

B. CLEMENTS.
DITCHING MACHINE.
APPLICATION FILED DEC. 28, 1907.

898,557.

Patented Sept. 15, 1908.

5 SHEETS—SHEET 1.

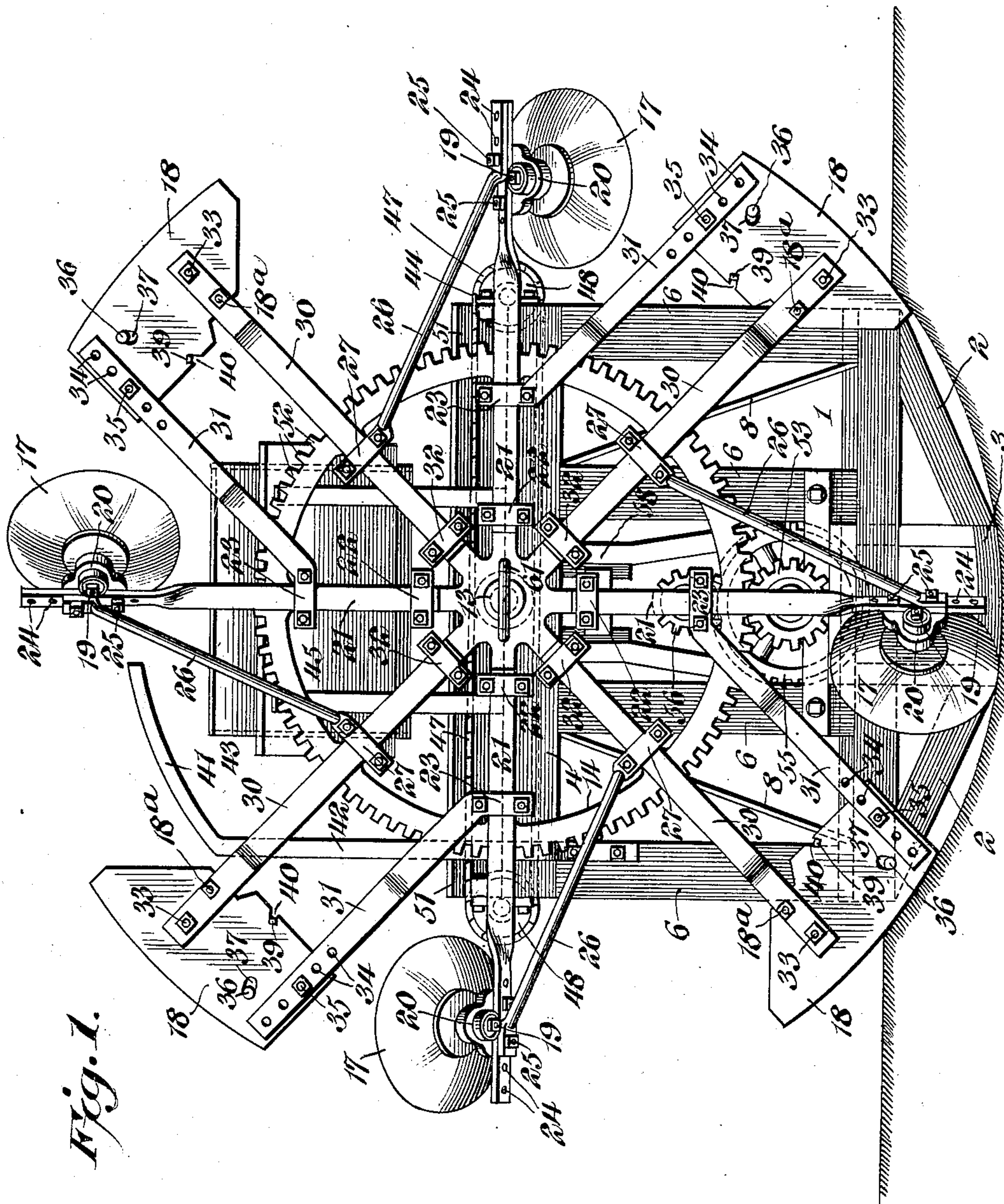


Fig. 1.

