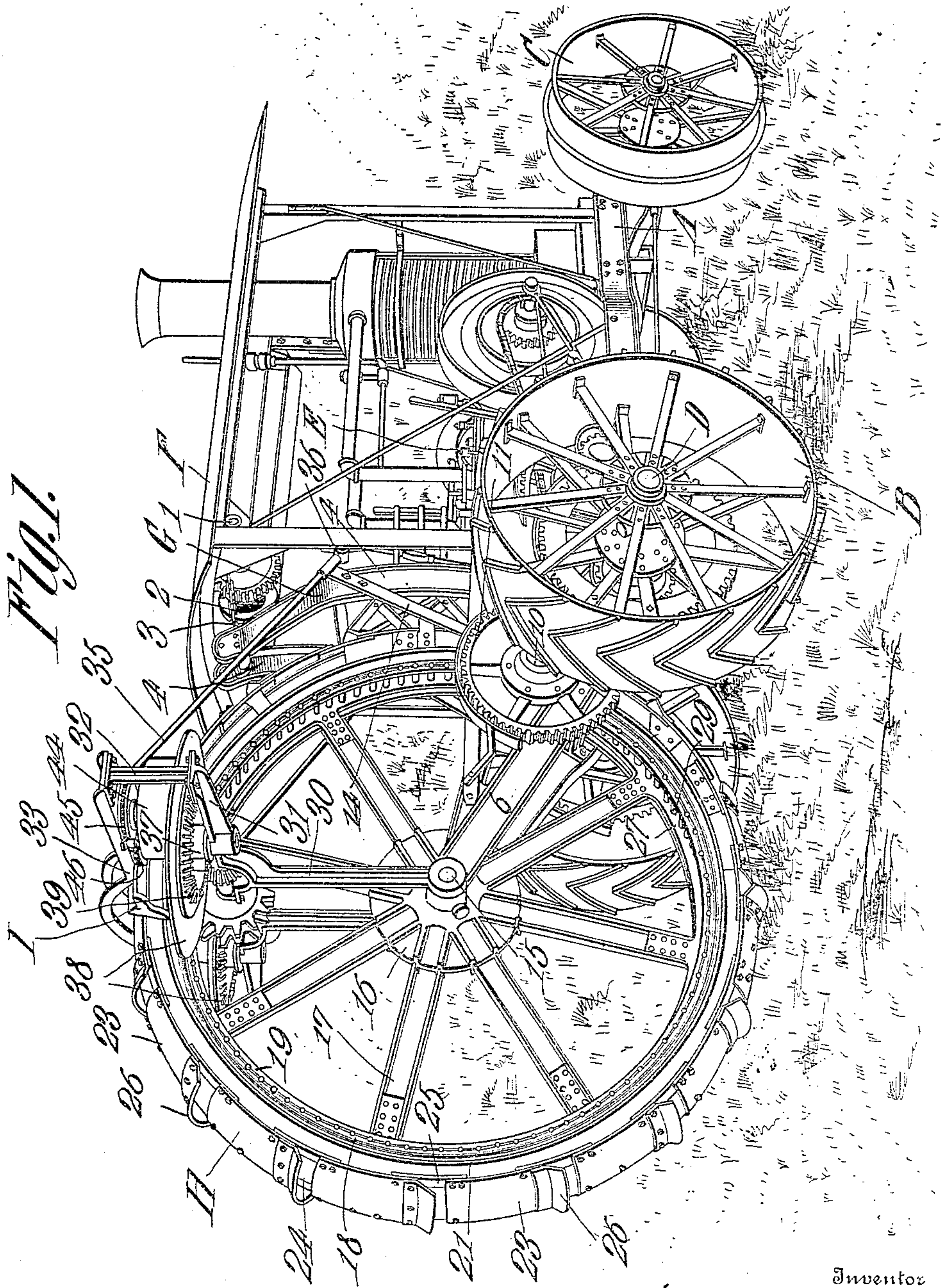


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DITCHING MACHINE.
APPLICATION FILED OCT. 12, 1908.

