

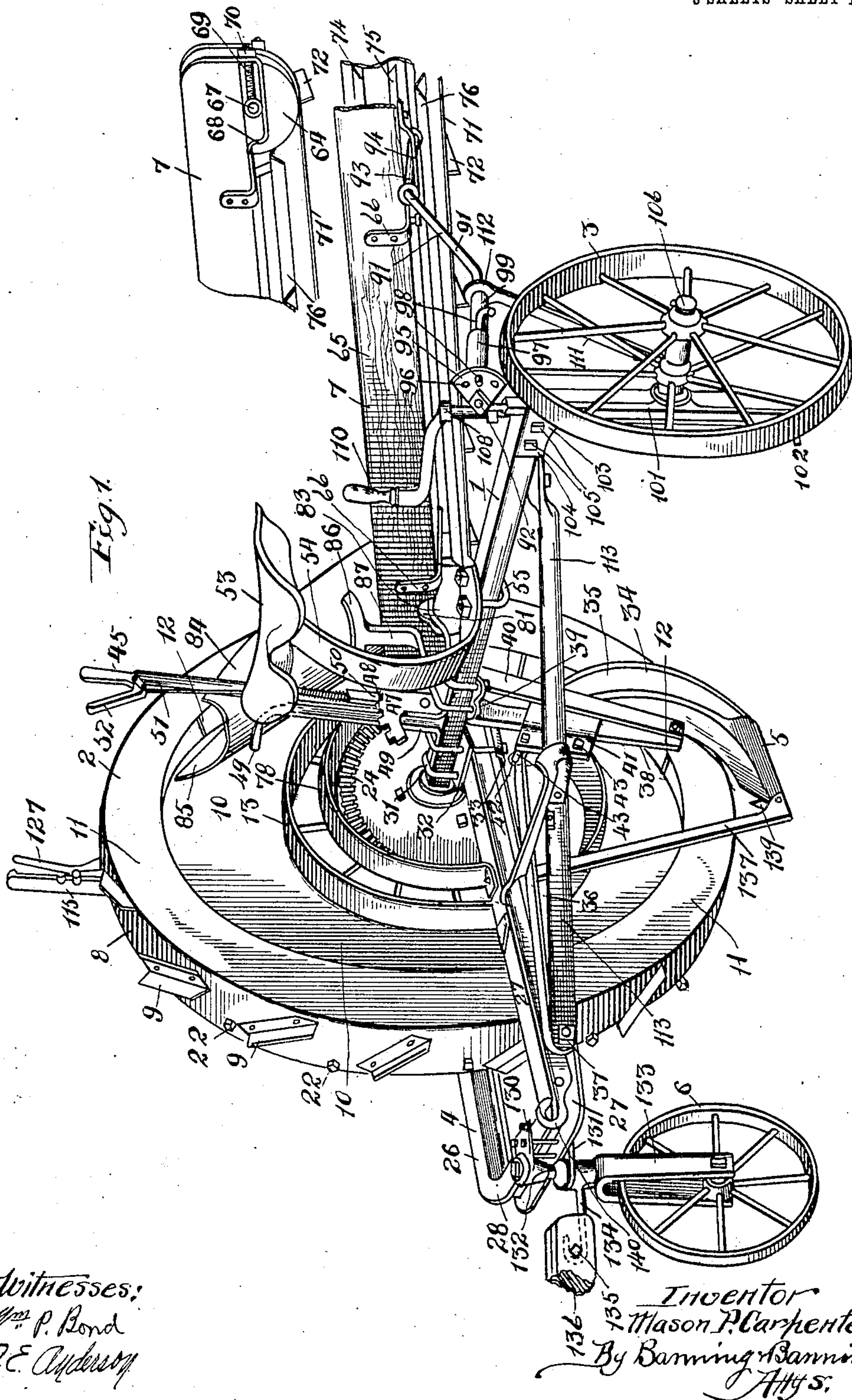
No. 849,458.

PATENTED APR. 9, 1907.

M. P. CARPENTER.
DITCHING MACHINE.

APPLICATION FILED MAY 18, 1906.

3 SHEETS—SHEET 1.



Witnesses:
P. Bond
Q. E. Anderson

Inventor
Mason P. Carpenter
By Banning & Banning
Attys.

