J. SOMMER.

EXCAVATING MACHINE.

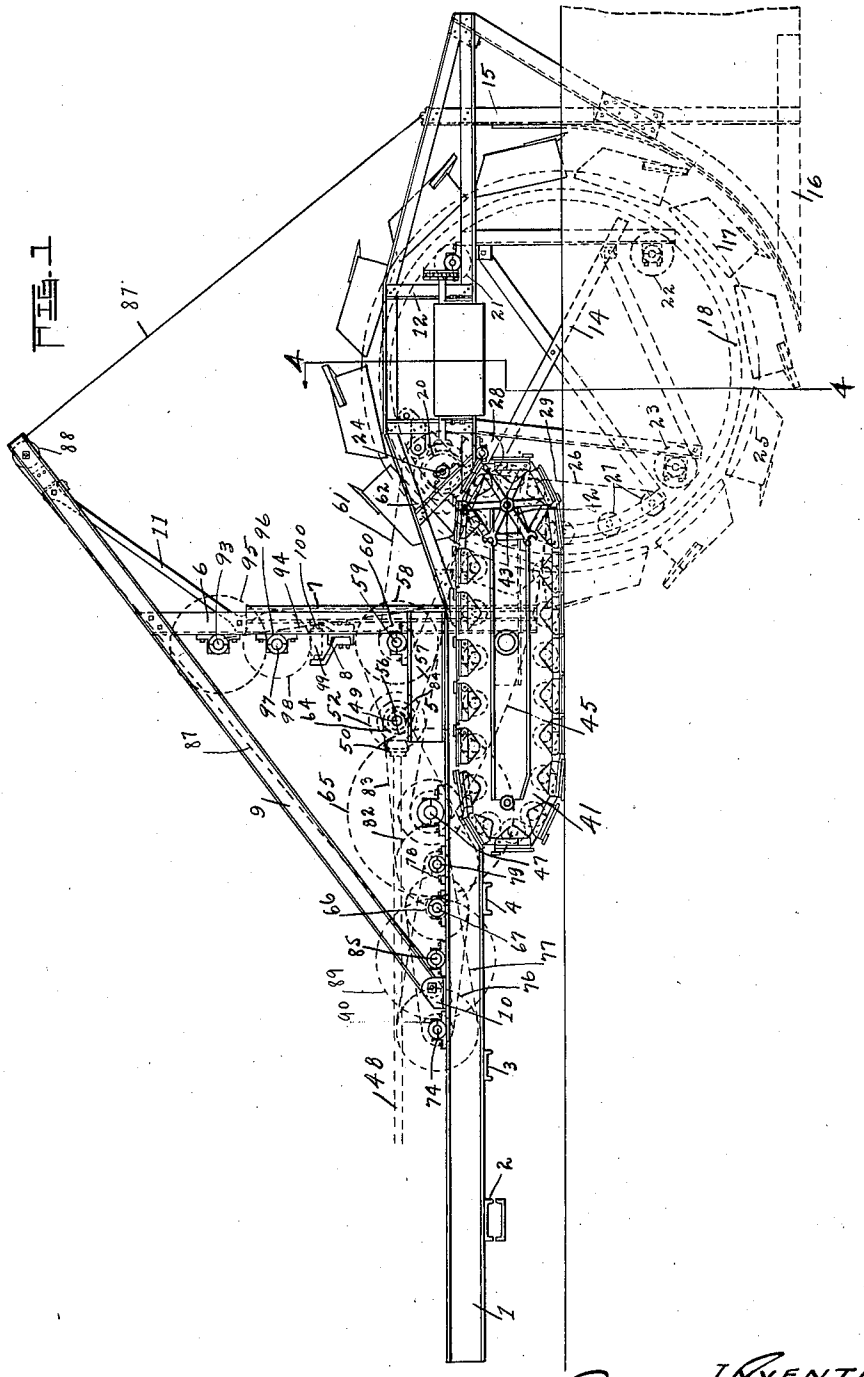
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1,376,837.

Patented May 3, 1921.