Witnesses

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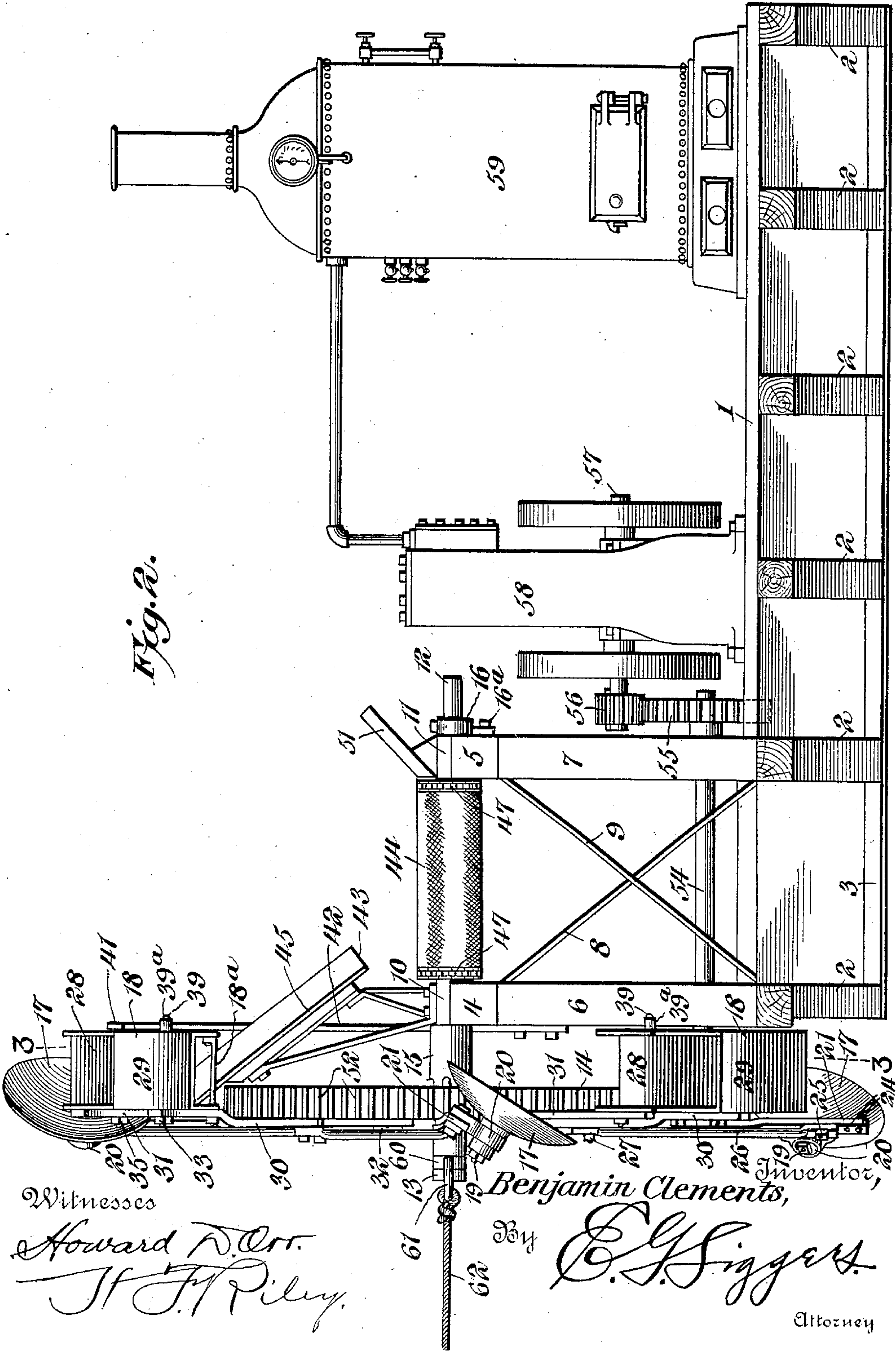
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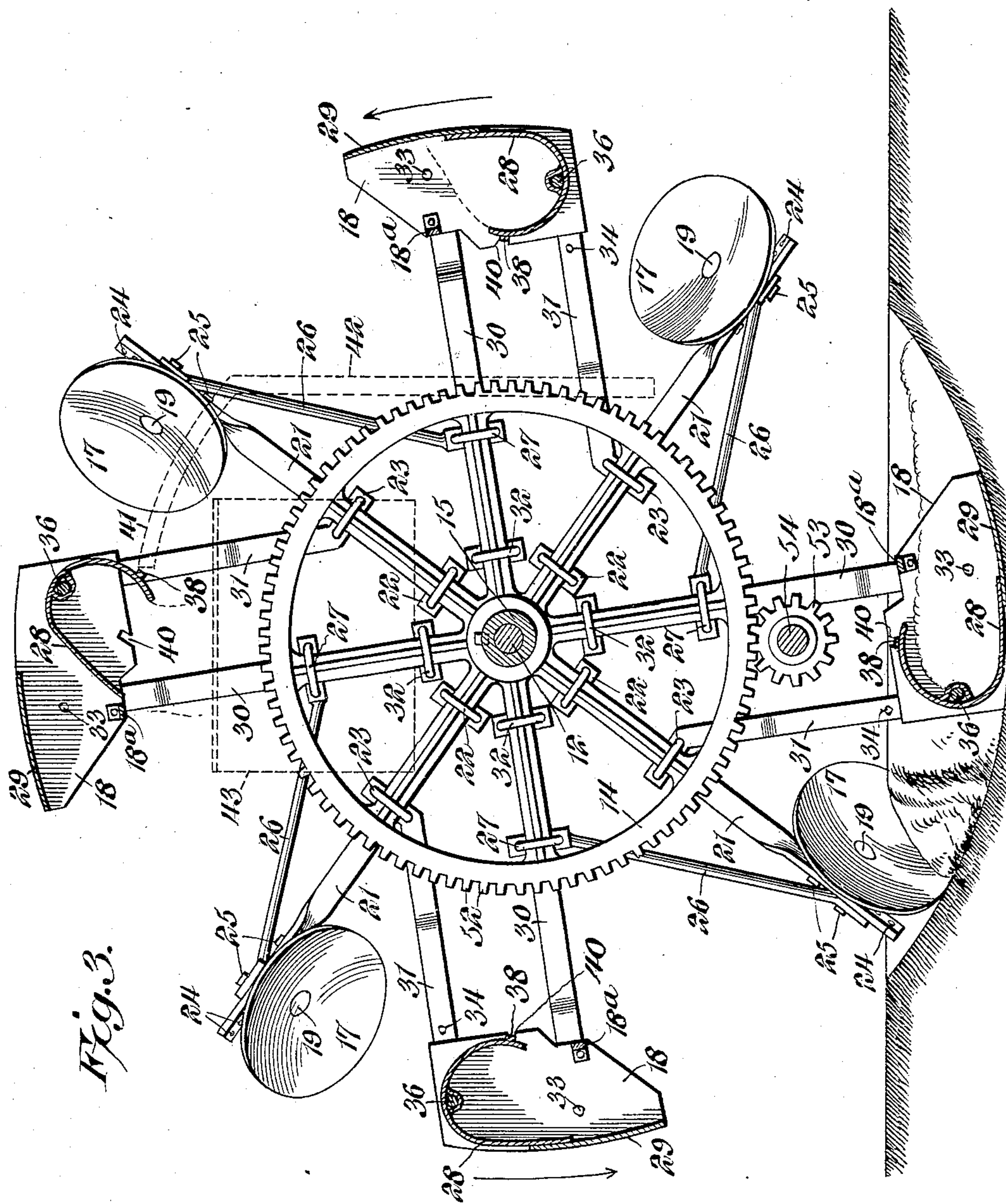


Fig. 3.

