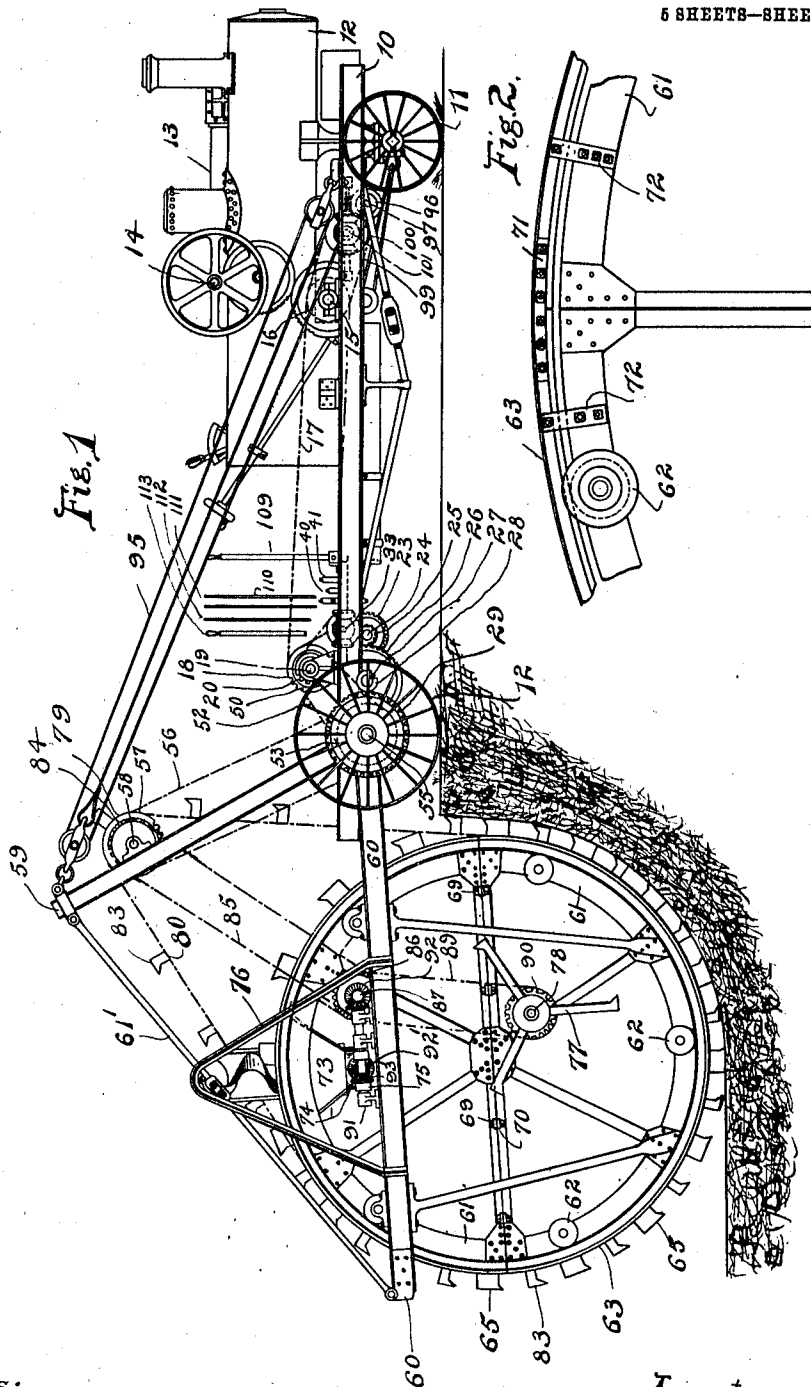


W. H. PONTIUS.
EXCAVATING MACHINE.
APPLICATION FILED FEB. 10, 1908.

953,226.

Patented Mar. 29, 1910.

