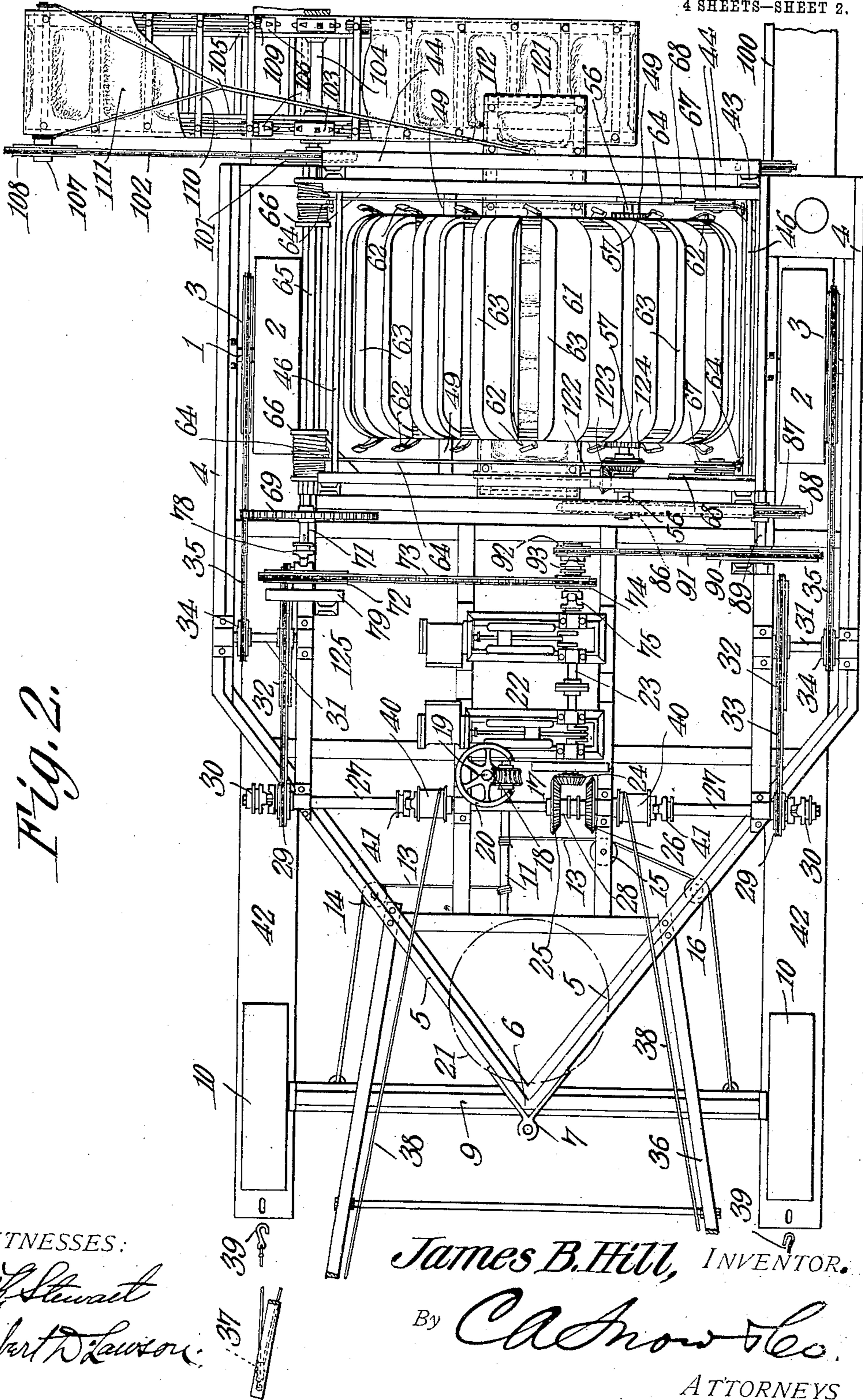


No. 865,702.

PATENTED SEPT. 10, 1907.

J. B. HILL.
DITCHING MACHINE.
APPLICATION FILED MAR. 8, 1907.

4 SHEETS—SHEET 2.



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4 SHEETS—SHEET 3.