6 SHEETS—SHEET 1.

FIG. 1



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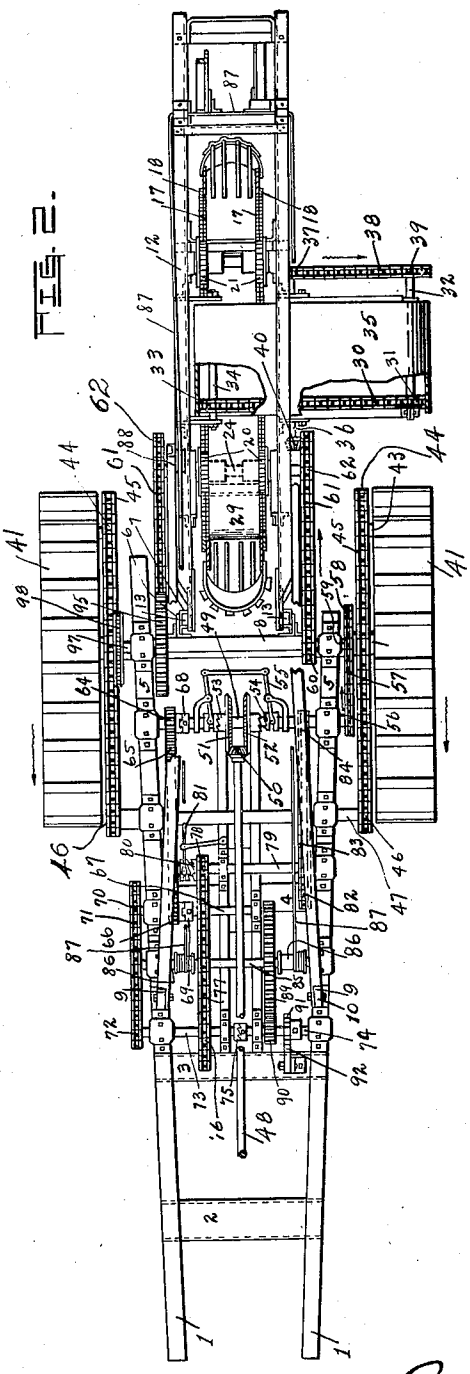
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6 SHEETS—SHEET 2.

FIG. 2.



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6 SHEETS--SHEET 3.

Fig. 5.

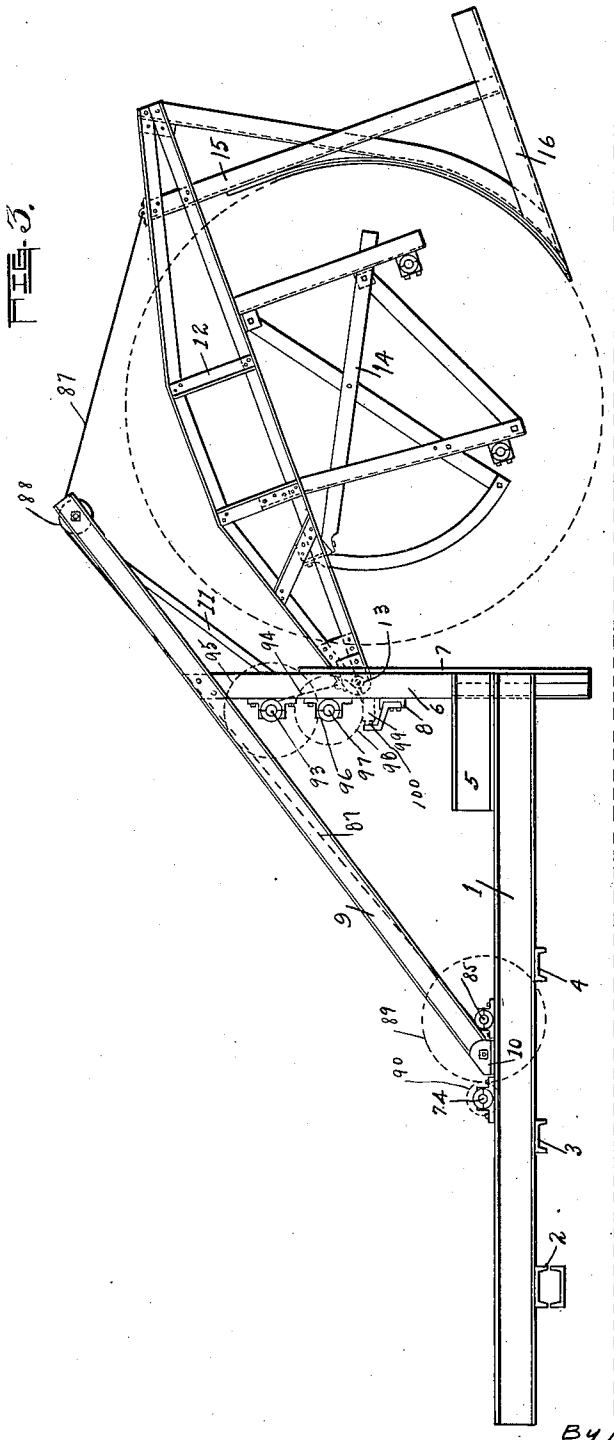
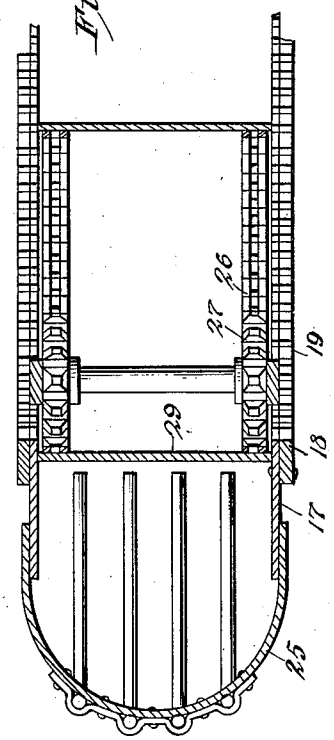


Fig. 7.