5 SHEETS—SHEET 1.



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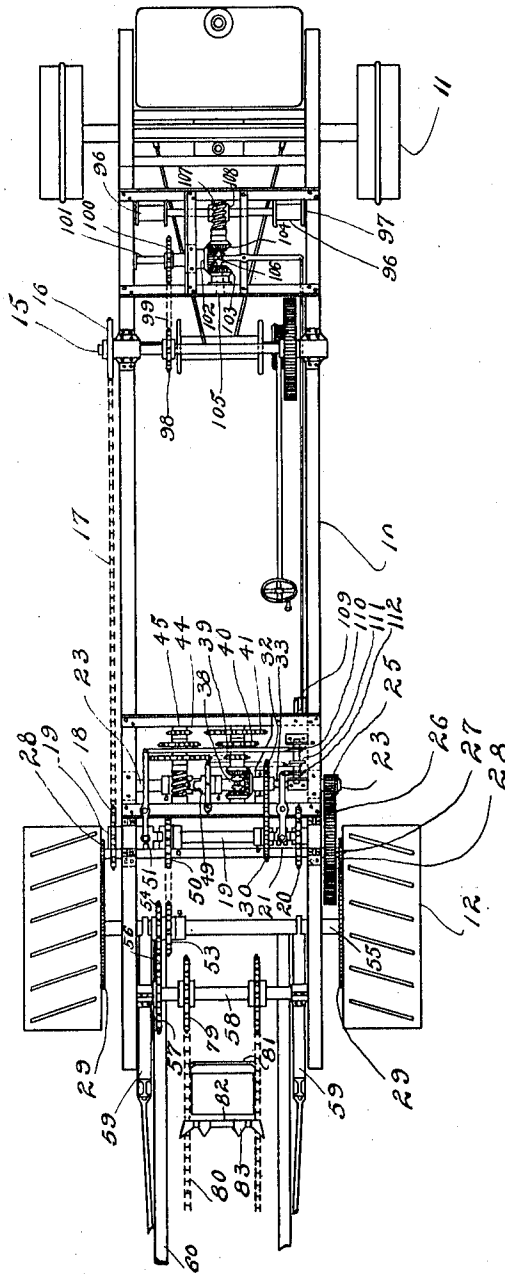
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6 SHEETS—SHEET 2.

Fig. 3.



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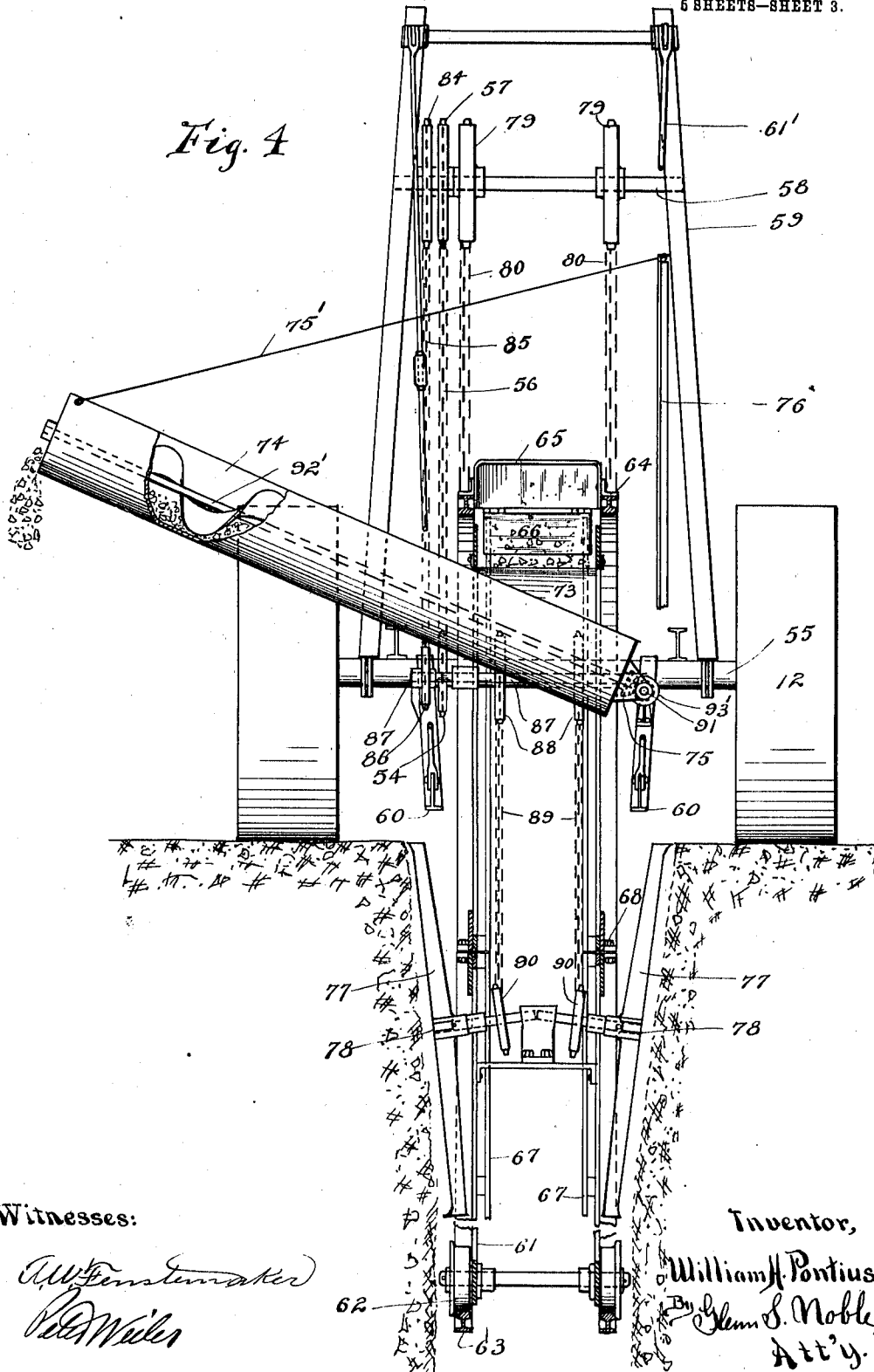
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5 SHEETS—SHEET 3.