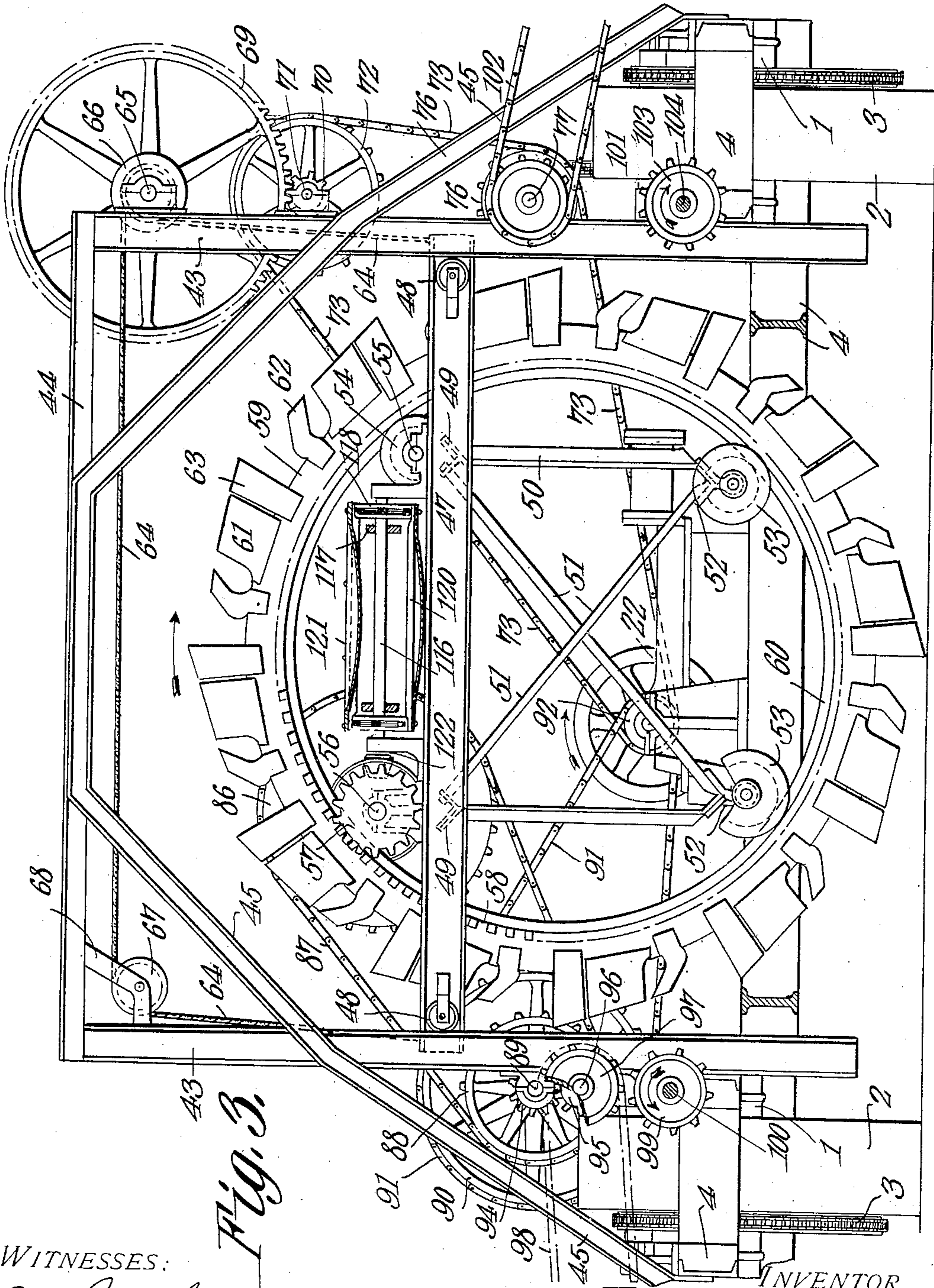


Fig. 3.

WITNESSES:

E. J. Stewart
Herbert W. Lawson

By

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James B. Hill,
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ATTORNEYS