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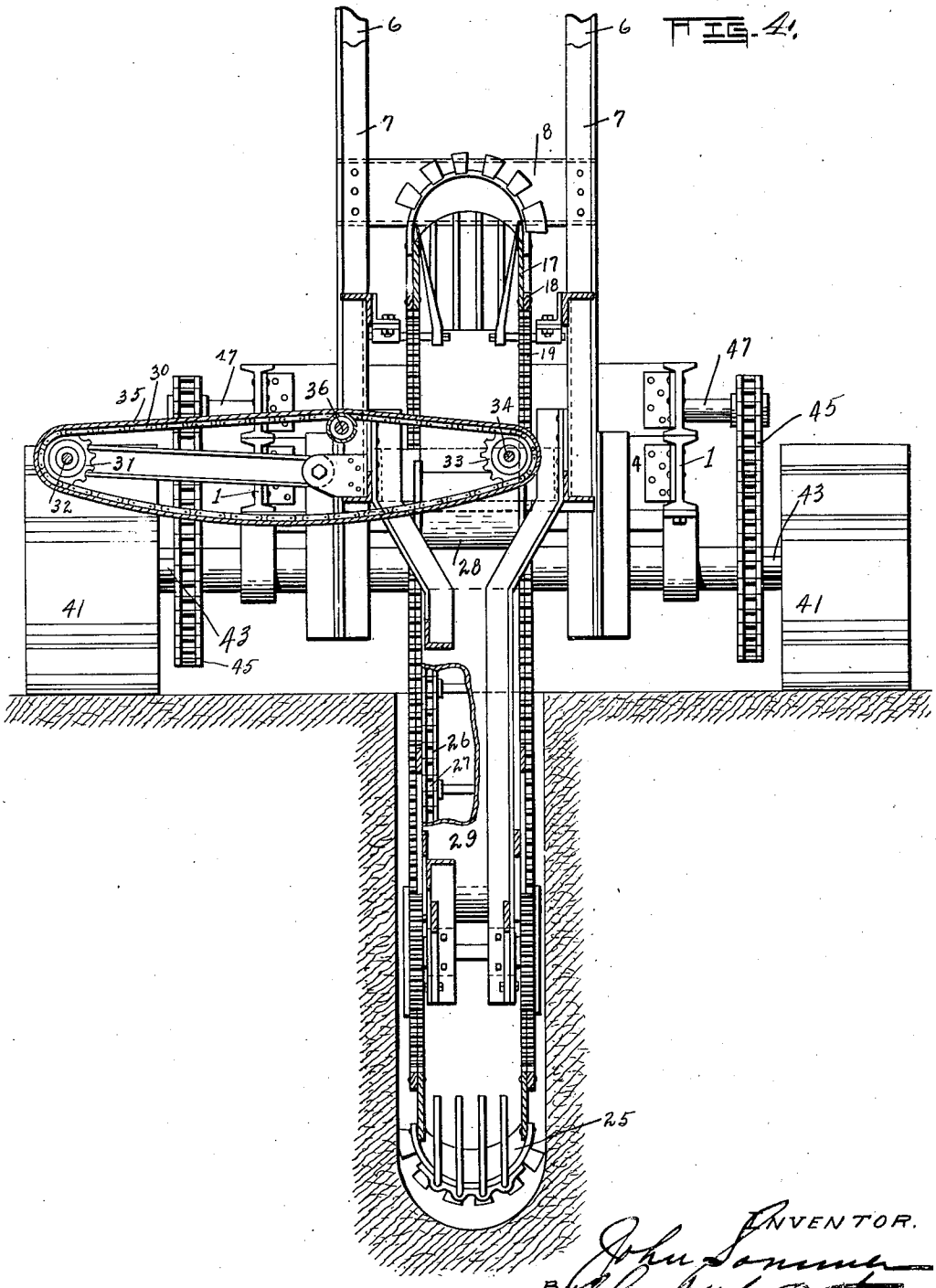
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6 SHEETS—SHEET 4.

FIG. 4.