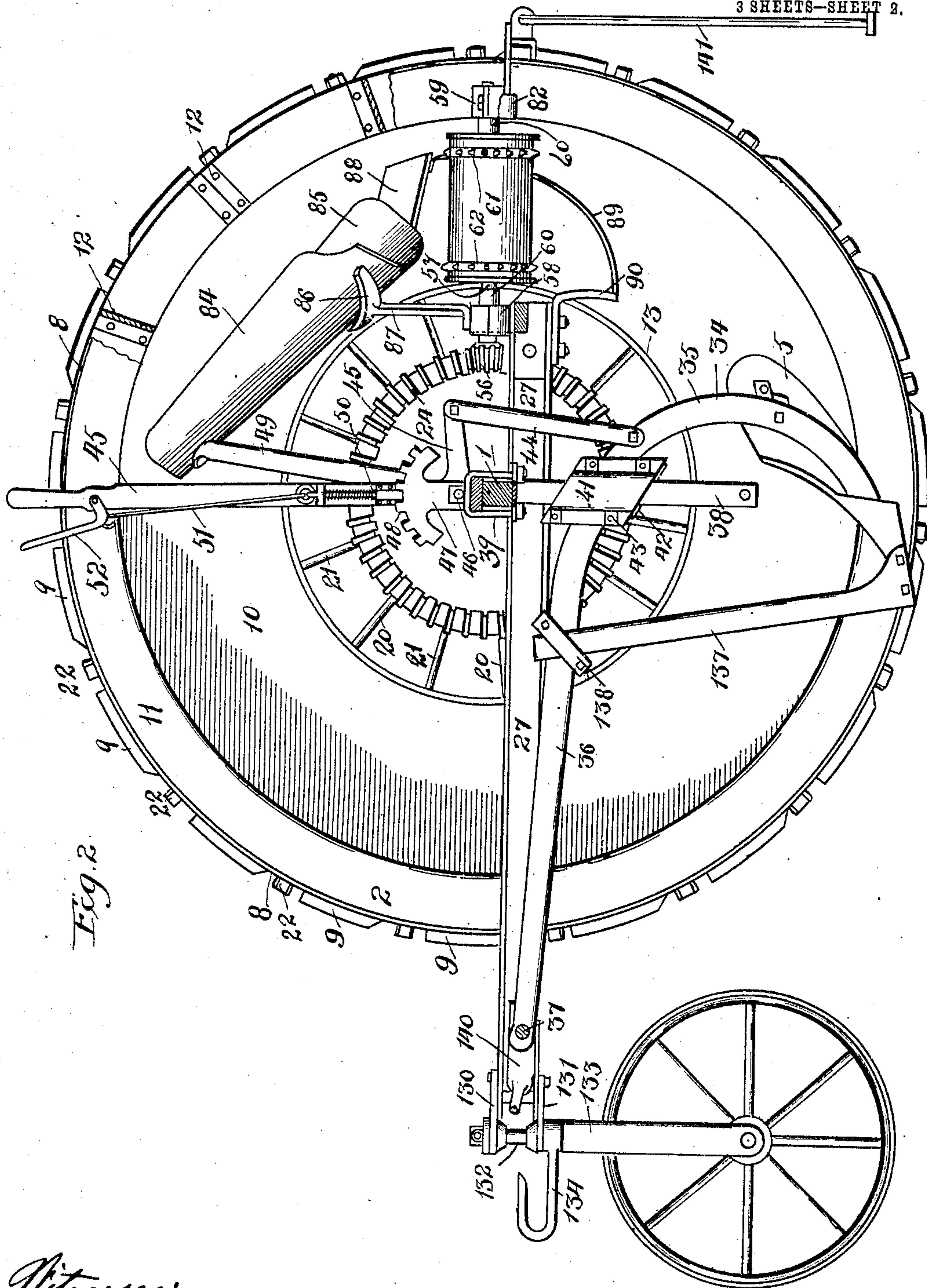
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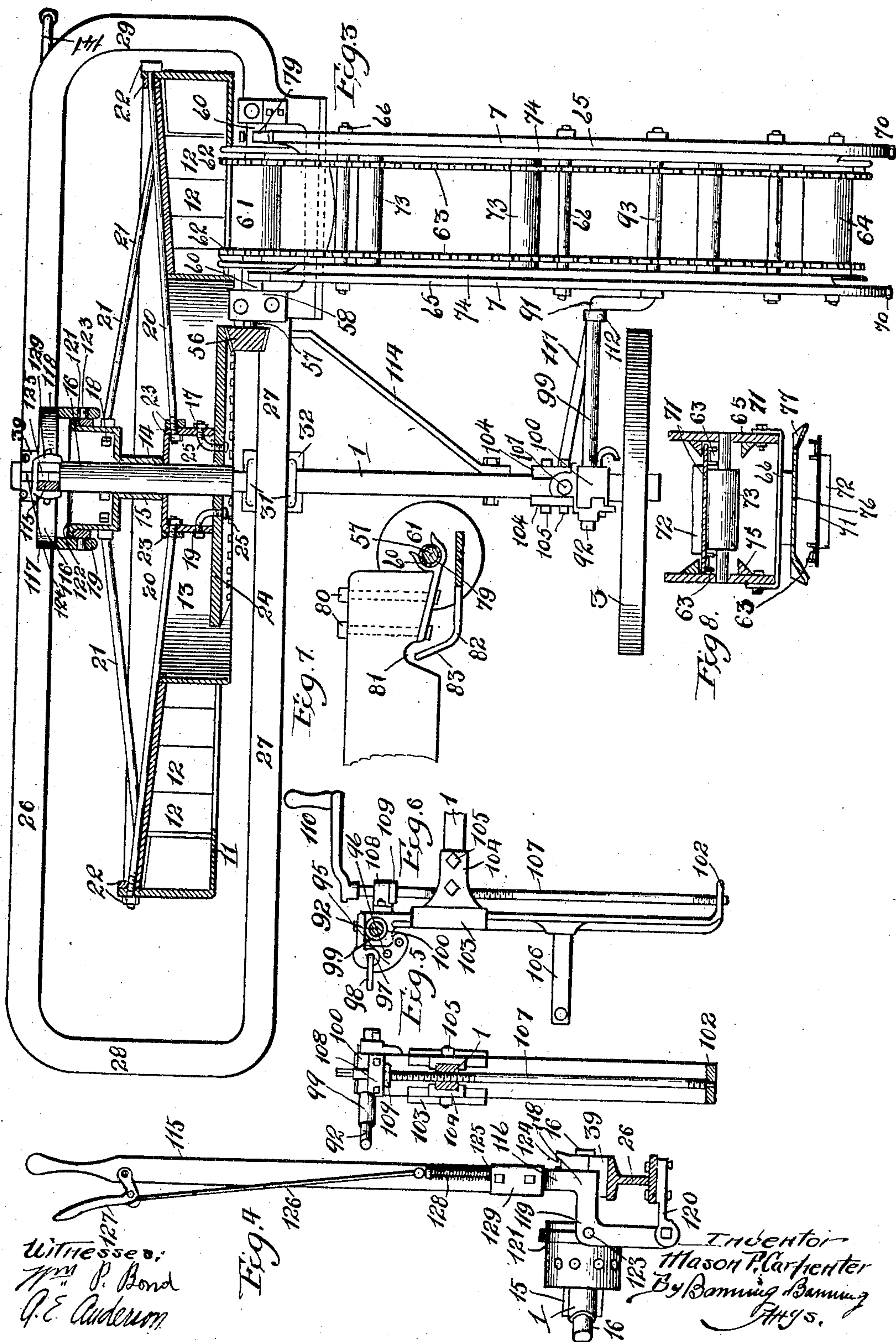
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3 SHEETS—SHEET 3.