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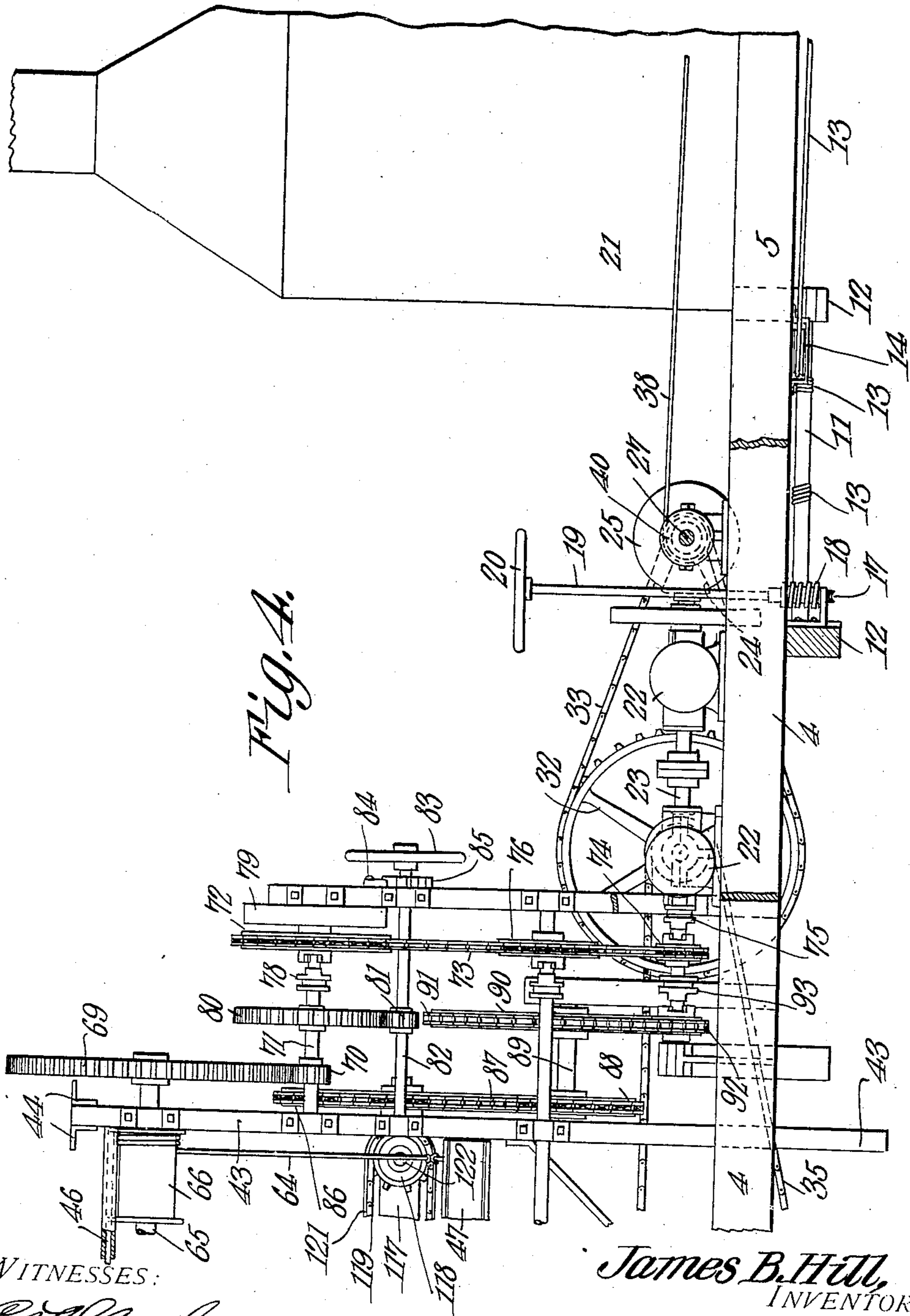


Fig. 4.

WITNESSES:

E. J. Stewart
Herbert H. Lawson

James B. Hill
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UNITED STATES PATENT OFFICE.

JAMES B. HILL, OF FINDLAY, OHIO.

DITCHING-MACHINE.

No. 865,702.

Specification of Letters Patent.

Patented Sept. 10, 1907.

Application filed March 8, 1907. Serial No. 361,387.

To all whom it may concern:

Be it known that I, JAMES B. HILL, a citizen of the United States, residing at Findlay, in the county of Hancock and State of Ohio, have invented a new and
5 useful Ditching-Machine, of which the following is a specification.

This invention relates to ditching machines and is designed for cutting open ditches, such as used for drainage and other purposes, and for cleaning old
10 ditches.

The device is more especially an improvement upon that described and claimed by me in a patent dated August 7, 1906, No. 828,208.

The principal object of the invention is to provide
15 an excavating wheel rotatable transversely of the direction of movement of the machine.

Another object is to provide a novel form of conveyer for carrying the excavated soil to one side of the ditch.

A still further object is to provide simple means under the perfect control of the operator whereby the excavating wheel can be raised or lowered a desired distance either manually or by means of power actuated mechanism.

Another object is to provide a conveyer designed to discharge excavated soil toward either side of the ditch.

A still further object is to provide means whereby timbers on which the machine is adapted to travel can be drawn by the motor of the machine into position in
30 front of the traction wheels after said wheels have passed thereover.

With these and other objects in view the invention consists of certain novel features of construction and combinations of parts which will be hereinafter more
35 fully described and pointed out in the claims.