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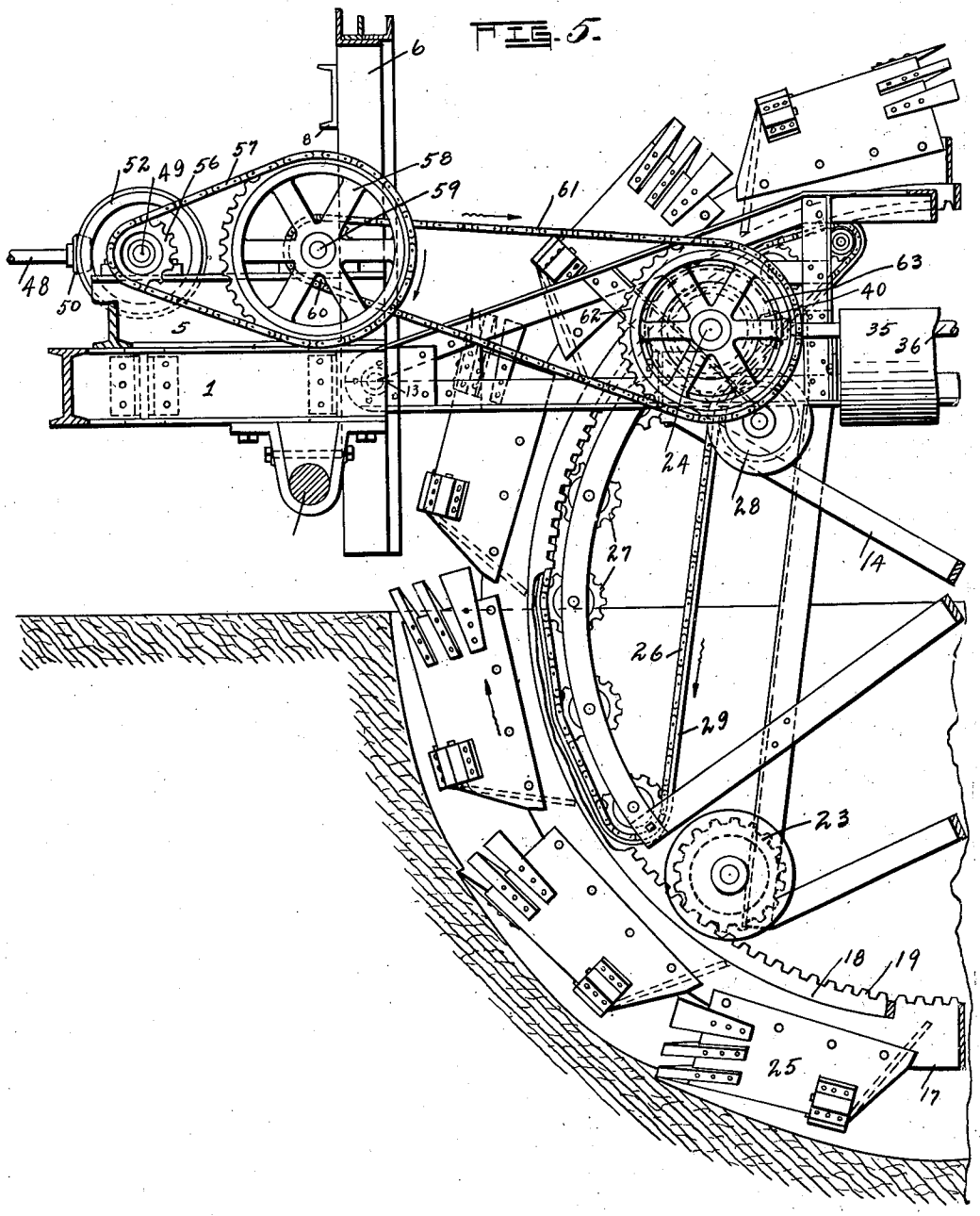
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6 SHEETS—SHEET 5.

FIG. 5.