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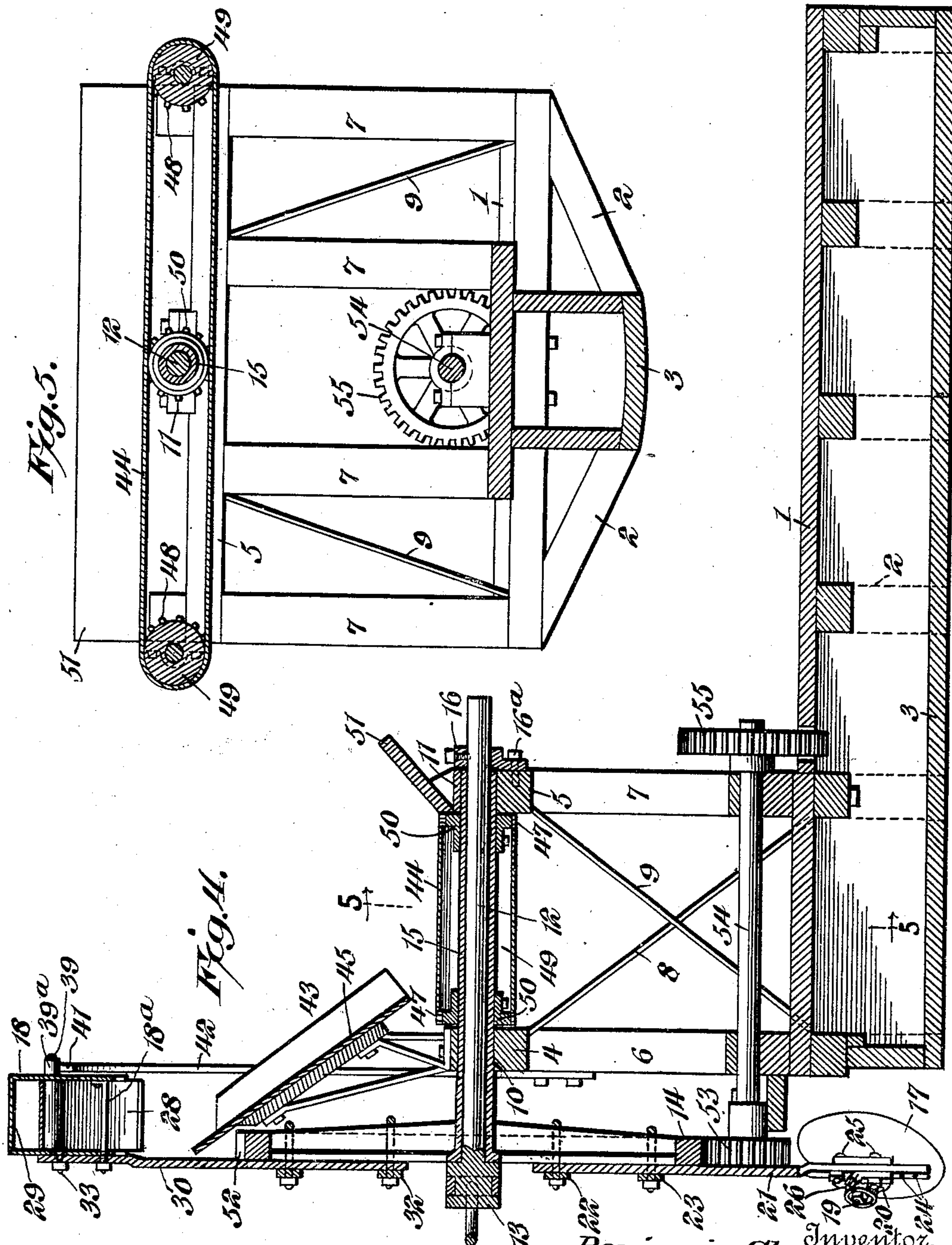
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5 SHEETS—SHEET 4.