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Fig. 4

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UNITED STATES PATENT OFFICE.

MASON P. CARPENTER, OF MISSOURI, ASSIGNOR OF ONE-HALF TO
WILLIAM DIESSEL, OF MISSOURI.

DITCHING-MACHINE.

No. 849,458.

Specification of Letters Patent.

Patented April 9, 1907.

Application filed May 18, 1906. Serial No. 317,491.

To all whom it may concern:

Be it known that I, MASON P. CARPENTER, a citizen of the United States, residing at Mexico, in the county of Audrain and State of Missouri, have invented certain new and useful Improvements in Ditching-Machines, of which the following is a specification.

This invention relates more particularly to machines for digging ditches, although it may be used for loading dirt, clay, or similar substance into wagons; and the object of the invention is to provide a simple, durable, and highly-efficient machine adapted to be pulled by two or more horses, which will raise and discharge the dirt in a rapid, continuous, and satisfactory manner.

The invention relates to the rotary elevator acting in combination with the plow, to the discharge-conveyer, to the method for actuating the carrier-belt, to the means for regulating the position of the plow and the elevation of the discharge-conveyer, and to the machine as a whole constructed and operating as hereinafter set forth. The ditching-machines of the ordinary construction are of such cumbersome and complicated nature that they are unfit for ordinary farm usage, since they are frequently operated by steam-power and are of such costly character that it is impossible for the average farmer to own one.

The present invention is adapted for ordinary farm usage, and it is of such simple construction that it may be manufactured at a low enough cost to enable the average farmer to own one of the machines, which will greatly facilitate the work of draining or irrigating land, road-making, and other similar work.

The invention consists in the features of construction and combination of parts hereinafter described and claimed.

In the drawings, Figure 1 is a corner perspective view of the entire machine; Fig. 2, a cross-sectional view cut through the square shaft with the discharge-conveyer removed; Fig. 3, a sectional plan view showing the plow and some of the adjusting mechanism removed; Fig. 4, a view of the lever for throwing the actuating-gears into and out of mesh; Figs. 5 and 6, detail views of the outer wheel adjustment; Fig. 7, a detail showing the

method of supporting the inner end of the discharge-conveyer, and Fig. 8 a cross-section of the discharge-conveyer.

The ditching-machine as a whole centers around a transversely-extending fixed shaft 1, upon one end of which is rotatably mounted a lifting bucket-wheel 2, and at the other end of which is adjustably mounted an outer supporting-wheel 3. The bucket-wheel is surrounded by a rectangular framework 4, which serves as a mounting for a plow 5 and a pivoted guide-wheel 6. The bucket-wheel is adapted to discharge into a conveyer 7, which throws the material back a considerable distance from the cut.

The bucket-wheel, which is the leading feature of the present invention, consists in a broad flat tire or rim 8, provided at suitable intervals with traction-cleats 9, and the tire or rim has secured thereto on the outside an inwardly-converging wall 10, which coöperates with an inner plate or ring 11 to provide an annular space which is cut up into a plurality of buckets by means of cross-plates 12, which extend between the inner ring and the outer wall. The converging outer plate terminates in an inner ring 13, which is concentric with the outer tire or rim, and the wheel as a whole is supported upon a hub 14, which comprises a neck 15, surrounding a rounded end 16 of the fixed shaft 1, upon which the hub is rotatably mounted. The neck 15 connects with inner and outer collars 17 and 18, each of considerably larger diameter than the neck and provided with a circular wall 19, adapted for the passage therethrough of a plurality of inner and outer stay-rods 20 and 21, respectively, arranged in staggered relation to one another and diverging from the tire or rim to the inner and outer collars, respectively.