In the accompanying drawings is shown the preferred form of the invention.

In said drawings: Figure 1 is a side elevation of the machine the excavating wheel being indicated by
40 dotted lines; Fig. 2 is a plan view of the machine, a portion of the rear conveyer being broken away; Fig. 3 is an enlarged rear elevation of the machine the rear conveyer being removed and the longitudinal conveyer shown in section; and Fig. 4 is an enlarged elevation of a portion of the driving mechanism looking
45 at the side opposite to that shown in Fig. 1.

Referring to the figures by characters of reference, 1 is the rear axle of the machine on which are mounted traction wheels 2 each of which has a drive sprocket 3
50 secured thereto and rotatable therewith. Secured upon the axle 1 in any preferred manner is the frame 4 constituting the body of the machine. This frame may be made in any preferred manner and of any suitable materials and the front portion thereof has its sides
55 converging as shown at 5. The point 6 of the frame has a bracket 7 extending therefrom to receive a king

bolt 8 which is connected to the front axle 9 at the center thereof, said front axle being supported by the front or steering wheels 10. A shaft 11 is journaled in hangers 12 extending downward from the body of the machine and secured to this shaft are the ends of oppositely extending cables 13. One of these cables extends partly around a pulley 14 journaled beneath the body of the machine, and the end of said cable is fastened to axle 9 near one of the wheels 10. The other
60 cable 13 extends partly around pulleys 15 and 16 and is connected to axle 9 near the other wheel 10. The cables are so connected to the shaft 11 that when said shaft is rotated one of the cables will be wound thereon and the other unwound thereby swinging the front
70 axle. In order that the shaft 11 may be easily rotated a worm wheel 17 is secured thereto and is engaged by a worm 18 at the lower end of an upright shaft 19 journaled within the body 4, said shaft having a hand wheel 20 at its upper end by means of which
75 the same can be easily rotated manually.

A boiler 21 is supported by the front portion of the body between the converging sides thereof and the steam generated therein is adapted to propel an engine 22 of any preferred type. The drive shaft 23 of this
80 engine has a bevel gear 24 at one end adapted to be engaged by either of two oppositely disposed bevel gears 25 and 26 which are feathered on a shaft 27 journaled upon and extending transversely of the body 4. The two gears 25 and 26 are preferably connected by
85 a sleeve 28 and are adapted to be shifted simultaneously to the right or left by means of a suitable lever, not shown, whereby either of the gears 25 and 26 can be caused to mesh with the gear 24. A sprocket 29 is loosely mounted on shaft 27 near each end and a clutch
90 30 is provided for each of these sprockets so as to place either or both of them into or out of operative relation with shaft 27. An intermediate shaft 31 is journaled within the body adjacent each side thereof and carries a large sprocket 32 driven by a chain 33 extending
95 over the sprocket 29 and a small sprocket 34 is secured on each shaft 31 and drives a chain 35 extending over the adjoining sprocket 3 of the traction wheels 2. With this arrangement of gearing it will be apparent that by properly manipulating the sleeve 28 the machine can be propelled forward or backward at the will
100 of the operator and by means of the clutches 30 either or both of the wheels 2 can be driven.

Extending forward from the converging portions 5 of the body 4 are beams 36 each of which carries a pulley
105 37 at its front end which is disposed above and in the plane of movement of the wheels 10 and 2. Supported by these pulleys are cables 38 preferably provided with hooks 39 at their free ends while their opposite ends are secured to drums 40 loosely mounted on shaft
110 27. Each of these drums is adapted to be locked upon the shaft by means of a clutch 41 which may be oper-

ated by any suitable device, not shown. When the machine is in use upon soft or marshy soil it is designed to propel the same along broad heavy planks 42 and after the machine has passed over one set of these
 5 planks and on to another set the hooks 39 are adapted to be placed in engagement with those planks over which the machine has passed and by disconnecting the sprockets 29 from their shaft 27 and connecting the drums 40 with said shaft the planks can be pulled for-
 10 ward into position in front of the machine by winding the cables 38 on the drums. The forward movement of the machine can then be continued on to the newly positioned planks.