Witnesses

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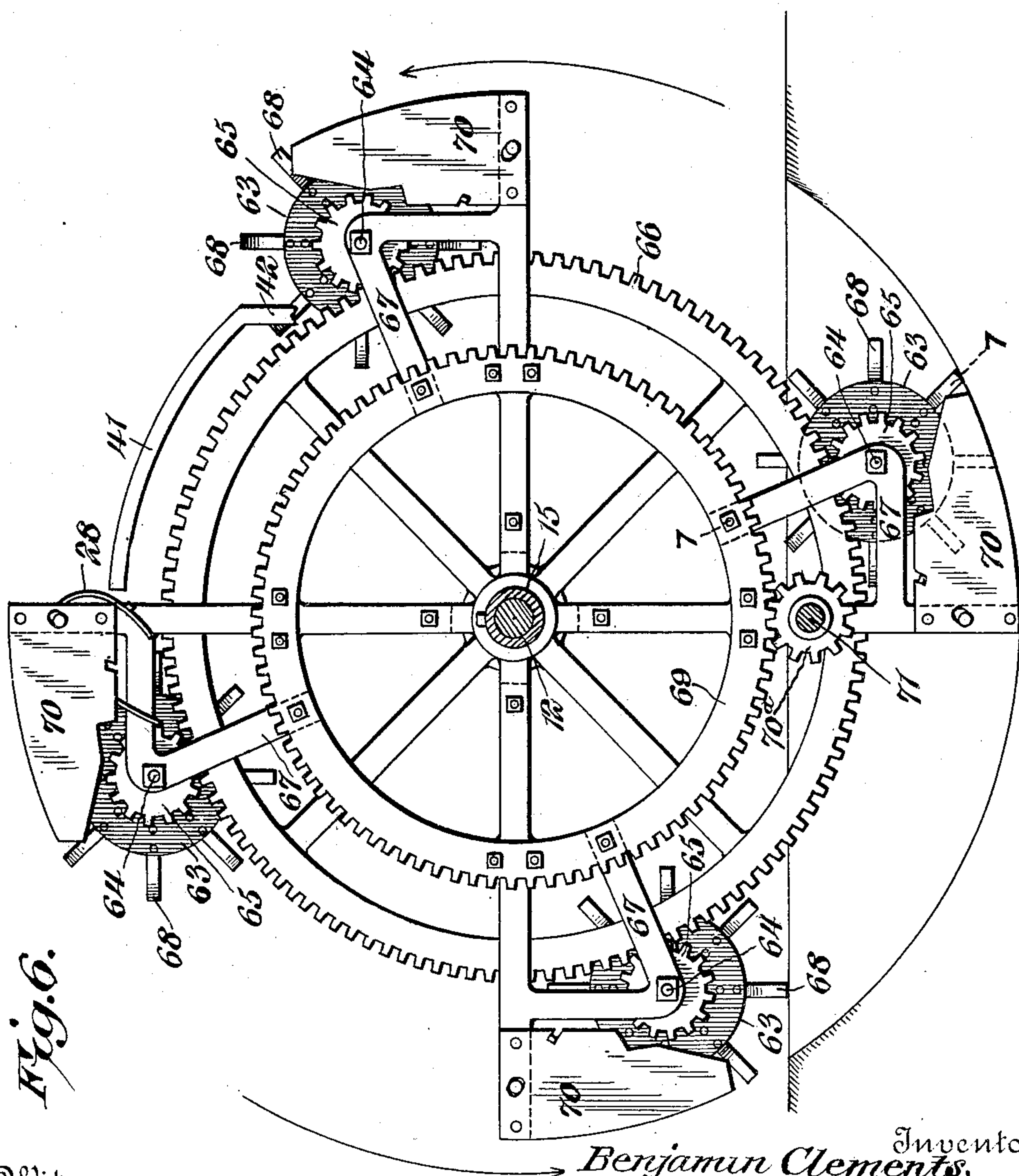
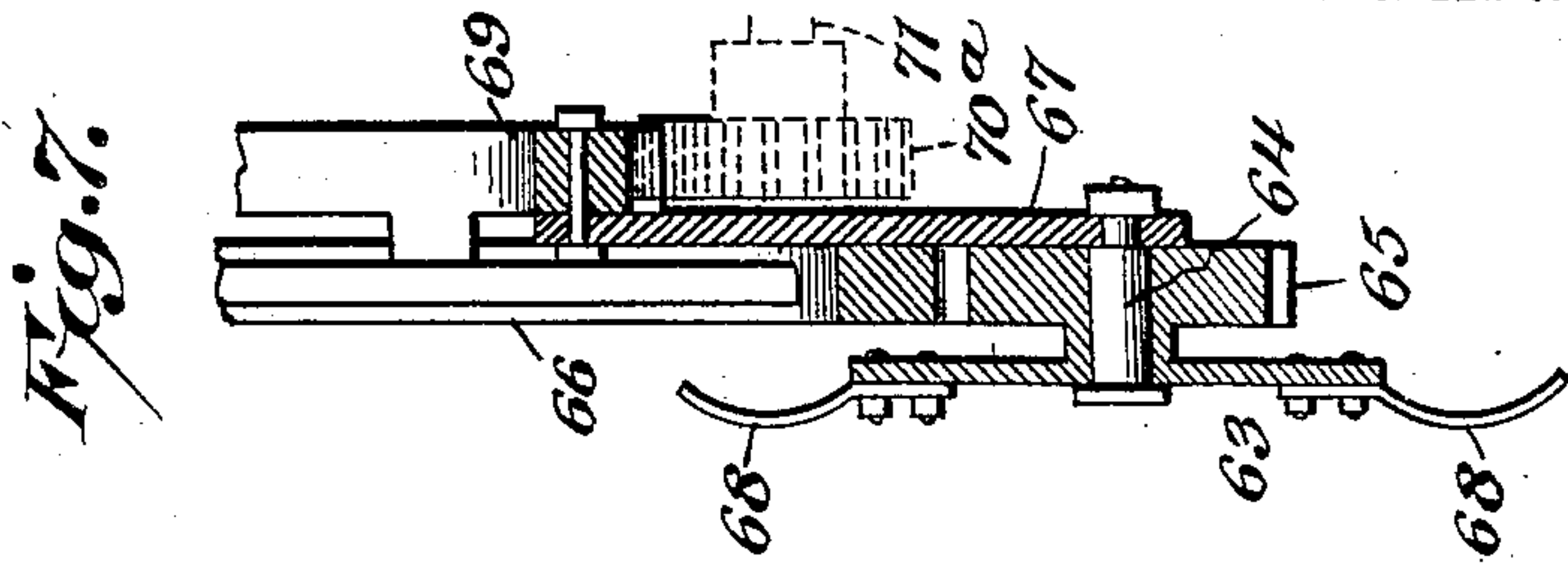
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5 SHEETS—SHEET 5.