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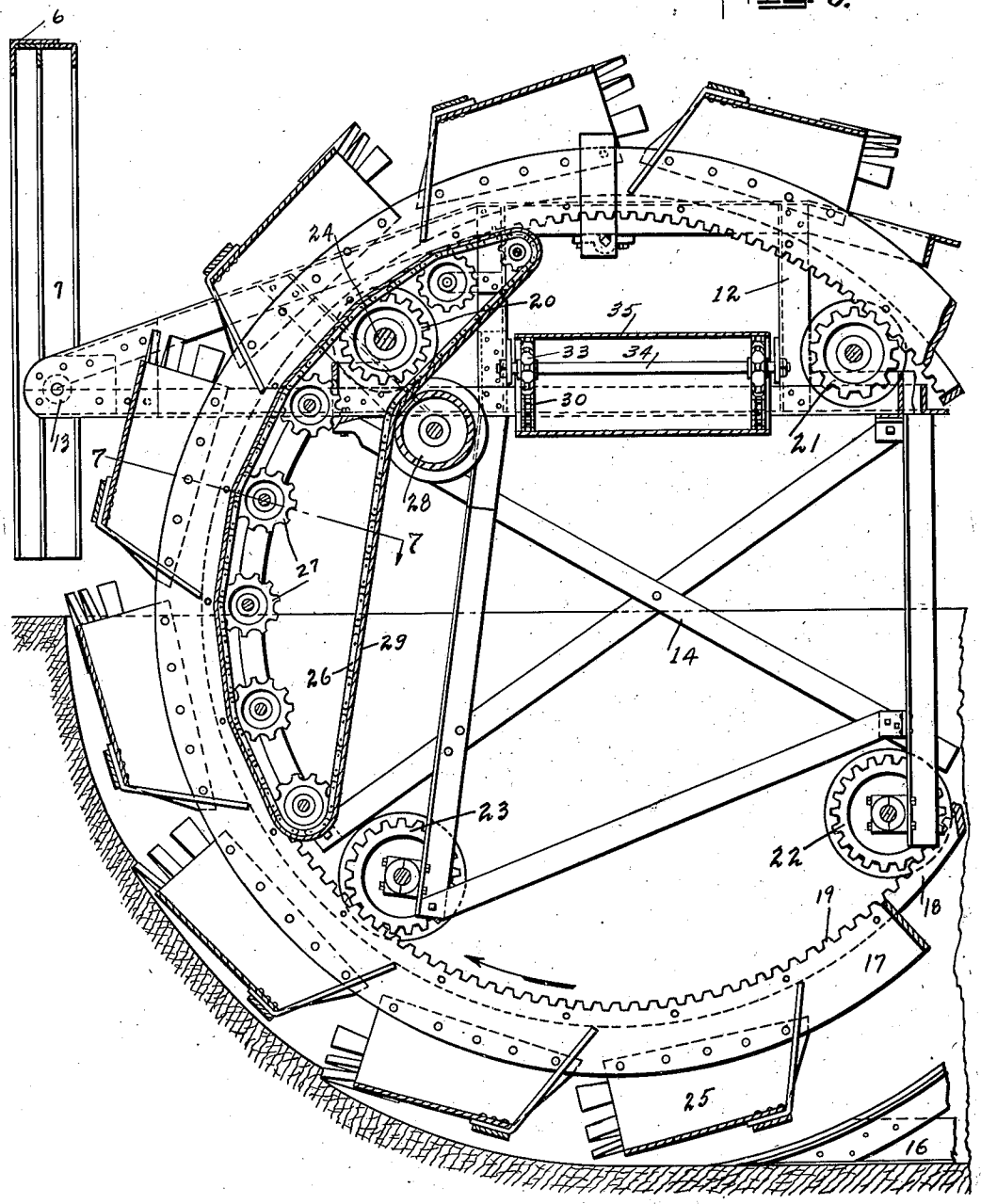
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6 SHEETS—SHEET 6.

FIG. 6.



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UNITED STATES PATENT OFFICE.

JOHN SOMMER, OF PEORIA, ILLINOIS.

EXCAVATING-MACHINE.

1,376,837. Specification of Letters Patent. Patented May 3, 1921.

Application filed February 10, 1917. Serial No. 147,785.

To all whom it may concern:

Be it known that I, JOHN SOMMER, a citizen of the United States, residing at Peoria, in the county of Peoria and State of Illinois, have invented new and useful Improvements in Excavating-Machines, of which the following is a specification.

This invention has reference to certain new and useful improvements in excavating machines, of that type sometimes referred to as a "traction ditcher," or "trench excavator."

One of the objects of the present invention is to improve that type of excavating machine, having an excavating wheel to which are secured the excavating buckets, by providing an endless conveyer, including a preferably, flexible steel belt adapted to form a bottom for the buckets and which is movable only through the frictional contact of the material scraped up by the buckets and engaging therewith.

The invention has for a further object to improve the conveyer, in machines of the type referred to, employed for carrying the material off outside the trench, by providing the conveyer with a preferably, flexible steel belt. Such a belt does not require replacing until completely worn out, and will not get soggy and stretch, and require replacing from time to time, as will the usual canvas belts common in machines of the character referred to.

The invention has for a still further object to improve the construction of the excavating wheel and manner of operating same, by providing said wheel with an internal gear wheel, instead of having gear teeth secured to the side face thereof which provides for an increased capacity, in fact, in practice, makes it possible to accomplish as much excavating with a 19″ wheel as was formerly done with a 24″ wheel; also in substituting caterpillars for the ordinary traction wheels.