Fig. 4



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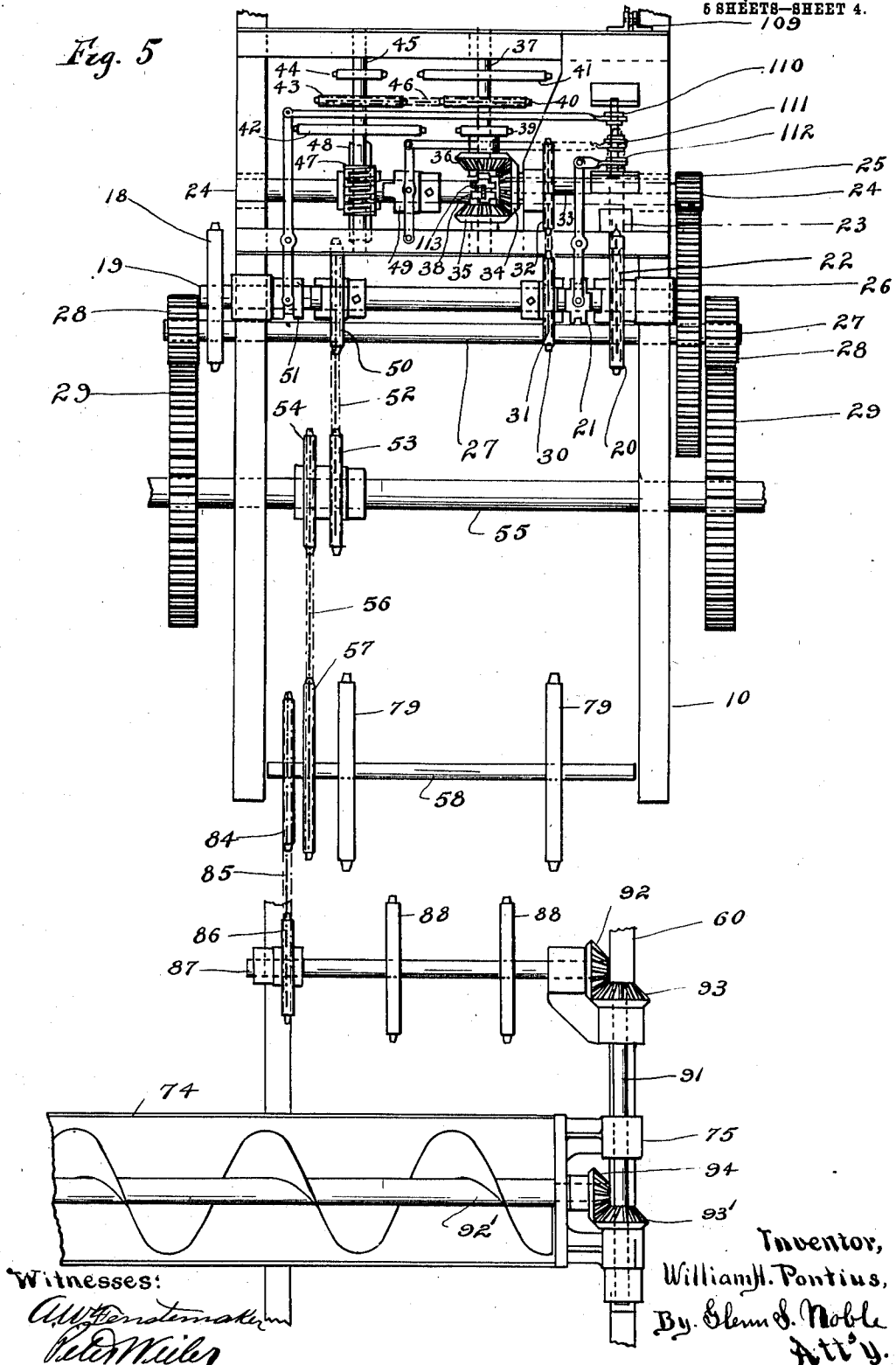
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6 SHEETS—SHEET 4.
109