Patented Jan. 26, 1909.
3 SHEETS—SHEET 1.



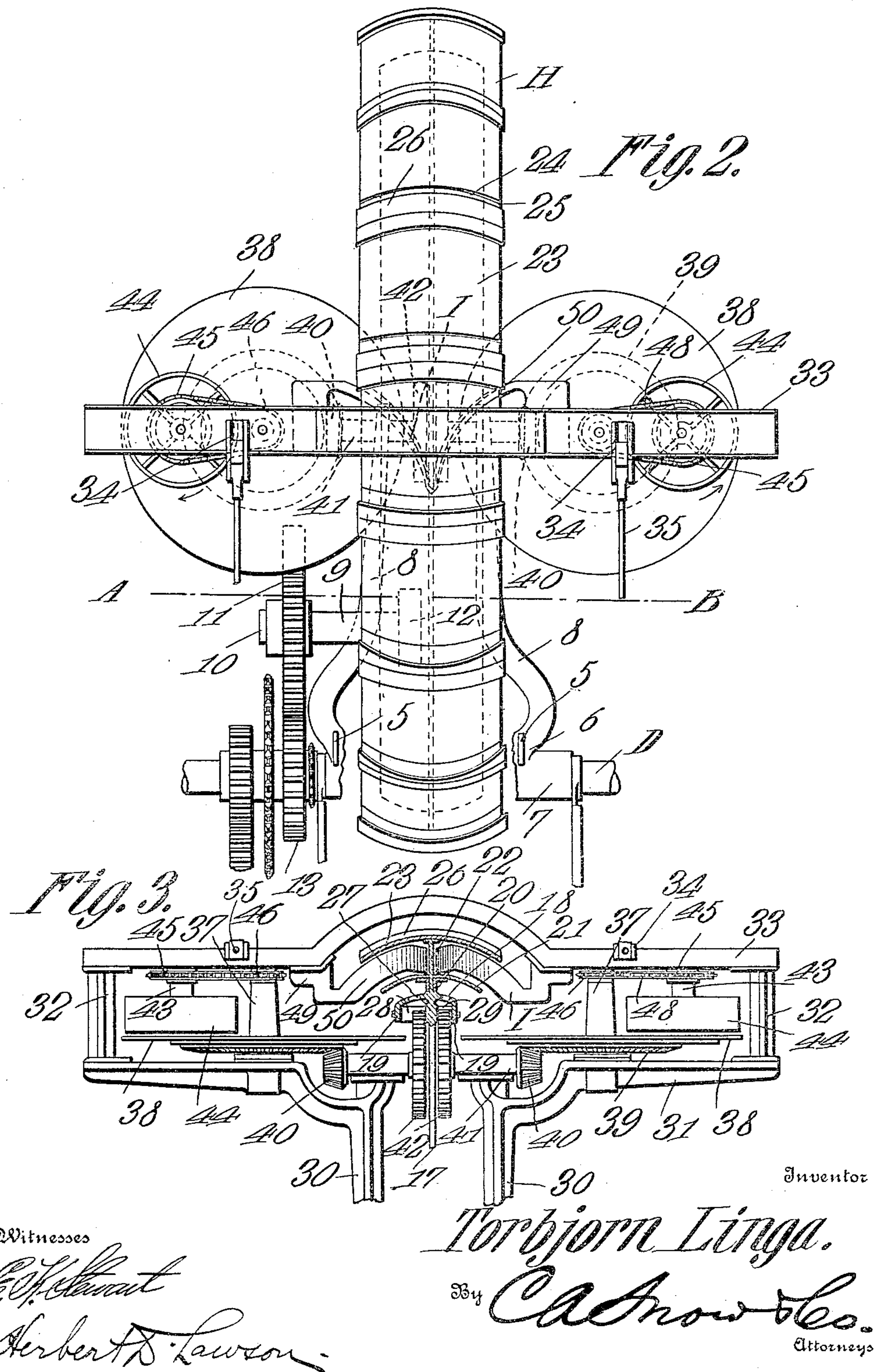
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