Extending upward from the sides of the rear portion of the body are guides 43 preferably formed of I-beams connected at their upper ends by cross strips 44. Braces 45 preferably formed of channel beams connect the central portions of the cross strips 44 with the sides of body 4 so that the guides 43 are rigidly supported in fixed relation to the body. The front and rear guides may be connected in any preferred manner as by means of rods 46 bolted or otherwise secured thereto. It will be noted by referring to Figs. 1 and 3 that the guides extend below the body. Movably mounted between the guides is a carriage 47 in the form of a rectangular frame having friction rollers 48 mounted upon opposite faces thereof and bearing against the inner or adjoining faces of the guides 43. Angle irons 49 extend across the carriage at opposite sides of the center thereof and depending therefrom are hangers 50 connected by cross braces 51. These hangers are provided at their lower ends with journals 52 in which are mounted guide wheels 53 provided with annular flanges, as shown in Fig. 1. Similar guide wheels 54 are mounted
 25 on a shaft 55 journaled upon the carriage 47. Another shaft 56 is journaled upon the carriage 47 and carries gears 57. These gears are adapted to mesh with annular racks 58 formed within the rims 59 of the excavating wheel. These rims also surround the guide wheels 54 and have annular flanges 60 upon which the wheels bear, said flanges extending inward from the racks 58. It will be apparent that this construction results in the centering of the rims upon the wheels and by rotating the gears 57 the rims are caused to revolve. The
 45 wheels 54 as well as the gears 57 constitute bearings for the rims. Mounted upon and connecting the two rims are buckets 61 of any suitable proportions. In front of each of these buckets and extending from the outer faces of the rims are side cutters 62 in the form of curved plates and between each pair of these side cutters and the bucket following the same is a longitudinal cutter 63 in the form of a bowed-blade, the ends of which are fastened to the rims. Any other means in addition to the buckets 61 and cutters 63 may be utilized for securing the two rims of the wheel together. It will be obvious that when the gears 57 are rotated the side blades 62 will cut into the soil and will be followed by the blades 63 after which the buckets 61 will scoop up the loosened soil and carry it upward to the
 60 point of discharge.

In order that the transversely extending excavating wheel and its carriage may be adjusted vertically between the guides each corner of the carriage has a cable 64 secured thereto. A shaft 65 is journaled upon the
 65 upper portions of the guides at one side of the machine

and carries drums 66 to which the cables 64 are secured. Two of these cables extend downward directly from the drums to those corners of the carriage 47 therebeneath while the other cables extend to the opposite side of the machine and downward over pulleys 67 supported by brackets 68 disposed adjacent the upper end of the adjoining guides 43. The two drums 66 when rotated will simultaneously wind the four cables thereon and therefore carriage 47 will be moved upward between the guides, thereby lifting the wheel therewith. 75 By unwinding the cables the wheel will move downward by gravity. In order that the drums may be rotated a gear 69 is secured to the shaft 65 and meshes with a small gear 70 on a shaft 71 journaled upon one side of the frame. This shaft carries a sprocket 72 over 80 which extends a chain 73 which is driven by a sprocket 74 normally loosely mounted on the drive shaft 23. A clutch 75 is provided, however, whereby the sprocket can be locked to the shaft 23. This clutch is adapted to be operated by any suitable means, not shown. 85 Chain 73 also extends downward under a sprocket 76 secured to a shaft 77 journaled upon the guides 43 at one side of the frame. The sprocket 72 is loosely mounted on this shaft 71 but is adapted to be locked to said shaft by means of a clutch 78 which may be operated 90 in any preferred manner.

It will be seen that by providing the mechanism above described motion can be readily transmitted from the shaft 23 of the engine to shaft 71 and that the gears 70 and 69 will therefore be rotated so as to wind 95 the cables on the drums to lift the carriage 47. By disengaging the sprocket 72 from shaft 71 the carriage will be permitted to move downward by gravity thereby unwinding the cables from the drums. In order that the descent of the carriage may be controlled when 100 the sprocket 72 is disengaged from shaft 71 a brake wheel 79 is secured to shaft 71. This wheel may be held in any preferred manner as by means of a brake band which may be of any preferred construction, and it is not therefore deemed necessary to illustrate the 105 same.

Instead of providing motor operated means for lifting the carriage manually operated means may be utilized in addition thereto or in lieu thereof. In Fig. 4 I have shown this manually operated means in addition 110 to the motor propelled means. By referring to said figure it will be noted that I provide the shaft 71 with a gear 80 which meshes with a gear 81 on a shaft 82 located below shaft 71 and provided with a hand wheel 83. Any suitable means such as a pawl 84 and ratchet 85 115 may be provided for locking the shaft so as to secure the carriage 47 in raised position.