Fig. 5

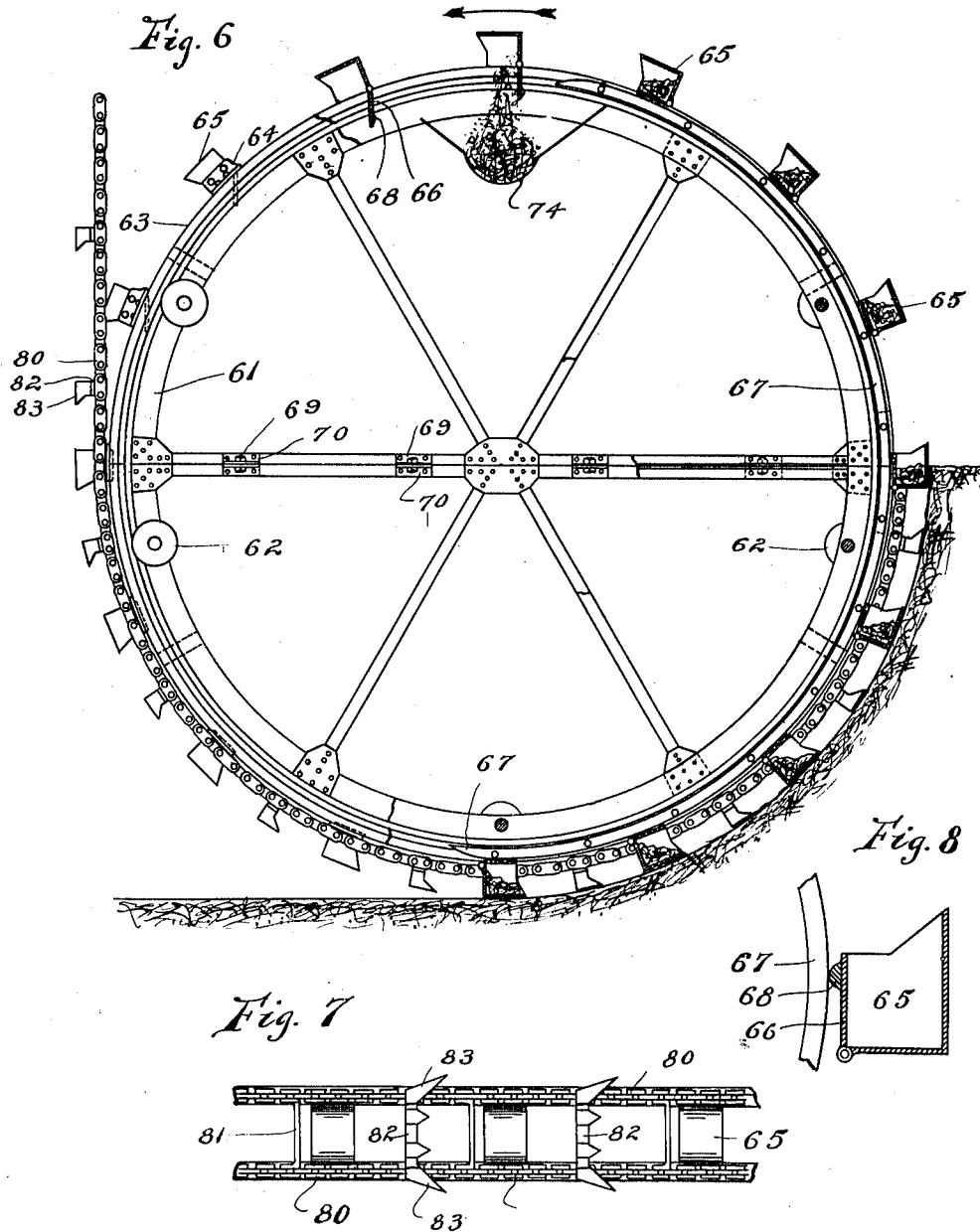


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6 SHEETS—SHEET 5.



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UNITED STATES PATENT OFFICE.

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EXCAVATING-MACHINE.

953,226.

Specification of Letters Patent.

Patented Mar. 29, 1910.

Application filed February 10, 1908. Serial No. 415,211.

To all whom it may concern:

Be it known that I, WILLIAM H. PONTIUS, 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 more particularly to machines adapted to be used for excavating trenches, ditches, or the like; and its objects are to provide an improved machine of this character which will successfully excavate or dig various kinds of soil, which will be comparatively simple in construction and durable in operation, which is particularly arranged for convenient and accurate control of its various movements, and which may be readily knocked down or arranged for transportation; and it also embodies such other features and improvements as will be more specifically pointed out and claimed hereinafter.

I have illustrated my invention in the accompanying drawings showing a preferred embodiment thereof in which—

Figure 1 represents a side view of the complete apparatus, showing the excavating wheel lowered in digging position; Fig. 2 is a detail showing the method of securing the movable bucket rails to the wheel frame when the machine is to be knocked down; Fig. 3 is a top plan view showing the truck portions of the driving mechanism, with the engine and boiler removed; Fig. 4 is a rear elevation of the machine, with the digging wheel shown in section; Fig. 5 is a top plan view, partly diagrammatical, showing the truck-driving and excavator-operating transmission devices somewhat enlarged; Fig. 6 is a detail view of the excavating and elevating wheel, with the driving and digging chains partially removed; Fig. 7 is an edge view of a portion of the wheel and driving and digging chains; and Fig. 8 is an enlarged detail of one of the buckets, showing guides for holding the doors in closed position.

As shown in these drawings, 10 represents a truck frame which is supported on front wheels 11 and rear driving wheels 12. This truck carries the engine or motor for propelling the same and also supports the ex-