The outer ends of the stay-rods are passed through the tire or rim near its outer edge and are secured thereto by means of inner and outer nuts 22, and the inner ends of the rods are likewise passed through the circular walls of the inner and outer collars and secured therein by means of inner and outer nuts 23. The inner collar abuts against the flat face of a bevel-face gear-wheel 24, which is secured to the collar by means of a plurality of L-shaped bolts 25, which pass through the body

of the gear-wheel and through the collar, respectively, clamping the one to the other. The fixed shaft passes transversely across the top of the rectangular open frame 4, which frame comprises an outer side rail 26, an inner side rail 27, a front cross-rail 28, and a rear cross-rail 29, the inner and outer side rails and the front rail being formed of a continuous piece of I-beam iron. The outer end of the rounded portion of the shaft is passed through a socket 30 on the outer rail, and the square portion of the shaft is clamped to the inner side rail by means of overlying strap-rods 31, of inverted-U shape, which are passed through an upper clamping-plate 32 and a lower clamping-plate 33, which embrace the top and bottom flanges of the side rail, which arrangement clamps the parts tightly together.

The plow 5 is arranged in suitable proximity to the lower side of the wheel and is of the usual shape adapted to throw up a furrow of dirt into the revolving bucket-wheel, and the plow is mounted upon the downwardly-curved end 34 of a plow-beam 35, which terminates in a forwardly-projecting upper end 36, which is pivoted at its forward extremity to the inner side rail by means of a bolt 37, which permits the plow-beam carrying the plow therewith to be raised and lowered, as may be desired.

The plow-beam is slidably connected with a guide-bar 38, which depends from and is secured to the square fixed shaft 1 by means of strap-rods 39. The guide-bar 38 is reinforced by means of a brace-bar 40, which is likewise secured to the square shaft. The connection between the plow-beam and the guide-bar is afforded by means of a channel-plate 41, which embraces the guide-bar and which coöperates with a clamping-plate 42 on the further side of the plow-beam, the two plates being connected together by means of tie-bolts 43, which arrangement permits the plow-beam to be raised and lowered upon the pivot-pin 37 as an axis, and the guide-rod prevents any side play or vibration after adjustment. The raising and lowering of the plow-beam is effected by means of a link 44, which is pivoted at its lower end to the curved or arcuate portion of the plow-beam and at its upper end is pivoted to an L-shaped adjusting hand-lever 45, which lever is pivoted by means of a bolt 46 between the shank 47 of a segmental rack 48 on the outside and an upright supporting-bar 49 on the inner side. The shank of the rack is clamped to the square shaft by means of the strap-rods 39, and the supporting-upright is likewise clamped under the strap-rods 31, which afford a firm rigid connection for the mechanism herein described.

The hand-lever 45 is provided with a latch 50 of the usual character, which is adapted to engage the teeth of the segmental rack,

and the latch is operated by means of a rod 51, connecting with an L-shaped handle 52.

A seat 53 is provided, mounted upon a curved spring-plate 54, which latter is secured to the square shaft by means of a clamping strap-rod 55.

The teeth of the gear-wheel 24 mesh with a bevel-pinion 56, carried upon the forward end of a shaft 57, which shaft is journaled within inner journal-boxes 58 and outer journal-boxes 59. Each of the journal-boxes has inwardly extending therefrom a sleeve or collar 60, and between the sleeves or collars is located a power-drum 61, having a pair of sprocket-wheels 62, which are adapted to drive a pair of endless sprocket-chains 63, which pass around an outer idler-drum 64, which is carried between side boards 65, suitably spaced to provide a discharge-conveyer of the requisite capacity, and the side boards are connected together by means of tie-bars 66, which extend beneath the side boards and are bolted or otherwise secured thereto. The idler-drum is carried by a shaft 67, the ends of which are slidably mounted within brackets 68, and the position of the drum can be regulated by means of adjusting-screws 69, having threaded thereon adjusting-nuts 70, which arrangement permits the sprocket-chains and the endless belt 71, carried thereby, to be tightened, as may be desired. The endless belt is provided at suitable intervals with cross-cleats 72 for carrying along the dirt to be discharged, and the belt is adapted to be supported by a plurality of transversely-extending rollers 73, journaled at their ends within the side boards. The edges of the belt are protected by means of a pair of longitudinally-extending beveled strips or cleats 74, secured to the inner walls of the companion side boards, which straps overlie the belt and prevent dirt from escaping between the edges of the belt and the side boards. The belt is likewise protected on its under or returning side by means of a similar pair of lower side strips or cleats 75. (Best shown in Fig. 8.) Below the discharge-chute is a metal guard-plate or shield 76, which is turned down along the edges to permit the discharge of any loose dirt which may escape, and the guard-plate bridges over the inner or non-acting face of the belt on its return trip and prevents sand or dirt from being carried around and into the working mechanism.

The forward edge 77 of the guard-plate 76 is turned up, as shown in Fig. 8, to further protect the working parts of the machine and prevent any dirt from being carried forward which may not have been shed by the sloping side edges of the guard-plate or shield. For a similar reason the gear-wheel 24 is provided with a semicircular shell 78, which surrounds the upwardly-projecting portion of the gear-wheel. The discharge-conveyer

is pivoted at its inner end to the inner and outer sleeves 60 of the journal-boxes 58 and 59 by means of Y-shaped brackets 79, which embrace the sleeves, but at the same time permit the chute as a whole to be withdrawn without difficulty. The Y-shaped brackets are secured to the under edges of the side boards by means of vertically-extending bolts 80, as shown in Fig. 7, and the side boards, near their ends, are provided with recesses 81 for the passage thereunder of a connecting-plate 82, which bridges the space occupied by the drum 61, which connecting-plate is slightly turned up at its outer edge 83 to give it sufficient reinforcement and is connected at its forward end to the side rail 27, and its rear end forms a continuation of the end rail 29.