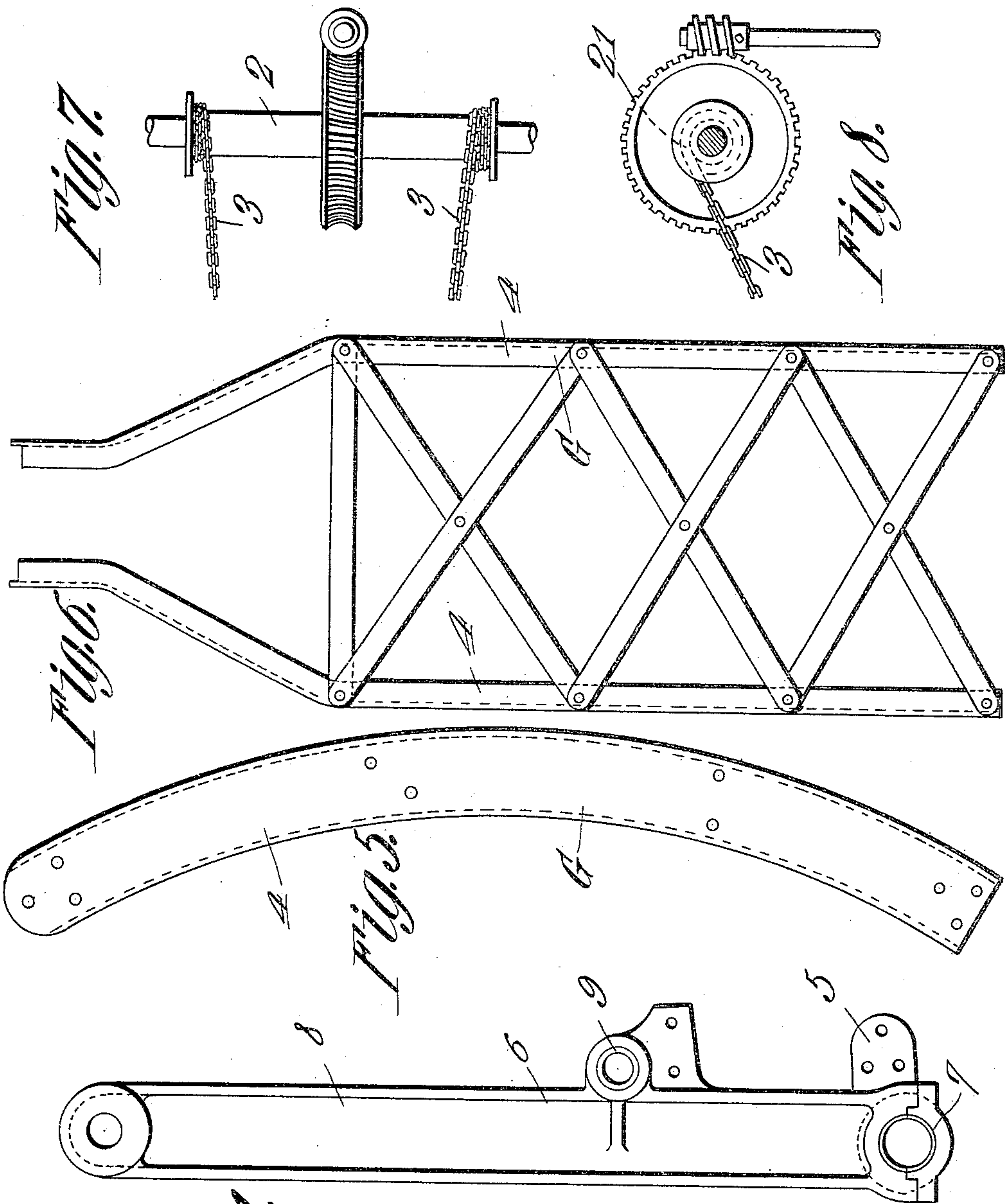
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UNITED STATES PATENT OFFICE.