cavating devices. Any suitable kind of power may be used, and for this purpose I have shown a boiler 12' and engine 13. The driving shaft 14 of the engine is connected by means of suitable gears to a counter-shaft 15 mounted on the truck frame; and this counter-shaft is provided with a sprocket 16 which is connected by means of a chain 17 with a sprocket 18 on a shaft 19 mounted adjacent to the rear end of the truck.

Variable speeds are desired for the truck when the machine is in operation, and a still higher rate of speed is desired when the machine is to be moved from place to place. For giving these various speeds, as well as a reversing movement, I have provided the transmission mechanism which is perhaps best shown in Figs. 1 and 5. For direct forward movement of the truck, the shaft 19 is provided with a sprocket 20 which may be thrown into or out of gear with said shaft by means of a clutch 21. The sprocket 20 is connected by means of a chain 22 to a sprocket 23 on a shaft 24 suitably mounted on the truck frame. The shaft 24 is provided with a pinion 25 which meshes with a gear 26 on a shaft 27, this last-named shaft being provided with pinions 28—28 which engage with gears 29—29 secured to the traction wheels 12. When a slower speed is desired the clutch 21 is thrown into engagement with a sprocket 30 on the shaft 19 and this sprocket is connected, by means of a chain 31, with a sprocket 32 on a stub shaft 33 also mounted on the truck frame. This stub shaft 33 is provided with a bevel gear 34 which meshes with beveled gears 35 and 36 on a shaft 37 arranged at right angles to the shaft 34 and also mounted on the truck frame. The gears 35 and 36 are provided with a clutch 38 whereby either one of said gears may be caused to turn the shaft 37, thereby giving reverse movements to said shaft. The shaft 37 is also provided with a series of sprocket wheels 39, 40 and 41, of different diameters, which are respectively arranged opposite sprocket wheels 42, 43 and 44, on a parallel shaft 45 also mounted on the truck frame. These sprocket wheels are so proportioned that one chain 46 may be used around any pair thereof, so that when the first pair, for instance, are used the shaft 45 will be driven at a