Immediately above the inner or receiving end of the discharge-conveyer is located a sloping feed-chute 84, having its inner edge 85 in close proximity to the wall 10 of the bucket-wheel, and the chute is located immediately beneath the annular space occupied by the buckets, so that as the bucket-wheel is revolved the dirt carried up by the buckets will fall from the buckets into the feed-chute as soon as the buckets begin to rise above the horizontal center of the wheel. The feed-chute slopes upwardly from rear to front and is in a plane substantially parallel to and coincident with the bucket-wheel, and the forward or upper end of the chute is supported upon the upright bar 49, previously mentioned, and its rear or lower end is supported upon a concavely-turned bracket 86, which conforms to the curvature of the chute and is supported upon an upright shank 87, mounted upon the top of the inner journal-box 58. Adjacent to the mouth of the feed-chute is a guard-plate 88, which is mounted upon a curved spring 89, which latter is secured at its free end to a depending bar 90. The spring-support has a curvature which converges toward the periphery of the bucket-wheel, and the guard-plate 88 is in close proximity to the outer wall of the bucket-wheel, which arrangement permits clods or lumps to pass by the guard-plate and curved supporting-spring by forcing back the spring and plate sufficiently to pass the same, thereby preventing any clogging or cramping and at the same time preventing the escape of such clods and lumps or loose dirt which might otherwise fail to be caught up by the feed-chute. The vertical elevation of the discharge-conveyer may be changed by means of a crank-bar 91, which comprises a pivoted end 92 and an adjusting end 93. The adjusting end is slidably mounted beneath the side boards and is held in place by means of slotted brackets 94, which permit the adjusting end of the crank-bar to be moved in the arc of a circle, thereby raising and lowering the discharge-conveyer, which

being pivoted at its inner end swings in conformity to the movement of the crank-bar. The pivoted end 92 of the crank-bar has secured thereto a segmental plate 95, provided with a plurality of holes 96, and the segmental plate is in immediate proximity to a sleeve 97, which affords a socket for a spring-pin 98, which pin is adapted to be inserted into any one of the holes 96 and serves to hold the crank-bar in adjusted position. The pivoted end of the crank-bar is passed through a sleeve 99, which extends in parallel relation with the sleeve 97 and is connected thereto, and the sleeve 99 terminates in a head 100 on the upper end of a flanged adjustable plate 101, provided on its lower end with a step 102, and the plate 101 is slidably mounted between channeled clamping-plates 103, provided with inwardly-extending shanks 104, which are connected to the end of the square shaft 1 by means of bolts 105. The adjustable plate is provided with an outwardly-extending stud-shaft or journal 106, upon which the outer wheel 3 is rotatably mounted, and the vertical elevation of the adjustable plate and wheel can be regulated by means of a vertically-extending adjusting-screw 107, which is screw-threaded through the end of the square shaft and is rotatably mounted at its lower end with in the step 2, and is rotatably mounted at its upper end within a collar 108, secured to the head 100. Immediately beneath the collar is located a washer 109, and the upper end of the adjusting-screw is provided with a handle 110, which permits its rotation. The crank-bar is reinforced by means of a diagonally-extending brace 111, secured to the step 102 and provided with an eye 112 at its upper end, which encircles the crank-bar, and the square shaft 1 is also reinforced by means of a diagonally-extending brace 113, which is secured at one end near the outer end of the shaft and is secured at its other end to the same pivot-bolt 37 which pivots the plow-beam. On the rear side of the square shaft is a similar diagonally-extending brace 114, which connects with the inner side rail 27 at a point immediately opposite the bevel-pinion 56, which arrangement prevents the teeth of the bevel-pinion from being thrown out of mesh with the gear-wheel 24 when the machine is operated.

The gear-wheel and pinion are adapted to be thrown into and out of mesh by means of a lever 115, connected at its lower end with a yoke 116, as shown in Figs. 3 and 4. The yoke comprises outwardly-extending side arms 117 and 118, the former of which is a continuation of the lever 115, and both side arms terminate in inverted-L-shaped arms 119, extending inwardly and outwardly, which arms are pivoted at their lower ends to ears 120, bolted to the under face of the I-beam rail 26. The arms 119 embrace a ring

121, which encircles the collar 19 and is held in place thereon by means of a flange 122 on the collar, and the L-shaped arms are pivoted to the collar by means of a pair of trunnions 123, outwardly extending from each side of the ring 121, which arrangement permits the lever to be swung back and forth to advance or retract the ring 19 and the hub and other members connected therewith, thereby moving the gear-wheel 24 into and out of mesh with the bevel-pinion 56. The lever is held in adjusted position by means of a rack 124 on the top of the journal-box 39, which rack is engaged by a latch 125, connected with a rod 126, secured at its upper end to a pivoted L-handle 127 of the usual character, a spring 128 being provided to hold the parts normally in engagement. The housing 129 incloses the lower end of the lever, the latch, and the upper end of the yoke-arm 118.

On the forward end of the framework are upper and lower plates 130 and 131, which are secured to the cross-rail 28 of the frame, and the plates serve to provide a pivotal mounting for a shank 132 of a yoke 133, which carries the guide-wheel. Between the plate 131 and the yoke 133 and rigidly secured to the yoke is a forwardly-extending hook 134, which is adapted to engage a transversely-extending pin 135 in a guide-shaft 136, the inner end of which is slotted to receive the hook.