Witnesses

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UNITED STATES PATENT OFFICE.

BENJAMIN CLEMENTS, OF CROOKSTON, MINNESOTA.

DITCHING-MACHINE.

No. 898,557.

Specification of Letters Patent.

Patented Sept. 15, 1908.

Application filed December 28, 1907. Serial No. 408,387.

To all whom it may concern:

Be it known that I, BENJAMIN CLEMENTS, a citizen of the United States, residing at Crookston, in the county of Polk and State of Minnesota, have invented a new and useful Ditching-Machine, of which the following is a specification.

The invention relates to improvements in ditching machines.

The object of the present invention is to improve the construction of ditching machines, and to provide a simple and comparatively inexpensive ditching machine, designed for use in railroad excavations, road constructions, ditching, and for digging various other trenches of any shape or size, and adapted to cut a clean ditch having sides of a uniform slope, and adapted to enable vehicles to be readily driven through it or across it.

With these and other objects in view, the invention consists in the construction and novel combination of parts hereinafter fully described, illustrated in the accompanying drawings, and pointed out in the claims hereto appended; it being understood that various changes in the form, proportion, size and minor details of construction, within the scope of the claims, may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawings:—Figure 1 is a front elevation of a ditching machine, constructed in accordance with this invention. Fig. 2 is a side elevation of the same. Fig. 3 is a transverse sectional view, taken substantially on the line 3—3 of Fig. 2. Fig. 4 is a longitudinal sectional view, taken substantially through the center of the machine. Fig. 5 is a transverse sectional view, taken substantially on the line 5—5 of Fig. 4. Fig. 6 is an elevation partly in section, illustrating a modification of the invention. Fig. 7 is a detail sectional view, taken substantially on the line 7—7 of Fig. 6.

Like numerals of reference designate corresponding parts in all the figures of the drawings.

The frame of the machine is provided with a platform 1, and it has a tapering lower portion, located below the platform and provided with inclined braces 2, extending upwardly and outwardly from a slightly curved bottom board 3, disposed longitudinally of

the frame. The tapered lower portion of the frame conforms to the general configuration of a ditch, excavated by the machine, as hereinafter fully explained. The frame, which may be mounted in any well known manner to enable it to be readily advanced as a ditch is cut, is provided at its front with an upwardly extending portion, composed of spaced horizontal top bars or beams 4 and 5 and vertical supporting bars or beams 6 and 7. The horizontal bars or beams 4 and 5 are disposed transversely of the machine, and the spaced front and rear members of the upwardly extending portion of the frame are also braced by inclined rods 8 and 9, located between the spaced members of the upwardly extending portion.

The upwardly extending portion of the frame is provided with front and rear bearings 10 and 11 for the reception of a centrally arranged horizontal shaft 12, projecting in advance of the upwardly extending portion of the frame, as clearly illustrated in Fig. 4 of the drawings. The front extended end of the central longitudinal shaft is provided with a head 13 and receives an auger wheel 14, provided with a rearwardly extending sleeve 15, arranged on the shaft 12 and fitting in the bearings 10 and 11. The auger wheel 14 and the sleeve 15 are adapted to rotate on the stationary shaft 12, which is provided at its rear end with a suitable stop, consisting of a collar 16 having a set screw and adapted to hold the shaft against longitudinal movement, and capable also of permitting the shaft to be adjusted longitudinally to permit a fixed gear to be applied to the same as hereinafter explained. The collar is held stationary by a fastening device 16^a piercing an extended portion of the collar and engaging the top bar or beam 5.

The auger wheel is equipped with cutters 17 and scoops or buckets 18, alternately arranged and adapted, when the auger wheel is rotated, to cut a ditch and remove the loose dirt therefrom. The auger wheel is disposed transversely of the ditching machine at the front end thereof, and the peripherally arranged cutters excavate a ditch, which is segmental in cross section. The cross sectionally segmental ditch, which is clean cut, has similar sloping sides, and while it is adapted to preserve its shape longer than

a ditch rectangular in cross section, it also enables a vehicle to readily drive through or across it.

The cutters and scoops or buckets may be of any desired number, and each cutter consists of a concavo-convex disk, set at an angle to the plane of the auger wheel and having its rear edge located in advance of the center of the front end of the following bucket or scoop, so as to deliver the loose earth to the same. The disk is mounted on a shaft or axle 19, arranged in a suitable bearing 20, which is adjustably secured to the outer portion of a radially arranged bar 21, mounted on the auger wheel and forming a projecting peripherally arranged arm. The auger wheel consists of a hub, rim and connecting spokes, and the inner portions of the bars 21 extend along the adjacent spokes of the wheel, and are secured to the same by means of inner and outer clips 22 and 23. The outer portion of the arm 21 is provided at intervals with perforations 24 for the reception of bolts 25, which secure the bearing 20 in its adjustment. The bolts are arranged at the inner and outer ends of the bearing 20, and the outer bolt also serves to secure the outer end of a brace 26 to the outer portion of the bar 21. The brace 26 is arranged at an angle to the bar 21 and diverges inwardly and rearwardly therefrom, its inner end being secured to the auger wheel at the next spoke thereof by means of a clip 27. The disks are adjustable inwardly and outwardly to vary the depth of a ditch, as will be readily understood.