comparatively slow speed; the speed will be increased if the chain is transferred to the second pair and increased still further if the chain is transferred to the third pair. By means of this arrangement variable speeds of the shaft 45 are readily secured by merely shifting the chain 46 from one to another of said pairs of sprockets. The shaft 45 is also provided with a worm 47 which meshes with a worm gear 48 on the shaft 24, this worm gear being provided with a clutch 49 whereby it may be thrown into or out of engagement with said shaft, this being the shaft heretofore mentioned which is geared to the traction wheels 12. It will be noted that the proportion of the various sprockets and gears in this arrangement is such that when it is used the speed of the truck will be much less than when the gearing above described is in use; and likewise a reverse movement may be secured to back the truck by shifting the clutch 38. The shaft 19 is also provided with a sprocket 50 which is provided with a clutch 51 for throwing it into and out of engagement with the shaft 19 and is connected, by means of a chain 52, with a sprocket 53 which is rigidly connected with a second sprocket 54, so that both turn freely on the axle 55. The sprocket 54 is connected, by means of a chain 56, with a sprocket 57 rigidly secured to a shaft 58 mounted in suitable bearings upon beams 59—59, said beams being pivotally mounted on the axle 55. This shaft 58 provides means for driving the excavating and elevating apparatus which will now be more fully described.

A pair of rearwardly projecting booms 60 are pivotally connected with the rear axle 55 and have their outer ends supported by means of adjustable guy-rods 61' which extend up to the top of the beams 59. These booms 60 support a circular frame 61 which may be attached thereto in any desired manner. Antifriction rollers or wheels 62 are mounted on the outer rims of the frame 61 and these rollers support rings 63, said rings being preferably made of rails bent with the heads extending inwardly as particularly shown in Fig. 4. These rails are provided at suitable distances apart, with short pieces of angle iron 64 to which are rigidly attached the digging and elevating buckets 65, said buckets extending across between the two rings to hold said rings in relatively fixed position. The back ends of the angle irons 64 are preferably made in the form of a gear tooth for engagement with cross-bars on the driving chains, as will presently be explained.

The buckets or scoops 65 are made with the two ends, the outer sides and the backs rigidly formed or connected together and have inwardly swinging doors 66 hinged thereto, as indicated in Figs. 6 and 8. The

circular frame 61 is provided with cams or guides 67 for holding the doors in closed position during a part of the revolution of the rings, and in order to prevent undue wear on the doors they may be provided with lugs or wearing strips 68 which may be readily renewed. The operation of these buckets, which forms an important feature of this invention, will be readily understood from Fig. 6. As shown at the top of the drawing, one of the buckets has just discharged its load, and the door hangs in open position. As the rings are turned in the direction shown by the arrow, the doors will swing shut and will remain closed until the bucket reaches its lowermost position where it may start to dig or fill up. At about this point the guide strips 67 engage with the door and will hold the door closed during the remainder of the revolution or until the buckets reach the topmost or dumping position where the strips terminate. These wheels are frequently of very large diameter, and in order to make them convenient for transportation I have shown the frame 61 made in halves, the two halves being joined together in any convenient manner, as by means of bolts 69 which pass through angles or lugs 70 on the adjoining frame members. The outer rings or rails 63 are also divided in halves, so that they may be separated as well as the frame. The ends are connected together by means of fish-plates 71 and bolts, as shown in Fig. 2. When the device is to be taken apart, it is desirable to secure the ring portions to the corresponding frame portions, and I have provided temporary connecting plates 72 by means of which the outer rings may be securely fastened as indicated in Fig. 2.