In order to reinforce the point of the plow, a colter-bar 137 is provided, which is bolted at its lower end to the plow and at its upper end is held against the plow-beam by means of a diagonally-extending plate 138. The efficiency is further increased by means of a sharpened plate 139, which is secured to the inner or turning edge of the plow, which serves to cut away sod, roots, or other obstructions. In using the device a doubletree or tripletree can be used, which is hitched to a hook 140 at the forward inner corner of the framework, which brings the line of draft between the plow and the wheel, so that there will be no side draft in using the machine. In order that the backing of the horses may not cause the machine to tilt up at its forward end, a pivoted post or standard 141 is secured to the rear end of the frame.

In use two or more horses are hitched to the device in such manner that the shaft will be properly guided during the advance of horses, and the plow is then adjusted to make a cut of the desired depth. This adjustment is made by moving the hand-lever 45, which raises or lowers the plow-beam, the channel guide-plate 41 sliding up and down along the guide-bar and permitting vertical adjustment of the plow without allowing any side play or vibration. The inner edge of the plow lies closely adjacent to the periphery of the bucket-wheel, so that after the machine

is started the furrow turned up by the plow will be thrown into the revolving bucket-wheel and carried up until the filled buckets are brought above the feed-chute, at which point the dirt will fall by gravity and be caught by the inclined feed-chute prior to its discharge onto the traveling belt or apron. Clods, lumps, or stones which may be carried up will, if of sufficient size, retract the curved spring 89 and the guard-plate 88, permitting such lumps or stones to be carried up without wedging or jamming the machinery, and at the same time the provision of the guard-plate prevents the dirt from escaping, which would be the case if no plate were interposed between the end of the inclined chute and the inner end of the discharge-conveyer.

When it is desirable to begin the ditching operation, the gear-wheel and pinion are thrown into mesh by a movement of the lever, which starts the operation of the apron, so that the dirt will be discharged at a considerable distance from the cut or furrow, and such discharge may, if desired, be made into a wagon or cart driven along with the ditcher to receive the dirt, although in many cases the discharge can be made directly onto the ground. If it is desired to make a wide ditch, the machine can make numerous trips, and in each case the bucket-wheel will travel in the cut previously made, and the plow will turn back a furrow from the previously-uncut soil. As the feed-wheel and plow descend deeper and deeper into the ground it will be necessary to change the vertical elevation of the outer wheel, which can be done by turning the handle 110, which revolves the adjusting-screw 111, which serves to change the vertical elevation of the plate 101, traveling within the slotted guide-plates 103. In this manner as the feed-wheel sinks lower and lower below the surface of the ground the outer wheel can be raised correspondingly, which serves to keep the main fixed shaft of the machine substantially on a level, although a slight inclination one way or the other will not materially affect the operation of the machine. When it is necessary to adjust the discharge-conveyer to accommodate the discharge to wagons or carts of different height, such adjustment can be made by retracting the pin 98 to disengage it from the perforated segmental plate on the forward end of the crank-shaft bar, which permits the outer end of the discharge-conveyer to be raised or lowered, as desired, after which adjustment the pin may be again inserted and the conveyer locked in adjustable position.

The machine can be operated by two horses in view of the fact that very little power is required to roll along the bucket-wheel, which raises the dirt or soil in a continuous stream and discharges it after a quarter-revolution of the wheel, so that the only power expended in addition to that re-

quired to roll along the machine and drag the plow through the soil is the slight amount of power required to raise by a rolling action the dirt from the plow to the feed-chute and the power necessary to impart travel to the loaded discharge-apron. This power can be easily furnished by two horses, which fact renders the machine peculiarly adapted for farm usage, and the cheapness of the machine in addition to its ease of operation makes it a machine peculiarly fitted for the purpose intended.

It is obvious that the shape or style of the ditch can be varied, as desired, by changing or modifying the number of cuts comprised in a completed ditch and that, if desired, the machine can be employed for leveling purposes, as well as ditching purposes, or for loading dirt into wagons for transportation or for use in brick-yards or other establishments in which it is desirable to dig up, elevate, and discharge dirt or soil.

The arrangement of the several adjusting mechanisms is one which brings them all easily within the reach of the driver, so that no difficulty will be experienced in driving and operating the machine at a rapid rate of speed and in an entirely satisfactory manner.

What I regard as new, and desire to secure by Letters Patent, is—

1. In a ditching-machine, the combination of a frame, a plow-beam pivoted at its forward end to the frame, a plow on the rear end of the beam, means for adjusting the vertical elevation of the plow-beam and plow, a rolling bucket-wheel in suitable proximity to the plow, a chute adapted to receive the material from the bucket-wheel and discharge the same, and a resilient deflecting-plate within the bucket-wheel and in suitable proximity to the chute and adapted to be retracted to permit the passage of lumps of dirt, substantially as described.

2. In a ditching-machine, the combination of a longitudinally-extending frame, a transversely-extending shaft fixedly secured to the frame, a rolling bucket-wheel rotatably mounted at one end of the shaft, a plow in suitable proximity to the bucket-wheel, a depending guideway at the other end of the fixed shaft, an outwardly-extending journal slidably mounted within the guideway, a feed-screw adapted to give a vertical adjustment to the journal, and an outer wheel rev-
olubly mounted on the journal, substantially as described.