TORBJÖRN LINGA, OF THOR, IOWA.

DITCHING-MACHINE.

No. 910,552.

Specification of Letters Patent.

Patented Jan. 26, 1909.

Application filed October 12, 1908. Serial No. 457,378.

To all whom it may concern:

Be it known that I, TORBJÖRN LINGA, a subject of the King of Norway, residing at Thor, in the county of Humboldt and State of Iowa, have invented a new and useful Ditching-Machine, of which the following is a specification.

This invention relates to machines for digging ditches or narrow trenches, such as used in laying pipes or building sewers.

The object of the invention is to provide a motor-propelled machine of this character having a wheel of novel construction for cutting a ditch or trench of any desired depth, novel means being employed whereby the wheel can be readily raised or lowered relative to the balance of the machine.

Another object of the invention is to provide a wheel which dispenses with the use of movable buckets such as ordinarily employed, and, instead utilizes a series of cutting blades fixedly attached to the wheel.

A still further object is to provide a wheel having simple means for retaining the dirt, means being provided for withdrawing the dirt forcibly from the wheel.

Another object is to provide lateral discharges for the elevated dirt, the same being simple, durable and efficient, and operating to discharge the dirt at points beyond the walls of the ditch or trench.

With these and other objects in view, the invention consists of certain novel details of construction and combinations of parts hereinafter more fully described and pointed out in the claims.

In the accompanying drawings the preferred form of the invention has been shown.

In said drawings:—Figure 1 is a perspective view of the complete machine. Fig. 2 is a plan view of the wheel and the adjoining parts of the machine, the clevis carrying the wheel being partly broken away. Fig. 3 is a section on line A—B Fig. 2. Fig. 4 is a side elevation of the clevis. Fig. 5 is a side elevation of the frame carried by the clevis. Fig. 6 is a rear elevation of the said frame. Fig. 7 is a plan view of the winding device utilized for shifting the clevis and frame. Fig. 8 is a side elevation of the parts shown in Fig. 7.

Referring to the figures by characters of reference, "A" indicates the frame of a tractor, the same being mounted on supporting wheels "B" and "C", the rear wheels "B" carrying the main or drive axle "D" of the

machine. Any suitable power mechanism such as indicated generally at "E" may be utilized both for propelling the machine and for actuating the wheel hereinafter described. This mechanism is preferably covered by a housing "F" of suitable strength to support a shaft 1, which is journaled in the upper portion of the housing and carries a drum 2, designed to be actuated at will by any suitable mechanism provided therefor. Secured to, and designed to be wound upon this drum, is a pair of flexible devices, such as chains 3, the outer ends of which are secured to the free end of a frame "G". This frame preferably consists of a pair of side beams 4, converging toward their free ends, while their other ends are suitably secured to ears upstanding from a clevis 6, consisting of a sleeve 7 and oppositely disposed arms 8 outstanding therefrom, said arms having those portions thereof adjoining the sleeve oppositely bowed as clearly indicated in Fig. 2. The sleeve 7 is mounted on the axle "D" and the clevis 6 can therefore swing upon this axle relative to the frame "A". One arm 8 of the clevis has an enlargement 9 in which is journaled a shaft 10. Gears 11 and 12 are secured at the two ends of the shaft and the gear 11 meshes with a gear 13 mounted to rotate independently of the sleeve 7 and the axle "D" and which receives power in any suitable manner from the driving mechanism "E" heretofore referred to. It will be noted that the gear 11 can swing in an arc concentric with the gear 13, and, therefore, remains constantly in mesh therewith. The gear 12 is positioned between the two arms 8 of the clevis and is for the purpose hereinafter set forth. Braces 14 arranged in any manner desired connect the arms 8 with the beams 4 of frame "G", so that said frame and the clevis are rigidly connected and, therefore, move together under all conditions.