In order that the excavating wheel may be rotated the shaft 56 is provided at one end with a sprocket 86 driven by a chain 87 extending under a sprocket 88. 120 This last mentioned sprocket is secured to a short shaft 89 journaled upon one of the guides 43 and carrying a large sprocket 90 which is in turn driven by a chain 91. This chain extends over a sprocket 92 loosely mounted on the drive shaft 23 and adapted to be locked thereon 125 by means of a clutch 93 which may be actuated in any suitable manner. It is apparent that the shaft 89 is fixed in relation to the guide 43 whereas the shaft 56 moves vertically with the carriage 47 and it will therefore be seen that the chain 87 becomes slack during 130

the vertical adjustment of the carriage but by reason of the extreme weight of this chain and the size of the sprockets 86 and 88 the chain will remain efficient as a propelling means even though it be slack. However, if preferred, any form of tightener may be utilized for holding the chain taut during the adjustment of the carriage. It has not been deemed necessary to illustrate such a tightener as the same may be of any well known construction.

10 A gear 94 is secured to the shaft 89 and meshes with a gear 95 on a shaft 96 journaled upon the guides 43 at one side of the machine. This shaft extends beyond the rear end of the machine. An idler sprocket 99 is arranged on a shaft 100 which projects beyond the rear of the machine and is for the purpose hereinafter more fully set forth. The shaft 77 which has been heretofore referred to also extends beyond the rear end of the machine and carries a sprocket 101 on which is mounted a chain 102. An idler sprocket 103 is loosely mounted on a stationary shaft 104 which extends beyond the rear end of the machine and is secured upon the guides 43. Shaft 104 constitutes a pivot for the frame 105 of a lateral conveyer. This frame carries a plurality of idler sprockets 106 in addition to the sprocket 103 and at one end of the frame is a shaft 107 carrying a sprocket 108 on which the chain 102 is mounted. Conveyer chains 109 are mounted on the idler sprockets 103 and 106 and connecting these chains are pipe sections 110 the ends of which are flattened and riveted or otherwise secured to the chains. Secured upon the pipe sections is a flexible strip of canvas or other material designated by the numeral 111 and which is adapted to sag between the chains and the pipe sections to form recesses or pockets in which the material to be conveyed will be held.

When the conveyer constructed in accordance with this invention is pivotally mounted on the shaft 107 it will discharge the dirt to one side of the ditch but by disconnecting the conveyer from said shaft, reversing it, and placing it on the shaft 100 the chain 98 can be placed in engagement with the sprocket 108 whereupon the conveyer will discharge the dirt at the other side of the ditch. The idler 99 of course takes the place of the idler 103 when the conveyer is thus positioned. When in either of its positions the conveyer is prevented from tilting by means of a hanger 112 which extends downward from the rear cross strip 44 and is connected to the sides of the frame 105 at the outer end thereof. This hanger can be adjusted in any preferred manner so as to raise or lower the outer end of the conveyer. In addition to the hanger 112 another hanger 113 is provided which extends downward from the cross strip 44 and extends over and below the outer side of the center of the conveyer to which it is pivotally connected. An arm 114 extends inward from this hanger and carries a roller 115 adapted to support the central portion of the lower ply of the conveyer.

The buckets 61 hereinbefore referred to may be of any suitable construction and are designed to discharge their contents upon reaching a position at vertical alinement with the center of the excavating wheel. Inasmuch as these buckets constitute no part of the present invention it is not deemed necessary to describe or illustrate them in detail.

65 In order that the material as soon as discharged from

the buckets may be carried rearwardly and deposited on the lateral conveyer heretofore described it is necessary to provide a longitudinal conveyer which extends from the wheel. As shown in the drawings this longitudinal conveyer is made up of shafts 116 carrying side strips 117 upon which are journaled idler sprockets 118 for supporting conveyer chains 119. These conveyer chains are connected by a pipe section 120 similar to the sections 110 hereinbefore referred to and support a flexible fabric strip 121 adapted to sag between the chains and pipe sections to form pockets. A shaft 122 is located at one end of this conveyer and carries a bevel gear 123 which meshes with a bevel gear 124 on the shaft 56 hereinbefore referred to. It is therefore apparent that when said shaft rotates the bevel gears will drive the shaft 122 and result in the actuation of the conveyer belt or strip 121 which will carry rearwardly any dirt deposited thereon by the buckets and will then drop it on to the lateral conveyer 111.

A suitable platform 125 is preferably arranged adjacent the engine 22 so that the operator can stand thereon in a position where the various clutch operating devices will be within convenient reach. This portion of the machine may be covered if preferred in order to protect the operator from the rays of the sun but such a cover has not been shown in the drawings as the same may be supported in any preferred manner.