The material elevated by the buckets is discharged into a hopper 73 upon a lateral screw conveyer 74, this conveyer being pivotally mounted at 75 in suitable bearings on one of the booms 60. The outer end of the conveyer is supported by means of a wire or guy-rope 75' which is connected at the opposite end with an upwardly extending brace 76 also fastened to the boom 60, the arrangement being such that the position of the conveyer 74 may be readily adjusted by varying the length of the line 75'. The material discharged at the outer end of this conveyer may of course be left along the bank or carried away in wagons, carts or the like.

Another important feature of this invention consists in the means which are provided for cutting away or beveling the top of the ditch which is being excavated. As ordinarily constructed, such a device would excavate a ditch with vertical parallel sides; but in certain kinds of soil it is frequently desirable to cut away the top of the ditch to prevent the sides from caving in. For

this purpose, I have provided cutting or trimming devices 77 which are arranged on either side of the circular frame 61. These devices consist of cutting arms which are arranged to reach to about the top of the ditch when the digging wheel is at its lowest position, and are arranged at such angles that they will cut the top of the ditch considerably wider than the normal width of the bottom thereof. The cutting arms 77 are mounted on shafts 78, having suitable bearings in the circular frame and may be rotated in any convenient manner. As this completes the main digging and elevating devices, the means for driving the same will now be considered. As heretofore mentioned, the shaft 58 provides means for driving these devices. This shaft is provided with sprocket wheels 79—79 which drive the bucket rings 63 by means of chains 80—80. These chains are connected together at suitable distances apart by means of cross-bars 81, these bars being adapted to engage with the ends of the angle irons 64 to drive the rings 63. I also prefer to provide these chains with intermediate cross-bars 82 which are provided with plows or teeth 83 to assist in loosening the material which is to be elevated by the buckets 65. The two outer teeth or plows of each cross-piece may be extended somewhat beyond the outer edge of the chains, as indicated in Fig. 7, in order to excavate the ditch sufficiently wide to prevent binding of the elevating rings and buckets. The shaft 58 is also provided with another sprocket wheel 84 which is connected by means of a chain 85 with a sprocket wheel 86 on a shaft 87 mounted in suitable bearings on the circular frame 61. This shaft 87 is provided with sprocket wheels 88—88 which are connected by means of chains 89—89 with sprocket wheels 90—90 on the shafts 78 of the beveling cutting devices, as shown particularly in Fig. 4. The shaft 87 also drives another shaft 91 by means of beveled gears 92 and 93, the shaft 91 being mounted in bearings on one of the booms 60, as shown in Figs. 1 and 5, this shaft 91 also furnishing a support for the pivoted end 75 of the screw conveyer 74. This shaft also drives the shaft 92' of the screw conveyer by means of beveled gears 93' and 94. By means of this form of attachment and driving mechanism, the conveyer may be driven when in any position without binding of the gears.

The position of the excavating wheel may be adjusted by raising or lowering the beams 59. These beams are connected, by means of rope and tackle 95, with the forward end of the truck, the one end of each of said ropes being secured to winding drums 96 on a shaft 97 mounted crosswise of the truck, as shown in Fig. 3. This shaft is driven from the counter-shaft 15 through intermediate

transmission devices comprising a sprocket wheel 98 on said shaft 15, which is connected by means of a chain 99 with a sprocket wheel 100 on a stub shaft 101. The stub shaft is provided with a beveled gear 102 which meshes with gears 103 and 104 mounted on a cross-shaft 105 and adapted to be thrown into engagement therewith by means of a double clutch 106. The shaft 105 is provided with a worm 107 which meshes with the worm gear 108 on the shaft 97, thereby driving said shaft to operate the drums 96. It will be readily understood that when the gear 103 is in engagement with the shaft, the drums will be turned in one direction, as for raising the beams 59; and when the gear 104 is in engagement with the shaft, the drums will be turned in the opposite direction, as for lowering said beams.