Mounted within the free ends of the arms 8 is an axle 15 on which is revolubly mounted the hub 16 of the ditching wheel "H". This hub has spokes 17 radiating therefrom and secured at their outer ends to the inner rim 18 of the wheel. This rim is concavo-convex in transverse section and provided at its edges with inwardly directed flanges 19 while arranged upon the outer or convex surface of the inner rim is an annular flange located at or adjacent the center of the rim. The outer rim 21 of the wheel is secured to

the outer edge of flange 20 and this rim is also concavo-convex in transverse contour and the edges thereof are positioned beyond the edges of the rim 18. An annular flange 22 extends from the rim 21 at a point adjacent or at the center of said rim and secured to the outer edge of said flange 22 is a series of retaining blades 23 of any desired length and which are concavo-convex in cross-section as indicated particularly in Fig. 3. These blades are concentric with the rim 21 and are spaced apart at their ends so as to form receiving slots 24 extending practically throughout the width of the blades, said blades being connected solely at their edges by means of tie rods 25 which are secured thereto in any preferred manner. Secured to each blade 23 is a cutting blade 26 preferably angular in cross section and riveted or otherwise fastened in place, the outstanding or cutting portion of the blade being arranged so as to partly overlap the adjoining slot. All of the cutting blades 26 are so positioned that when the wheel is rotated in one direction they will slice the dirt and direct it between the retaining blade 23 and the outer rim 21, where it will be tightly packed and held by friction until the point of discharge is reached.

A flange 27 is arranged between and parallel with the flanges 19 and is preferably formed integral with the inner rim 18. Mounted at opposite sides of this flange and between it and the two side flanges 19 are two circular series of rollers 28 and 29 respectively, the rollers 28 being longer than the rollers 29 and designed to mesh with and to be actuated by the gear 12 hereinbefore referred to.

Pivotally mounted on the axle 15 and extending upwardly therefrom are arms 30 one of which is arranged adjacent each side of the wheel "H". Each arm terminates close to but inside of the inner rim 18 and has a lateral extension 31 provided at its outer end with a standard 32. The two standards are connected by a cross-beam 33 which extends over the upper portion of the wheel "H" and has ears 34 thereon to which are pivotally connected brace rods 35. These rods are parallel with the clevis arms 8 and are pivotally connected to the framing of housing "F" as indicated at 36. The arms 30 being parallel with the vertical plane in which the pivots 36 and the axle "D" are located it will be apparent that said arms 30 will be maintained vertical irrespective of the vertical swinging movement of the clevis on which they are mounted.

Journalled within each extension 31 and within the adjoining portion of the cross-beam 33 is a vertical shaft 37 to the lower portion of which is secured a circular table 38 extending inwardly under the outer rim 21 of

the wheel "H" and close to the spokes 17. A gear 39 is also secured to the lower portion of each shaft and below the table 38 and meshes with a gear 40 secured to one end of a shaft 41, journaled upon the upper portion of one of the arms 30. Each of these shafts 41 has a gear 42 at its inner end, one of said gears 41 being disposed to receive motion from the rollers 29, while the other gear 42 engages the rollers 28. It will be apparent therefore that when the wheel "H" rotates motion will be transmitted to the gears 42 and shafts 41 and each of the two tables 38 will therefore be caused to rotate in opposite directions simultaneously.

The shafts 43 are journaled at their upper ends in the outer end portions of the cross-beam 33 and secured to the lower ends of these shafts 43 are deflecting pulleys 44 supported close to the upper faces of the tables 38 and between the shafts 37 and the standards 32. A sprocket 45 is secured to each shaft 43 and another sprocket 46 is secured to each shaft 37, there being a chain 48 extending around these sprockets, so that motion will be transmitted from the shafts 37 to the shafts 43 and the pulleys 44 and tables 38 caused to rotate in the same direction simultaneously.