3. In a ditching-machine, the combination of a longitudinally-extending frame, a transversely-extending shaft fixedly secured to the frame, a rolling bucket-wheel rotatably mounted at one end of the shaft, a plow in suitable proximity to the bucket-wheel, a depending guideway at the other end of the fixed shaft, an outwardly-extending journal slidably mounted within the guideway, a

feed-screw adapted to give a vertical adjustment to the journal-box, an outer wheel rev-
olubly mounted on the journal, and a lever adapted to raise and lower the plow, substantially as described.

4. In a ditching-machine, the combination of a rectangular open frame, a transversely-extending shaft rigidly secured to the frame and outwardly projecting therefrom at one side, a rolling bucket-wheel rotatably mounted on the shaft and revoluble within the frame, a brace diagonally extending between the frame and the outer end of the shaft, an outer wheel at the outer-end of the shaft, a plow secured to the frame in suitable proximity to the bucket-wheel, and a chute for receiving the material from the bucket-wheel, substantially as described.

5. In a ditching-machine, the combination of a rectangular open frame, a transversely-extending shaft rigidly secured to the frame and outwardly projecting therefrom at one side, a rolling bucket-wheel rotatably mounted on the shaft and revoluble within the frame, a brace diagonally extending between the frame and the outer end of the shaft, an outer wheel at the outer end of the shaft, a plow-beam pivoted at its forward end to the frame and having its rear end downwardly and forwardly bent or turned, a plow secured to the plow-beam, means for adjusting the vertical elevation of the plow-beam, and a chute for receiving the material from the bucket-wheel, substantially as described.

6. In a ditching-machine, the combination of a rectangular open frame, a transversely-extending shaft rigidly secured to the frame and outwardly projecting therefrom at one side, a rolling bucket-wheel rotatably mounted on the shaft and revoluble within the frame, a brace diagonally extending between the frame and the outer end of the shaft, an outer wheel at the outer end of the shaft, a plow-beam pivoted at its forward end to the frame and downwardly and forwardly bent or turned at its free end, a guide-bar depending from the fixed shaft adjacent to the plow-beam, a guide-plate on the plow-beam embracing the guide-bar, a plow secured to the plow-beam, and a lever for raising and lowering the plow-beam, substantially as described.

7. In a ditching-machine, the combination of a rectangular open frame, a transversely-extending shaft rigidly secured to the frame and outwardly projecting therefrom at one side, a rolling bucket-wheel rotatably mounted on the shaft and revoluble within the frame, a brace diagonally extending between the frame and the outer end of the shaft, an outer wheel at the outer end of the shaft, a plow-beam pivoted at its forward end to the frame and downwardly and forwardly bent or turned at its free end, a guide-bar depending from the fixed shaft adjacent to the plow-

beam, a guide-plate on the plow-beam embracing the guide-bar, a plow secured to the plow-beam, an L-shaped lever pivoted to the top of the fixed shaft, a link connecting the short arm of the lever with the plow-beam, a segmental rack adjacent to the lever, and a spring-latch on the lever adapted to engage the rack for holding the lever in adjusted position, substantially as described.

8. In a ditching-machine, the combination of an elongated rectangular frame formed of a substantially continuous bar of channel-iron, a shaft transversely extending across and fixedly secured to the frame, a rolling bucket-wheel rotatably mounted on the shaft within the frame, a plow in suitable proximity to the bucket-wheel, a pivoted guide-wheel at the forward end of the frame, an outer wheel at the outer end of the shaft, and a chute for receiving the material from the bucket-wheel, substantially as described.

9. In a ditching-machine, the combination of a rectangular framework, a transversely-extending shaft fixed thereto and round at one end, a bucket-wheel rotatably and slidably mounted on the rounded end of the shaft within the framework and provided with inwardly-opening buckets, a gear-wheel rigidly secured to and rotatable with the bucket-wheel, a plow adapted to turn up the soil and deposit it in the bucket-wheel, a bevel-pinion normally meshing with the gear-wheel, a lever for moving the bucket-wheel along the rounded end of the shaft to throw the gear-wheel and pinion into and out of engagement, a drum actuated by the pinion, an endless belt carried by the drum, and a feed-chute adapted to receive the material from the buckets and discharge it onto the endless belt or apron, substantially as described.

10. In a ditching-machine, the combination of a rectangular framework, a transversely-extending shaft fixed thereto and round at one end, a bucket-wheel rotatably and slidably mounted on the rounded end of the shaft within the framework and provided with inwardly-opening buckets, a gear-wheel rigidly secured to and rotatable with the bucket-wheel, a plow adapted to turn up the soil and deposit it in the bucket-wheel, a bevel-pinion normally meshing with the gear-wheel, a lever for moving the bucket-wheel along the rounded end of the shaft to throw the gear-wheel and pinion into and out of engagement, a drum actuated by the pinion, an endless belt carried by the drum, a feed-chute adapted to receive the material from the buckets and discharge it onto the endless belt or apron, and a guide-wheel pivotally mounted at the forward end of the frame, substantially as described.

11. In a ditching-machine, the combination of a rectangular framework, a transversely-extending shaft fixed thereto and

round at one end, a bucket-wheel rotatably and slidably mounted on the rounded end of the shaft within the framework and provided with inwardly-opening buckets, a gear-wheel rigidly secured to and rotatable with the bucket-wheel, a plow adapted to turn up the soil and deposit it in the bucket-wheel, a bevel-pinion normally meshing with the gear-wheel, a lever for moving the bucket-wheel along the rounded end of the shaft to throw the gear-wheel and pinion into and out of engagement, a drum actuated by the pinion, an endless belt carried by the drum, a feed-chute adapted to receive the material from the buckets and discharge it onto the endless belt or apron, a guide-wheel pivotally mounted at the forward end of the frame, and an outer wheel pivotally secured to the end of the shaft, substantially as described.