A further object of the invention is to improve the frame construction supporting the excavating wheel, and the means for raising and lowering the same; also, the mechanism and controlling means therefor, for moving the machine and for operating the various mechanisms thereof.

That the invention may be more fully understood reference is had to the accompanying drawings, in which:—

Figure 1 is a side elevation, greatly reduced, of my improved machine, the forward caterpillars and motor being omitted;

Fig. 2 is a plan view of Fig. 1, parts being broken away;

Fig. 3 is a view similar to Fig. 1, showing only the frame of the machine, with certain mechanism shown in dotted lines, and the wheel supporting frame is shown in its raised position when being transported from place to place, or in the position it would be, just prior to the beginning of the excavating work;

Fig. 4 is an enlarged cross-section as the same would appear if taken on the line 4—4 Fig. 1;

Fig. 5 is an enlarged detail view, showing in side elevation a part of the excavating wheel and the operating means therefor;

Fig. 6 is an enlarged vertical sectional view through the excavating wheel and associated parts, and

Fig. 7 is a cross-section as the same would appear if taken on the line 7—7 of Fig. 6.

Like characters of reference denote corresponding parts throughout the figures.

The frame.—The frame parts of the frame are divided into two units; the tractor-frame, and the frame supporting the excavating wheel and associated parts.

The tractor-frame includes preferably, the spaced longitudinal side beams 1, connected by the cross-beams 2, 3, and 4 and such others as may be necessary; the additional short longitudinal beams 5, upon which are mounted suitable bearings; the standards or parts 6 to the matching faces of which are secured the guides 7, the standards or parts 6 being connected by the cross brace 8 and such others as may be necessary and the upwardly inclined beams 9, the lower ends of which are connected to couplings 10 secured on the beams 1, their upper ends crossing and being secured to the upper ends of the standards or parts 6, and the braces 11 for the upper ends of said inclined beams 9.

The frame for supporting the excavating wheel includes preferably, the truss-frames 12, to the forward ends of which are journaled rollers 13 movable up and down in the guides 7; the frame work 14 connected with and suspended from the truss-frames 12 and on which are journaled certain gearing and guiding rollers, and the parts 15 and guiding shoes 16 connected with the outer ends of said truss-frames. Mechanism is

employed, to be described, for raising the excavating wheel frame from the position shown in Fig. 1 to that position shown in Fig. 3.

The excavating wheel and associated parts.—The excavating wheel is preferably, an open wheel; that is, it has no axle, and includes the spaced annular rings 17 and attached shallow rings 18, each of which is provided with an internal ring gear 19. This wheel revolves on flanged gear wheels 20, 21, 22, and 23, which are journaled on shafts having a bearing on the frames 12 and 14. The shaft for the gear wheels 20 is designated for convenience 24 because it is an operating shaft by means of which motion may be imparted through the gear wheels 20 to the excavating wheel. The gear wheels 21, 22, and 23 are idlers on which the excavating wheel revolves; 25 designates the excavating buckets. These buckets have no bottoms, but their back walls are curved and are connected to the opposite rings 17 of the excavating wheel, see Fig. 7. The buckets may have any suitable end wall. In action, when the excavating wheel is revolved, the buckets act similar to a drag-scraper, see Fig. 6. A movable bottom is provided for the buckets, for a portion of their travel, in the form of a conveyer. This conveyer comprises preferably, the endless chains 26 traveling over the plurality of sprocket wheels 27, and the idler roller 28, all of which are journaled on shafts having a bearing on the frames 14. To these chains 26 is secured the flexible steel belt 29, of any suitable construction. The lowest end of the endless conveyer is located at a point to receive the dirt immediately after it has been scraped up by the buckets 25 and serves as the bottom for the buckets until the excavating wheel and buckets have rotated to discharging position. By providing a movable conveyer, such as this steel belt, in place of the non-revoluble plate which has been used as a bottom for the buckets, I obviate any danger of clogging or sticking, which will not only stop the excavating wheel, but break the buckets and necessitate a cleaning means. When the dirt in the buckets is brought into contact with the endless steel belt, friction will cause the belt to move with the buckets to the point where the dirt is discharged from the buckets.