Each bucket, which is provided with a tapered projecting front end, is composed of a relatively fixed outer member and a pivotally mounted inner dumping member 28. The outer member, which forms the body of the bucket, is composed of two sides and a connecting bottom 29, which is curved longitudinally, as clearly illustrated in Fig. 3 of the drawings. The buckets are adjustable radially with the auger wheel to position them properly with relation to the cutters, and they will be connected with the auger wheel by means of a front radially arranged bar or member 30 and a rear bar or member 31, arranged in parallelism with the radially arranged bar or member 30.

The sides of the fixed sections of the buckets or scoops are braced by transverse rods 18^a, located at the front portions of the buckets or scoops and extending from the bar or member 30 to the inner sides of the fixed sections of the buckets or scoops and connected to the same. The outer ends of the rods 18^a pierce the bars or members 30 and are threaded for the reception of nuts. These bars or members are adjustable inwardly or outwardly on the wheel by means of clips. The inner ends of the bars or members 30 are equipped with clips 32, and the inner ends of

the rear bars or members are connected to the wheel by the said clips 23. The clips 23 and 32 embrace the adjacent spokes of the auger wheel, and are movable longitudinally of the same. The outer end of the bar or member 30 is secured to the bucket at the front portion thereof by a bolt 33, or other suitable fastening device, and the outer portion of the rear bar or member 31 is provided at intervals with perforations 34 for the reception of a bolt 35, or other suitable fastening device for adjustably connecting the rear portion of the bucket to the said bar or member 31. When the bucket or scoop is adjusted inwardly or outwardly, the rear bar 31 is adapted to be moved along the spoke on which it is mounted to bring one of the perforations 34 in position to receive the bolt 35.

The inner pivoted dumping member 28, which is automatic in its operation, is approximately U-shaped, being composed of top and bottom portions and a rear connecting portion and constituting the back of the bucket. The bottom portion of the pivoted member is extended in advance of the top portion and rests upon the bottom 29 of outer section or body of the bucket, when the latter is at the bottom of the auger wheel, as clearly illustrated in Fig. 3 of the drawings. The rear portion of the pivoted dumping member is connected with the sides of the body portion of the bucket by means of a transverse pivot or pintle rod 36, having its terminals arranged in inclined slots 37 of the sides of the outer fixed section of the bucket. The top portion of the pivoted member is equipped with a transversely disposed locking bar 38, extending beyond the side edges of the pivoted member and forming laterally projecting lugs 39, which are arranged in inclined recesses 40, located at the upper edges of the sides of the fixed portion of the bucket or scoop, when the latter is at the bottom of the auger wheel. The weight of the material carried by the bucket or scoop maintains the top portion of the pivoted member in its interlocked relation with the sides of the fixed body portion of the bucket or scoop during the upward movement thereof until the bucket or scoop arrives at the top portion of the auger wheel. When the bucket or scoop approaches the top of the auger wheel, the pivoted dumping member is maintained in its interlocked relation with the fixed member by means of a curved bar 41, forming an arcuate track, and provided with a vertical supporting portion 42, secured at its lower end to the frame of the machine, as clearly illustrated in Fig. 1 of the drawings. The arcuate track or member is arranged in the path of the inner extended end or lug of the locking bar and holds the pivoted member against movement independently of the

fixed member of the bucket or scoop until the latter arrives at the top of the wheel. The locking bar is then carried beyond the upper end of the track or member 41, and the weight of the material tilts the pivoted member of the bucket or scoop, and the contents of the bucket or scoop are dumped into an inclined chute 43, which delivers the material to a transversely disposed endless conveyer 44. The pivoted dumping member is returned to its normal position by gravity, as the bucket or scoop approaches the ditch for another load. The inner lug or projecting portion 39 of the locking bar is equipped with an anti-friction roller 39^a, which is adapted to run on the arcuate track without friction. The inclined chute extends upwardly and forwardly from the front of the frame of the machine, as clearly shown in Figs. 2 and 4 of the drawings, and the transversely disposed conveyer carries the dirt to one side of the machine. The dirt may be discharged either into a wagon, or upon the ground at one side of the ditch. The chute is supported by bars or braces, which are mounted upon the front upwardly extending portion of the frame of the machine, and the upper edge of the chute is located adjacent to the plane of the outer side of the bucket or scoop. The upper portion of the inclined bottom 45 of the chute is extended above the side walls of the same, which terminate short of the top of the chute to enable the buckets or scoops to clear the latter.

The endless carrier or conveyer 44 consists of a broad belt or apron, provided at the side edges with sprocket chains 47, arranged in end sprocket wheels 48 of rolls 49, which support the endless carrier or conveyer. The rolls 49, which are provided with suitable journals or gudgeons, are mounted in bearings of the upwardly extending front portion of the frame at opposite sides of the latter. The sleeve 15 of the auger wheel is equipped with sprocket wheels 50 meshing with the sprocket chains 47 and communicating motion from the auger wheel to the endless carrier or conveyer. The upwardly extending portion of the frame is provided at the rear side of the carrier or conveyer 44 with an inclined wall 51 for preventing the material discharged by the inclined chute 43 from falling off the rear side of the carrier or conveyer.

