of said buckets tangentially forwardly and adapted to deliver the excavated soil to said conveyer.

8. The combination with an excavating wheel, of a series of buckets rigidly mounted on said wheel and open at their forward ends, and a troughlike chute extending from the front side of each of said buckets tangentially forwardly.

9. The combination with an excavating wheel, a bucket mounted on said wheel, and a chute extending from the front side of each of said buckets.

10. The combination with an excavating wheel, of a series of buckets mounted on the periphery of said wheel, a driving belt trained around said buckets and means for driving said belt to rotate the wheel.

11. The combination with an excavating wheel, of a series of buckets rigidly mounted on the periphery of said wheel, and a sprocket belt trained around sprocket projections formed on the outer face of said several buckets, and means for driving said sprocket belt to rotate the wheel.

12. In an excavating machine, the combination with a suitable wagon, of an excavator connected to said wagon, a trailer-conveyer and suitable driving connections for said excavator and said conveyer.

13. In an excavating machine, the combination with an excavator, of a trailer-con-

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veyer delivering in the rear of said excavator and mechanism for operating said excavator and driving said conveyer.

14. In an excavating machine, the combination with an excavator, a trailer-conveyer
5 adapted to deliver the soil into the ditch in the rear of said excavator, and mechanism

for operating said excavator and driving said conveyer.

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Witnesses:

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