It has heretofore been pointed out that one of the objects of this invention was the convenient arrangement of the controlling devices, whereby the machine could be preferably controlled by one man. For this purpose, the various controlling levers are arranged in a group adjacent to each other, as indicated in Fig. 1. The steering wheel is also arranged convenient to these levers; but as the steering mechanism is not included in the present invention, no further description will be necessary. The clutch 106, just described, is connected by means of suitable levers and rods to an operating lever or handle 109 adjacent to the operator's platform. A second handle 110 is connected by means of suitable rods and levers with the clutch 51 heretofore described. The next handle 111 is connected by means of suitable rods and levers with the clutch 49 of the worm gear 48. The next handle 112 is connected by means of suitable rods and levers with the double clutch 21 which coacts with the sprockets 20 and 30; and the clutch 38 is operated directly by means of a handle 113. These various levers are grouped together and provide for the convenient control of the various operating parts of the machine by one man.

The machine as thus described is intended to be used in various kinds of soils; for instance, in digging where there is stone or gravel, the plows or diggers on the driving chains will assist in loosening up the material, which is then collected and elevated by the buckets. The machine is also conveniently arranged for transportation, as the wheel may be separated, as above described, into halves and the tie-rods 61' may be removed, allowing the beams 59 to be lowered down alongside the booms 60.

It is obvious that various changes may be made in the details of construction of an excavating apparatus embodying the present invention, and therefore I do not wish to be

limited to the exact construction herein shown and described; but

What I claim and desire to secure by Letters Patent is—

5 1. In an excavating machine, the combination of a circular frame, rollers mounted on said frame, revoluble rings engaging with said rollers, buckets secured to said rings and having inwardly swinging doors, and means connected with said frame for
10 holding said doors in closed position during a portion of the revolution of said rings.

2. In an excavating machine, the combination of a supporting frame, rings rotatably mounted on said frame, buckets on
15 said rings, having hinged doors, and guides on said frame for holding said doors in closed position.

3. In an excavating machine of the character described, the combination with rotating buckets having inwardly swinging doors,
20 of lugs or wearing strips on said doors, and guides adapted to engage with said lugs to hold said doors in closed position during a predetermined period.

4. An excavating wheel comprising a circular frame divided diametrically in halves, means for securing said halves together,
25 means on said frame for supporting revoluble bucket rings, bucket rings also divided in halves, and means for temporarily securing one-half of said bucket rings to a corresponding portion of the frame for convenience in transportation or the like.

35 5. The combination of a circular frame adapted to be readily separated into two equal parts, means for holding said parts together, bearing rollers on said frame, rings engaging with said rollers and also adapted
40 to be readily separated into equal parts, buckets secured to said rings, and means for temporarily fastening the parts of said rings to the corresponding parts of said frame.

6. In an excavating machine, the combination of a substantially circular frame,
45 rollers mounted on said frame, revoluble rings engaging with said rollers, excavating and elevating buckets secured to said rings, inwardly swinging doors for said buckets,

and guide strips secured to said frame and extending around about half the circumference thereof for holding said doors in closed position.

7. The combination with a rotatable digging wheel having rings formed of rails
55 and buckets secured to said rails by means of angle irons having tooth-shaped ends, of chains engaging with said rails, said chains being provided with cross-bars adapted to engage with the ends of said angle irons for
60 turning said wheel.

8. In an excavating apparatus, the combination of an excavating wheel having digging and elevating buckets arranged around the periphery thereof, chains for driving
65 said wheel, said chains engaging with the periphery of the wheel and passing along the sides of the buckets, and digging devices on said chains, said devices extending laterally beyond the sides of the wheel and
70 buckets and adapted to excavate the trench sufficiently wide so that said wheel and buckets will pass therein.

9. In an apparatus of the character set forth, the combination of a substantially circular frame, means for supporting said
75 frame, rings adapted to rotate around said frame, buckets secured to said rings, rotatable digging devices arranged obliquely to said frame and adapted to widen the top of the ditch being excavated, and means for
80 driving said rings and said digging devices.

10. The combination of a substantially circular frame, rollers on said frame, rings engaging with said rollers, buckets secured
85 to said rings, chains for driving said rings, digging teeth on said chains, rotary digging devices mounted on said frame for beveling or widening the top of the ditch, means for driving said digging devices, a lateral conveyor for carrying away the material elevated by said buckets, and means for driving
90 said conveyor.

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