Secured to the cross-beam 33 at opposite sides of the wheel "H" are plows "I", each plow consisting of a hanger 49 bolted or otherwise secured to the lower face of the beam 33 and provided at its lower end with a curved blade 50, the two blades of the plows converging toward the body of the machine or in the direction from which the dirt is received, the terminals of the blades 50 bearing upon the opposite faces of flange 22, as clearly indicated in Fig. 3. These blades are so shaped and proportioned as to accurately deflect on to the tables 38 the dirt forced thereagainst by the rotating wheel "H".

In using the machine the same is propelled forward by means of the motor and power-transmitting mechanism carried by the frame "A" and the chains 3 are paid out slowly so as to permit the frame "G" and the clevis to swing downwardly slow, so as to bring the digging wheel into contact with the ground, said wheel being designed to move downwardly as fast as it digs into the dirt. The wheel is rotated by means of the shaft 10 and gear 12, said gear meshing with the series of rollers 28 and causing the wheel "H" to slowly rotate. The digging blades 26 will thus be brought successively into contact with the ground and cut slices of dirt therefrom, said slices being forced between the retaining blade 23 and the outer rim 21. The dirt will be retained by friction between these blades and the outer rim until it comes into contact with the deflecting plows "I". These plows operate to direct the dirt out-

wardly from between the blades and the outer rim and on to the tables 38. As heretofore stated these tables are revolved by the gears 40 and 39 receiving motion through the gears 42 from the rollers 28 and 29. The dirt is carried outwardly beyond the sides of the digging wheels by these tables and is brought into contact with the rotating pulleys 44, which pulleys operate to deflect the dirt from the tables and discharge it beyond the sides of the ditch. When the desired depth of ditch has been dug the clevis can be held against further movement in any preferred manner and the machine caused to travel slowly forward as the digging wheel "H" rotates.

It will be noted that in the form of ditcher herein described the number of parts necessary is reduced to the minimum, and importance is attached to the fact that the ordinary forms of conveyer aprons, bucket conveyers and the like, are dispensed with and the simpler form of revolving conveyer tables substituted therefor.

It is to be understood that various changes may be made in the construction and arrangement of parts without departing from the spirit or sacrificing the advantages of the present invention.

What is claimed is:—

1. A ditching machine comprising a motor-propelled structure, a revoluble digging wheel mounted to swing vertically relative thereto, a conveyer at one side of and movable vertically with the wheel, and means for maintaining the conveyer in a predetermined relation to the horizontal.

2. A ditching machine comprising a motor-propelled structure, a revoluble digging wheel carried thereby, a conveyer at one side of, and disposed to receive material from the wheel, and means operated by the wheel for actuating the conveyer.

3. A ditching machine comprising a supporting structure, a revoluble digging wheel connected thereto, a table at one side of, and disposed to receive material from the wheel, and means for rotating the table.

4. In a ditching machine a revoluble digging wheel, a support therefor, means for actuating the wheel, a revoluble conveyer table for receiving material from the wheel, and means actuated by the wheel for operating the table.

5. In a ditching machine a revoluble digging wheel, a support therefor, a horizontally revoluble conveyer for receiving material from the wheel, and deflecting means supported above the table.

6. In a ditching machine a digging wheel, means for rotating the same, a revoluble conveyer table for receiving material from the wheel, and a deflecting device supported above the table.

7. In a ditching machine a revoluble digging wheel, means for actuating the same, a revoluble conveyer table and revoluble deflecting means supported above the table.

8. In a ditching machine a revoluble digging wheel, a revoluble conveyer table, and a revoluble deflecting device supported above the table.

9. In a ditching machine a revoluble digging wheel, a revoluble conveying table for receiving material therefrom, means for transmitting motion from the wheel to the table, and a revoluble deflecting device supported above the table.

10. In a ditching machine a digging wheel, means for rotating the same, a revoluble conveying table for receiving material from the wheel, means actuated by the wheel for rotating the table, a revoluble deflecting device supported above the table, and means operated by the said table for actuating the deflecting device.