In using the machine all of the clutches are disengaged with their respective sprockets and the engine 22 is set in motion. Series of heavy planks or heavy timbers 42 may be placed in front of the machine so as to form a track on which the wheels 2 and 10 can travel. The carriage 47 is lowered so that the lower cutters thereof will rest upon the surface of the ground. Sprocket 92 is then locked upon shaft 23 by means of clutch 93 and this will result in the rotation of the shafts 89 and 56. Gears 57 will therefore revolve and cause the excavating wheel to rotate around the guide wheels 54. The side cutters 62 will cut into the ground and be followed by the blade 63 after which the bucket adjacent said blade will scoop up the loosened soil and carry it slowly upward as the excavating wheel rotates. When the filled bucket reaches a point above the conveyer 121 the contents thereof will be discharged therefrom in any preferred manner and will fall upon said conveyer. Shaft 122 will be rotated by gears 124 and 123 so that the conveyer will conduct the dirt rearwardly and discharge it on to the lateral conveyer 111. This conveyer is actuated by throwing the clutch 75 into engagement with the sprocket 74 which in turn causes the chain 73 to drive the loose sprocket 72 and sprocket 76. As sprocket 101 rotates with the sprocket 76 the conveyer 111 will be driven through chain 102 and sprocket 108. This conveyer will conduct the dirt to one side of the cut. As the excavating wheel gradually removes the soil it will settle into the cut and therefore the depth of the cut will gradually increase. After the excavating wheel has reached a predetermined level the same is raised by rotating the gears 81, 80 and 69 manually so as to wind the cables 64 upon the drums 66. Instead of operating these drums manually, however, the clutch 78 can be shifted into engagement with sprockets 72 so as to cause the chain 73 which drives the conveyer

111 to also rotate the gears 70 and 69. After the excavating wheel has been raised from the cut the machine is moved forward upon the planks 42 by throwing the clutches 30 into engagement with sprockets 29 and the machine can be readily guided by means of the steering mechanism which has been heretofore described. When the machine has moved forward a distance slightly less than the width of the cut produced the same is stopped and the operation hereinbefore described repeated. After the machine has passed from the first set of planks and on to another set the rear planks are drawn forward by means of cables 38 as hereinbefore stated. Instead of cutting the ditch by lowering the excavating wheel to a predetermined level between every two forward movements of the machine said wheel can be located at a desired level and then moved forward so that the wheel will cut to a certain depth throughout the length of the ditch. The machine can then be returned to its initial position and the wheel lowered after which the machine can be again driven forward. If it is desired to deposit the dirt at the left side of the ditch instead of the right side as shown in the drawings the conveyer 111 can be detached and placed on the shaft 100 as heretofore described whereupon motion will be transmitted thereto through the gears 94 and 95, sprocket 97 and chain 98.

What is claimed is:

1. A ditching machine comprising a self-propelled wheel supported body, an excavating wheel carried by the body, motor operated means for raising and lowering said wheel in relation to the body, and means for rotating the wheel in a plane extending at an angle to the direction of movement of the body.
2. A ditching machine comprising a wheel supported body, a motor carried thereby for propelling the body, an excavating wheel carried by the body, means operated by the motor for rotating said wheel in a plane extending at an angle to the direction of movement of the body, and means operated by the motor for raising or lowering the wheel in relation to the body.
3. In a ditching machine the combination with a wheel supported body and a motor thereon for propelling the body; of an excavating wheel carried by the body, means operated by the motor for adjusting the wheel vertically, means operated by the motor for rotating the wheel independently of its adjustment, said wheel being revoluble in a plane extending at an angle to the direction of movement of the body, and a conveyer within and extending rearwardly from the excavating wheel, said conveyer and wheel being adjustable together.
4. In a ditching machine the combination with a longitudinally movable body; of an excavating wheel disposed in rear thereof and carried by the body, means upon the body for rotating said wheel in a plane extending transversely of the body, a conveyer within and designed to receive material from said wheel and to carry it rearwardly from the machine, and means for adjusting the wheel and conveyer vertically.
5. In a ditching machine the combination with a self-propelled body; of guides carried by the body, a carriage interposed therebetween, hangers depending from the carriage, guide wheels carried by the carriage and hangers, an excavating wheel mounted to rotate upon the guide wheels and movable with the carriage, said wheel being revoluble in a plane extending transversely of the body, power actuated means for shifting the carriage within the guides to adjust the wheel, and power operated mechanism for rotating the wheel.
6. The combination with a self-propelled body, and an adjustable transverse conveyer at one end; of an excavating wheel disposed adjacent said conveyer and designed to rotate in a plane extending transversely of the body, a conveyer within the wheel and extending rearwardly therefrom and disposed to direct material onto the first men-

tioned conveyer, means for rotating the wheel, and means for adjusting said wheel and the conveyer therein vertically independently of their movement.