12. In a ditching-machine, the combination of a rectangular framework, a transversely-extending shaft fixed thereto and round at one end, a bucket-wheel rotatably and slidably mounted on the rounded end of the shaft within the framework and provided with inwardly-opening buckets, a gear-wheel rigidly secured to and rotatable with the bucket-wheel, a plow adapted to turn up the soil and deposit it in the bucket-wheel, a bevel-pinion normally meshing with the gear-wheel, a lever for moving the bucket-wheel along the rounded end of the shaft to throw the gear-wheel and pinion into and out of engagement, a drum actuated by the pinion, an endless belt carried by the drum, a feed-chute adapted to receive the material from the buckets and discharge it onto the endless belt or apron, a guide-wheel pivotally mounted at the forward end of the frame, and a guide-wheel pivotally and vertically adjustably secured to the end of the shaft, substantially as described.

13. In a ditching-machine, the combination of a rectangular framework, a transversely-extending shaft fixed thereto and round at one end, a bucket-wheel rotatably and slidably mounted on the rounded end of the shaft within the framework and provided with inwardly-opening buckets, a gear-wheel rigidly secured to and rotatable with the bucket-wheel, a plow adapted to turn up the soil and deposit it in the bucket-wheel, a bevel-pinion normally meshing with the gear-wheel, a lever for moving the bucket-wheel along the rounded end of the shaft to throw the gear-wheel and pinion into and out of engagement, a drum actuated by the pinion, an endless belt carried by the drum, a feed-chute adapted to receive the material from the buckets and discharge it onto the endless belt or apron, a guide-wheel pivotally mounted at the forward end of the frame, a vertically-adjustable bar slidably mounted on the end of the shaft, an outer wheel outwardly extending from the bar, an outer wheel mount-

ed on the journal, and an adjusting-screw for raising and lowering the slidably-mounted bar to change the vertical elevation of the wheel, substantially as described.

5 14. In a ditching-machine, the combination of a rectangular open framework, a transversely-extending shaft rigidly secured to the framework, a bucket-wheel rotatably mounted on the shaft within the framework
10 and comprising an outer tire or rim, an outer wall, an inner wall or ring open at the center, and a plurality of transversely-extending plates forming buckets open at the center, said wheel being mounted upon a hub comprising inner and outer collars connected together, the rim of the wheel being connected with the inner and outer collars by means of tie-rods extending alternately to the inner and outer collars, a vertically-adjustable
20 plow in suitable proximity to the inwardly-opening buckets, a plow-beam to which the plow is secured, means for adjusting the plow-beam, and a chute entered within the open side of the bucket-wheel in position to receive the material dropped from the inwardly-opening buckets, substantially as described.

15. In a ditching-machine, the combination of a rectangular open framework, a transversely-extending shaft rigidly secured to the framework, a bucket-wheel rotatably mounted on the shaft within the framework and comprising an outer tire or rim, an outer wall, an inner wall or ring open at the center,
35 and a plurality of transversely-extending plates forming buckets open at the center, the wheel being mounted upon a hub comprising inner and outer collars connected together, the rim of the wheel being connected with the inner and outer collars by means of tie-rods extending alternately to the inner and outer collars, a plow in suitable proximity to the bucket-wheel, a hooked bent plow-beam pivoted at its forward end to the
40 framework, a guide-bar for the plow-beam, an L-lever, a link connecting the L-lever with the plow-beam, and a chute located

within the open side of the bucket-wheel and adapted to receive the material falling from the buckets, substantially as described.

16. In a ditching-machine, the combination of a rectangular open-framework, a transversely-extending shaft rigidly secured to the framework, a bucket-wheel rotatably mounted on the shaft within the framework and comprising an outer tire or rim, an outer wall, an inner wall or ring open at the center, and a plurality of transversely-extending plates forming buckets open at the center, the wheel being mounted upon a hub comprising inner and outer collars connected together, the rim of the wheel being connected with the inner and outer collars by means of tie-rods extending alternately to the inner and outer collars, a plow in suitable proximity to the bucket-wheel, a hooked bent plow-beam pivoted at its forward end to the framework, a guide-bar for the plow-beam, an L-lever, a link connecting the L-lever with the plow-beam, a chute located within the open side of the bucket-wheel and adapted to receive the material falling from the buckets, a gear-wheel rigidly secured to the hub of the bucket-wheel, a bevel-pinion normally meshing therewith, a drum actuated by the bevel-pinion, and an endless carrier-belt actuated by the drum and adapted to receive the material from the chute and discharge the same, substantially as described.

17. In a ditching-machine, in combination with a main shaft, a bucket-wheel rotatably mounted thereon, a plow adapted to discharge material into the bucket-wheel, a chute adapted to receive the material carried up by the bucket-wheel, a slidably-mounted vertically-extending plate or bar on the end of the shaft, an outer wheel journaled thereto, and an adjusting-screw for changing the vertical elevation of the outer wheel, substantially as described.

MASON P. CARPENTER.

Witnesses:

F. B. KENT,
ALMA WILLIAMS.