11. In a ditching machine a digging wheel having a rim, a series of spaced retaining blades concentric with and outside of the rim, means for directing dirt between the spaced blades and into position between said blades and the rim.

12. In a ditching machine a wheel having a rim, a circular series of retaining blades surrounding, and concentric with the rim, and a cutting blade outstanding from each retaining blade for directing material between said retaining blade and the rim.

13. In a ditching machine a wheel having a rim, an annular flange outstanding therefrom, a circular series of annularly spaced retaining blades mounted upon the flange and extending laterally there-beyond, and a cutting blade carried by each retaining blade.

14. In a ditching machine a wheel having a rim provided with a transversely convex outer surface, a circular series of retaining blades outside of and concentric with said rim, said blades being concavo-convex in transverse contour and being spaced annularly, and means for directing material between said blades and the rim of the wheel.

15. In a ditching machine a digging wheel having concentric inner and outer rims, separate means spaced from the outer rim for directing material there-against, and retaining it thereon.

16. In a ditching machine a digging wheel having concentric inner and outer rims, separate means spaced from the outer rim for directing material there-against and retaining it thereon, and relatively fixed means for deflecting material laterally from the wheel.

17. In a ditching machine a digging wheel comprising inner and outer rims, power-transmitting means carried by the inner rim, a circular series of annularly spaced retaining blades outside of and concentric with the

outer rim, means for directing material into position between said blades and the outer rim, and relatively fixed means projecting between said rim and blades for deflecting material from position there-between.

18. In a ditching machine a wheel comprising a rim, a circular series of annularly spaced retaining blades outside of and concentric with said rim, means carried by the blades for directing material between the blades and the rim, said rim and blades cooperating to both engage and retain the material, and relatively fixed means extending between the rim and blades for deflecting material from position there-between.

19. In a ditching machine a digging wheel comprising a rim, a circular series of annularly spaced retaining blades surrounding, and concentric with the rim, a cutting blade carried by each retaining blade and outstanding from one end portion thereof, and a curved deflecting device extending between the rim and retaining blades for removing material contained there-between.

20. In a ditching machine a digging wheel comprising a rim, a circular series of annularly spaced retaining blades surrounding, and concentric with the rim, a cutting blade carried by each retaining blade and outstanding from one end portion thereof, and a curved deflecting device extending between the rim and retaining blades for removing material contained there-between, a revoluble conveyer table for receiving said material and means for deflecting said material from the table.

21. The combination with a wheel rim, a circular series of annularly spaced retaining blades surrounding and concentric with said rim, and means carried by the blades for directing material between said blades and the rim; of a plow projecting between the rim and blades for deflecting material therefrom, a revoluble conveyer table for receiving the deflected material, and means operated by the wheel, for rotating the table.

22. The combination with a wheel-rim, a circular series of annularly spaced retaining blades outside of and concentric with the rim, and means for directing material into position between the blades and rim; of a relatively fixed deflecting device projecting between the rim and blades, a revoluble conveyer table for receiving said material, and a revoluble deflecting device supported above the table.

23. In a ditching machine the combination with a supporting structure and a revoluble driving element journaled therein; of a clevis pivotally mounted upon said element, a frame rigidly connected to and movable with the clevis, a revoluble digging wheel carried by the clevis, a winding device, and a flexible connection between said winding device and the frame, said connection being disposed along a straight line between the frame and winding device.

24. In a ditching machine the combination with a supporting structure and a driving element mounted therein; of a clevis pivotally connected to the structure and mounted to swing in an arc concentric with said driving element, a digging wheel mounted within the clevis and comprising a rim, a circular series of rollers within the rim, a power-transmitting device journaled upon the clevis and engaging said series of rollers, means for transmitting motion to said device from the driving element, dirt-cutting and retaining means carried by the rim, a revoluble conveyer table movable with the clevis, means for maintaining said table in a predetermined relation to the horizontal, and means operated by the wheel for actuating the table.

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

TORBJÖRN LINGA.

Witnesses:

MINNIE GUSTAFSON,
FRED DOERING.