7. In a ditching machine the combination with a self-propelled body; of a reversible and adjustable lateral conveyer at one end of the body, means for actuating said conveyer when in any of its positions, an excavating wheel carried by the body and revoluble in a vertical plane extending transversely of the body, a conveyer within said wheel for carrying material to the lateral conveyer, and independent mechanism for actuating the wheel and the conveyer therein and for adjusting said conveyer and wheel vertically independently of their operation.

8. A ditching machine comprising a longitudinally movable body, a transversely extending rotatable excavating wheel, rotatable wheel actuating means surrounded by and engaging said wheel, a conveyer extending through the wheel and disposed to receive material therefrom and discharge it at the rear end of the machine, means operated by the rotatable means for actuating said conveyer, an adjustably mounted lateral conveyer for receiving material from the longitudinal conveyer, and means upon the body for simultaneously or independently actuating the rotatable means and the lateral conveyer.

9. In a ditching machine the combination with a longitudinally movable body; of guides thereon, a carriage movable vertically between the guides, means for adjusting the carriage between the guides, an excavating wheel rotatably mounted within and movable with the carriage, said wheel and carriage extending transversely of the body, and means for rotating the wheel independently of the adjustment thereof.

10. In a ditching machine the combination with a longitudinally movable body; of guides thereon, drums carried by the guides, a carriage mounted between the guides, flexible supports extending from the carriage and connected to the drums, means for winding said supports upon the drums to adjust the carriage, and a transversely extending rotatable excavating wheel within and movable with the carriage.

11. In a ditching machine the combination with a longitudinally movable body; of guides thereon, drums carried by the guides, a carriage mounted between the guides, flexible supports extending from the carriage and connected to the drums, means for winding said supports upon the drums to adjust the carriage, a transversely extending rotatable excavating wheel within and movable with the carriage, and means upon the body for actuating the wheel independently of the adjustment thereof.

12. In a ditching machine the combination with a longitudinally movable body; of guides upstanding therefrom, a carriage movably mounted between the guides, flexible supporting devices connected to the carriage, rotatable means for winding said devices to raise the carriage, a rotatable excavating wheel within and movable with the carriage, a conveyer extending from said wheel and mounted upon the carriage, and means upon the body for actuating the wheel and conveyer independently of the adjustment of the carriage.

13. In a ditching machine the combination with a movable body; of guides upstanding therefrom, a carriage movably mounted between the guides, manually operated means upon the body for adjusting the carriage vertically between the guides, a longitudinal conveyer upon the carriage and extending through the wheel, rotatable means upon the carriage for simultaneously actuating the wheel and conveyer, and means upon the body for actuating said rotatable means independently of the adjustment of the carriage.

14. In a ditching machine the combination with a movable body; of upstanding guides thereon, a transversely extending rotatable excavating wheel mounted between the guides, pivot shafts extending rearwardly upon the body, a lateral conveyer mounted upon either of said pivot shafts, means for actuating said lateral conveyer when in either of its positions, a conveyer for directing material from said wheel on to the lateral conveyer, and means for actuating the wheel and longitudinal conveyer.

15. In a ditching machine the combination with a longitudinally movable body; of a transversely extending ex-

5 excavating wheel carried by the body, means for actuating said wheel, means for conveying material from the wheel to the rear end of the body, pivot shafts extending from the body, a conveyer mounted upon either of said shafts for receiving material from the longitudinal conveyer to discharge it at either side of the machine, and means for actuating the lateral conveyer when in either of its positions.

10 16. In a ditching machine the combination with a body and a transversely extending excavating wheel carried thereby; of forwardly extending beams upon the body, draft cables supported by said beams, cable winding means upon the body, and mechanism upon the body for simultaneously or independently actuating the wheel and the

15 cable winding means.
17. In a ditching machine the combination with a body and a transversely extending excavating wheel carried thereby; of a conveyer for receiving material from said wheel, said conveyer comprising endless chains, tubular

20 connections between the chains, and a slack flexible strip

connected to the tubular connections and chains and sagging therebetween to form pockets.

18. In a ditching machine the combination with a movable body and a transversely extending excavating wheel carried thereby; of a longitudinal conveyer within and extending from the wheel at the rear end of the body, a lateral conveyer pivotally mounted upon the rear end of the body and positioned to receive material from the longitudinal conveyer, means upon the body for actuating said conveyer, means for holding the lateral conveyer against movement upon its pivot, and a supporting device extending under said conveyer. 25 30

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

JAMES B. HILL.

Witnesses:

ZEPHIRIN FOLSE,
FRANZ BERNHARD.