The belt conveyer for receiving the dirt from the buckets and transferring the same to a vehicle, or to discharge the same outside of and alongside the trench, comprises the endless chains 30 operated by the sprocket wheels 31 on the shaft 32, and traveling over the idler sprocket wheels 33 on shaft 34. Both of these shafts are journaled in suitable bearings secured to the frames 14. The belt 35 of this conveyer is preferably, an endless flexible steel belt, and the inner end of the conveyer is located at one side of the excavating wheel, passes transversely therethrough and beyond to a suitable point of discharge, see Fig. 4. The flexible steel belt will not stretch or become soggy, and therefore requires no attention or replacing as is the case with a canvas belt. The shaft for operating the transfer conveyer is designated 36, passes between the upper and lower runs of the conveyer and is journaled in bearings secured to one of the frames 14. On one end of the shaft 36 is a sprocket wheel 37 engaging a sprocket chain 38 which actuates a sprocket wheel 39 secured on the operating shaft 32. On the opposite end of the shaft 36 is carried a bevel gear pinion 40 adapted to receive power in a manner to be explained.

Traction.—The machine is mounted on caterpillars 41 which are employed to transport the machine from place to place, as well as for moving the machine during excavating work. These caterpillars may be of any suitable construction and connected with the tractor frame in any suitable manner. The driving sprockets for the caterpillars are designated 42 carried on shafts 43. On the inner ends of the shafts 43 are carried sprocket wheels 44 operated by chains 45 which receive power from sprocket wheels 46 carried on opposite ends of an operating shaft 47 journaled on the tractor frame. While I have shown only two caterpillars, one on each side of the rear end of the tractor frame, it is understood that it is intended to employ one or more caterpillars at the forward end of said tractor frame.

Operating mechanism.—This mechanism includes those devices and means for transmitting power from the engine or motor to the caterpillars; to the excavating wheel, and to the drums for raising and lowering the excavating wheel and supporting frame, and in addition to the operating shafts 24 and 47 comprises the shaft 48 which receives power from the engine or motor and transmits the same to the shaft 49 through the bevel gear pinion 50 on said shaft 48, meshing with the bevel gear wheels 51 and 52 loosely carried on said shaft 49. A clutch 53 having a spline and groove connection with shaft 49 is employed to clutch the wheel 51 to said shaft, and a clutch 54 having a spline and groove connection with said shaft 49 is employed to clutch the wheel 52 to said shaft. A lever arrangement 55, operatively connected with said slutches 53 and 54 is employed to operate said clutches, and the same is so arranged that when the clutch 53 is in operative connection with the gear wheel 51, the clutch 54 is out of operative connection with the gear wheel 52, and vice versa.

On one end of said shaft 49 is secured a sprocket pinion 56 which actuates a sprocket chain 57, and said chain operates a sprocket wheel 58, and through it, a shaft 59. On the

shaft 59 are secured sprocket pinions 60, operating chains 61, which operate sprocket wheels 62, secured on the operating shaft 24. One of the sprocket wheels 62 has cast therewith, or secured thereto, a bevel gear wheel 63, as shown in dotted lines in Fig. 5, with which meshes the bevel gear pinion 40, on the shaft 36, through which power is imparted to the transfer conveyer.

Loosely carried on the shaft 49 is a spur gear pinion 64 which meshes with a large spur gear wheel 65 on the operating shaft 47, and said last mentioned wheel is in meshing relation with a spur gear pinion 66 loosely carried on a shaft 67. The pinion 64 is adapted to have a clutch engaging relation with the shaft 49 through the clutch part 68 adjustable on said shaft 49, and the pinion 66 is adapted to have a clutch engaging relation with the shaft 67 through the clutch part 69 on said shaft 67. On one end of said shaft 67 is secured a sprocket wheel 70, and engaging the teeth thereof is a sprocket chain 71, which also engages the teeth of a sprocket wheel 72 on the outer end of a shaft section 73. This shaft section 73 may have a clutch connection with a shaft section 74, through a clutch 75. On the shaft section 73 is a sprocket wheel 76, the teeth of which are engaged by a sprocket chain 77, which also engages the teeth on a sprocket pinion 78 loosely carried on a shaft 79, and said pinion 78 is adapted to have a clutch connection with the shaft 79 through a clutch part 80, controlled by a lever 81. On the opposite end of the shaft 79 is secured a sprocket wheel 82, the teeth of which are engaged by a chain 83, which also engages with the teeth on a sprocket pinion 84 on the shaft 49.

The drum shaft is designated 85, and has secured thereto the drums 86 around which may be wound cables 87, which extend up and over rollers or idler wheels 88 on the outer ends of the inclined beams 9, and down and are secured to the truss-frames 12 at a suitable point, see Fig. 3. On the drum shaft is secured a spur gear wheel 89 which meshes with a spur gear pinion 90 on the shaft section 74. The shaft section 74 has secured thereto the ratchet wheel 91 engaged by a pawl 92.