The auger wheel is provided at its periphery with spur teeth 52, which mesh with a spur pinion 53 of a lower counter shaft 54, located below the central shaft 12 and journaled in front and rear bearings of the frame. The shaft 54 is equipped at its rear end with a gear wheel 55, which meshes with a pinion 56 of a drive shaft 57 of an engine 58. The engine 58, which is mounted on the platform of the machine in rear of the auger wheel, is connected with a boiler 59, but any other

form of engine or motor may be employed for furnishing the power for operating the auger wheel. The operating mechanism for the auger wheel is located in rear of the same and serves to counter-balance the weight of the said auger wheel.

The head 15 of the central auger shaft 12 is provided with an annular groove for the reception of a collar 60 of a swiveled loop 61, adapted to receive a rope or cable 62 for connecting the machine with a capstan, or other suitable means for advancing it to feed the auger and cut the ditch.

The radial adjustment of the cutters and buckets or scoops enables the ditching machine to cut ditches of different depths. The cutters, when the ditch is comparatively shallow, are preferably arranged at uniform distances from the center of the auger wheel, and when a deeper ditch is to be excavated, two of the cutters are arranged to cut one half the depth of the ditch, and the other two are set to cut the depth of the ditch. The inner and outer cutters are alternately arranged, and the buckets or scoops are correspondingly positioned. The first inner cutter excavates and removes the soil to a depth one half of the ditch, and the second cutter completes the partially excavated portion, digging the ditch to the proper depth. The advancement of the feeding of the machine causes the next inner cutter to excavate the soil to one half the depth of the ditch, and the succeeding outer cutter completes the digging of the partially excavated portion. The machine may be advanced as rapidly as the character of the soil will permit, and owing to the transverse arrangement of the auger wheel, a clean cut ditch results.

Various forms of cutters may be employed to adapt the ditching machine to the character of the ground to be operated on. In Fig. 6 of the drawings, the machine is shown equipped with positively rotated cutters 63, mounted on stub shafts 64 and connected with pinions 65, which mesh with a fixed gear 66, whereby, when the auger wheel is rotated, a rotary movement will be imparted to the cutters 63. The stub shafts are secured to brackets 67, and each rotary cutter consists of a disk provided with an annular series of radially arranged blades 68. The large stationary gear 66 is fixed to the central shaft 12, and is arranged in advance of the auger wheel 69, which is equipped with buckets 70, mounted on the brackets 67 and provided with pivotal dumping members similar to those heretofore described. The rotary cutters 63 are adapted for operating on hard ground where excessive power would be required for cutting the ground with disk-shaped cutters. However, the machine may be equipped with a motor tank and a hose

for moistening the ground and for wetting the buckets, so that the material will slide freely from the same. The rotary auger wheel 69 is constructed similar to that heretofore described, and is driven in the same manner by a pinion 70^a of a counter shaft 71. The central auger shaft is capable of sufficient longitudinal adjustment to receive the fixed gear for rotating the cutters 63.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. A ditching machine comprising a frame, a transversely disposed rotary auger wheel provided with alternately arranged cutters, and scoops or buckets adapted to cut transversely of a ditch and remove the loose dirt, said cutters and scoops or buckets being rigid with and projecting from the periphery of the auger wheel, and means for rotating the auger wheel.

2. A ditching machine comprising a frame, a transversely disposed auger wheel provided with cutters and having buckets or scoops for elevating the loose dirt, a chute into which the loose dirt is discharged, and a transverse conveyer arranged to receive the material from the chute.

3. A ditching machine comprising a frame, a transversely disposed auger wheel provided with cutters and having buckets or scoops for elevating the loose dirt, said cutters and buckets or scoops projecting from and carried by the periphery of the auger wheel, a chute into which the loose dirt is discharged, and a conveyer arranged to receive the material from the chute.

4. A ditching machine comprising a frame, a transversely disposed auger wheel provided with cutters and having buckets or scoops for elevating the loose dirt, said cutters and buckets or scoops projecting from and carried by the periphery of the auger wheel, a transverse conveyer extending across the frame in rear of the auger wheel, and an inclined chute extending upwardly from the conveyer to the upper portion of the auger wheel and arranged to receive the loose dirt therefrom.

5. A ditching machine comprising a frame, a transversely disposed auger wheel provided with cutters and having buckets or scoops for elevating the loose dirt, an inclined chute located in rear of the auger wheel at the upper portion thereof, and a transversely disposed conveyer arranged beneath the lower end of the chute and adapted to carry the material to one side of the machine.

6. A ditching machine comprising a frame, a transversely disposed auger wheel arranged at the front of the frame and provided with cutters and having scoops or buckets, a downwardly and rearwardly inclined chute located in rear of the upper portion of the auger wheel in position to receive the mate-

rial discharged from the buckets, a horizontally disposed transversely arranged endless conveyer having its front edge located beneath the chute, and a transverse wall extending upwardly at the rear side of the conveyer.

7. A ditching machine comprising a frame, a transversely disposed auger wheel arranged at the front of the machine and provided with cutters and buckets or scoops, said auger wheel being also equipped with teeth, a rearwardly extending shaft provided with a gear meshing with the teeth of the auger wheel, means mounted on the frame for rotating the said shaft, and means for conveying away the loose material.

8. A ditching machine comprising a frame, an auger shaft mounted on the frame, a transversely disposed auger wheel mounted on the shaft and arranged to cut transversely of a ditch, means mounted on the frame for rotating the auger wheel and for conveying away the loose dirt, and a rope or cable arranged centrally with relation to the auger wheel and connected to the front end of the said shaft.