To propel the machine over the ground and also operate the excavating wheel for digging purposes, the clutch 68 is released from the pinion 64, leaving the latter loose on the shaft 49, and the clutch 53 is connected with the bevel gear wheel 51 making it fast with said shaft 49, while at the same time the clutch 54 is disengaged from the bevel gear wheel 52, see Fig. 2. The shaft 49 being operated through bevel gear wheel 51, will impart proper direction of rotation to the shaft 59 through the chain 57, to rotate the excavating wheel through the sprocket wheels 60, chains 61, sprocket wheels 62 and other coacting parts described. The operation of the shaft 24, on which the sprocket wheels 62 are carried, will, through the gearing described, also actuate the transfer conveyer. The shaft 49 is motion, through the operation of the bevel gear wheel 51, and the clutch part 80 clutching the sprocket pinion 78 to the shaft 79, the sprocket pinion 84 will actuate chain 83 and it in turn will operate the sprocket wheel 82 and shaft 79. The pinion 78 clutch connected with the shaft 79 will actuate the chain 77, and it in turn will operate the sprocket wheel 76 and the shaft section 73, (the shaft section 73 and 74 being disconnected. The shaft section 73 will operate the sprocket wheel 72, and it in turn will operate the chain 71 which will operate the sprocket wheel 70 on the shaft 67. The clutch 69 in clutch engagement with the spur gear pinion 66 will cause said pinion to be actuated, and it in turn will operate the spur gear wheel 65 and operating shaft 47, and the operation of said last mentioned shaft in manner specified will impart proper movement to the caterpillars 41 through the chains 45 to propel the machine over the ground.

To propel the machine over the ground, when the excavating wheel has been raised into the position shown in Fig. 3, all that is necessary to do is for the operator to remove the chain 57 disconnecting the excavating wheel from operative connection with the shaft 49, and operate the caterpillars from the shaft 49 in manner just previously described.

To operate the shaft sections 73 and 74 and the drum shaft 85 to cause the cables 87 to be wound on the drums 86 so as to raise the outer end of the truss-frames 12 into the position shown in Fig. 3 the operator will leave the clutch part 53 in clutch engagement with the bevel gear wheel 51 so that the shaft 49 will receive its power through said bevel gear wheel. He will also see that clutch parts 68 and 69 are disconnected from their respective spur gear pinions, and that the clutch part 75 is clutched to the ends of the shaft sections 73 and 74. The shaft 49 will then operate the shaft 79 through the chain 83 and connections; the shaft 79 will in turn operate the shaft sections 73 and 74 through the chain 77 and connections. The pinion 90 on shaft section 74 will operate the gear wheel 89 and it in turn will operate the drum shaft 85. The ratchet wheel 91 and pawl 92 will hold the drum shaft upon the disconnection of any of the parts; the operator controlling the height the outer end of the truss frames 12 are raised by manipulation of the lever mechanism 55. To reverse the operation of the drum shaft through the mechanism just described, the

operator will release the clutch part 53 from the bevel gear wheel 51 and connect the clutch part 54 with the bevel gear wheel 52, and will also release the pawl 92 from the ratchet wheel 91.

The drum shaft 85, as has been explained, is employed through power connections with the engine to raise or lower the outer ends of the truss-frames 12, the latter oscillating on the pivot formed between the rollers 13 and guides 7. The following mechanism is employed by the operator to lift the forward ends of the truss-frames 12 on the guides 7:—93 designates a drum shaft and 94 a pair of cables connected with said shaft and with the inner ends of the truss frames 12, see Fig. 3. The drum shaft has a spur gear wheel 95 meshing with a spur gear pinion 96 on a shaft 97, and 98 is a worm wheel in mesh with a worm 99 on a short shaft 100. This shaft is operated by means of the crank 101.

It will thus be observed that the operator may raise the excavating wheel and its supporting frame out of a trench or lower the same for digging the trench by means which is simple and efficient; the manually actuated means being operated in timed relation with the power means for raising the excavating wheel so that the vertical lift of the inner end of the excavating wheel frames will not be raised out of proportion to the outer ends thereof.

What I claim is—

1. In a machine of the character described, in combination, an excavating wheel including spaced annular rings, each provided with internal ring gears, buckets connecting said rings, a supporting frame, a plurality of gear wheels journaled on said frame in mesh with said internal ring gears of said excavating wheel and on which said wheel revolves, one pair of said gear wheels being driving gear wheels, and means for actuating said driving gear wheels.

2. In a machine of the character described, in combination, an excavating wheel comprising spaced annular rings, each ring including a pair of members, one shallower than the other and the inner circumferential edge of each pair of members provided with gear teeth, forming an internal gear, buckets connecting the wider members of each ring, a supporting frame, a plurality of gear wheels journaled on said frame in mesh with the teeth of said rings, one pair of said gear wheels being driving gear wheels, and means for actuating said driving gear wheels.

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