9. A ditching machine comprising a frame, a stationary centrally arranged auger shaft mounted on the frame, an auger wheel arranged on the shaft and provided with teeth and having cutters and scoops or buckets, a counter shaft having a pinion meshing with the teeth of the auger wheel and extending rearwardly therefrom, means mounted on the frame for rotating the counter shaft, a transversely disposed conveyer located above the counter shaft for conveying away the loose dirt, and gearing for operating the conveyer.

10. A ditching machine embodying an auger wheel provided with a cutter and having a bucket or scoop, said bucket or scoop being provided with an automatically operable dumping member arranged to discharge the contents of the bucket or scoop at the top of the auger wheel.

11. A ditching machine embodying an auger wheel having a bucket composed of a relatively fixed section, and a pivotally mounted dumping member interlocked with the fixed section and movable into and out of such interlocked relation by gravity.

12. A ditching machine embodying an auger wheel having a bucket composed of a relatively fixed section, and a dumping section pivotally mounted within the fixed section and provided with means for engaging the same, said pivoted member being arranged to retain the said means in engagement with the fixed section by gravity and adapted to discharge the contents of the bucket at the top of the wheel.

13. A ditching machine embodying an auger wheel provided with a bucket or scoop composed of a relatively fixed section pro-

vided at opposite sides with slots and having recesses at the upper edges of the sides, and a movable dumping section provided with a pivot operating in the said slots, said dumping section being also provided with lugs or projections for detachably engaging the said recesses.

14. A ditching machine embodying an auger wheel provided with a bucket or scoop composed of a relatively fixed section provided at opposite sides with inclined slots and having recesses at the upper edges of the sides, and a movable dumping member provided with a pivot operating in the said slots, said dumping member being also provided with a transverse locking bar extending laterally from the dumping member and detachably engaging the recesses of the fixed member.

15. In a ditching machine, the combination of an auger wheel provided with a bucket or scoop having a pivoted dumping section, and an arcuate track or guard arranged to hold the dumping section against pivotal movement during a portion of the rotation of the auger wheel.

16. In a ditching machine, the combination of an auger wheel provided with a bucket or scoop having a pivoted dumping section operable by gravity, and an arcuate track or guide arranged at the upper portion of the wheel and terminating above the top thereof and adapted to hold the dumping member against pivotal movement until the bucket or scoop reaches the top of the auger wheel.

17. A ditching machine provided with an auger wheel embodying a series of spaced cutters consisting of disks set at an angle, and scoops or buckets located in rear of the cutters for carrying the loose dirt upward.

18. A ditching machine provided with an auger wheel embodying a series of spaced peripheral cutters, scoops or buckets located in rear of the cutters for carrying the loose dirt upward, said buckets or scoops being provided with dumping members, and means for holding the dumping members inoperative until the buckets or scoops arrive at the top of the wheel.

19. A ditching machine provided with an auger wheel embodying radially arranged arms, cutters adjustably mounted on the arms, parallel bars or members arranged between the cutters, and buckets or scoops mounted on the said bars or members and adjustable inwardly and outwardly to vary the depth of the ditch.

20. A ditching machine provided with an auger wheel comprising a wheel provided with spokes, radially arranged bars provided at their inner ends with clip-engaging spokes of the wheel, cutters adjustably mounted on the outer portions of the said bars, parallel

members arranged in pairs between the said bars and provided at their inner ends with clips, buckets or scoops carried by the said members, and braces connected at their outer ends with the said bars and provided at their inner ends with clips embracing the spokes of the wheel and one of each pair of the parallel members.

21. In a ditching machine, the combination of a frame, power mechanism, a rotary excavating wheel mounted transversely of the frame at the front thereof, a conveyer mounted on the frame at one side of the wheel between the same and the power mechanism, and an inclined chute extending upwardly from the conveyer to the upper portion of the auger wheel and arranged to receive the loose dirt.

22. A ditching machine provided with an auger wheel embodying peripherally arranged spaced buckets open at the front and provided with a bottom, side walls and a rear end wall, and peripherally arranged cutters consisting of disks set at an angle and arranged to deliver the loose dirt to the open front ends of the buckets.

23. In a ditching machine, the combination of a frame, an excavating wheel arranged transversely of the frame at the front thereof, a transverse conveyer located at one side of the wheel, and a longitudinal shaft carrying the excavating wheel and connected with and actuating the conveyer.

24. A ditching machine embodying an auger wheel provided with a cutter and having a bucket or scoop, said bucket or scoop being provided with an automatically operable dumping member forming the rear wall and a portion of the bottom of the bucket and arranged to discharge the contents of the bucket at the top of the auger wheel.

25. A ditching machine embodying an auger wheel provided with a cutter and having a bucket or scoop, said bucket or scoop being provided with an automatically operable pivotally mounted dumping member forming the rear wall and a portion of the bottom of the bucket and arranged to discharge the contents of the bucket at the top of the auger wheel.

26. A ditching machine provided with an auger wheel embodying a series of spaced cutters consisting of concavo-convex disks set at an angle with their convex faces to the front of the machine, and scoops or buckets located in rear of the cutters for carrying the loose dirt upward.

27. A ditching machine provided with an auger wheel embodying a series of buckets or scoops having curved outer walls, and disk cutters having their cutting edges operating in the same plane as the curved walls of the buckets.

28. A ditching machine provided with an

auger wheel embodying a series of spaced cutters and buckets or scoops located between the cutters, the operable faces of the buckets or scoops and the cutting edges of the cutters being located at uniform distances from the center of the wheel.

In testimony, that I claim the foregoing as

my own, I have hereto affixed my signature in the presence of two witnesses.

BENJAMIN CLEMENTS.

Witnesses:

GEO. T. HAMERY,

MAGNUS LUNDBERG.