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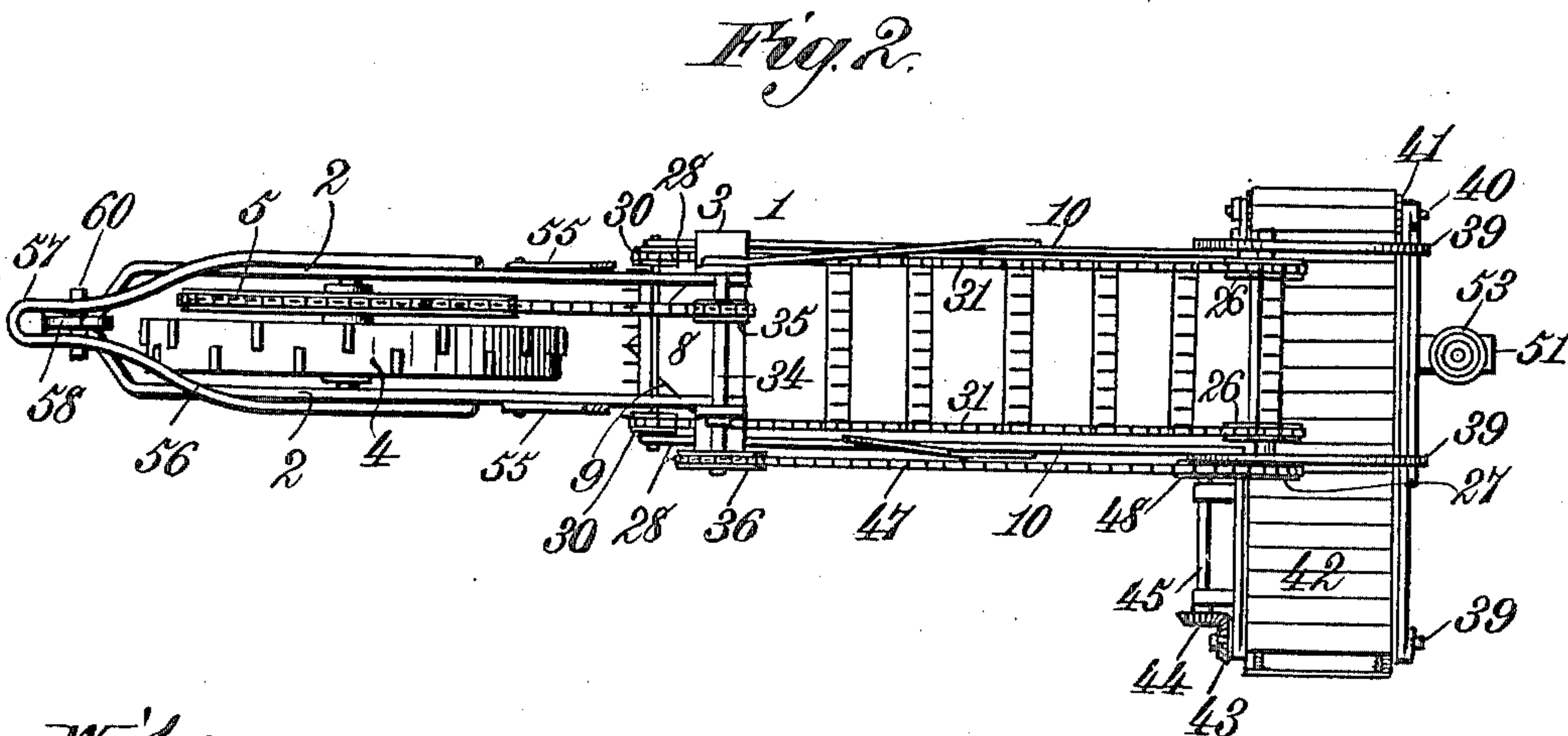
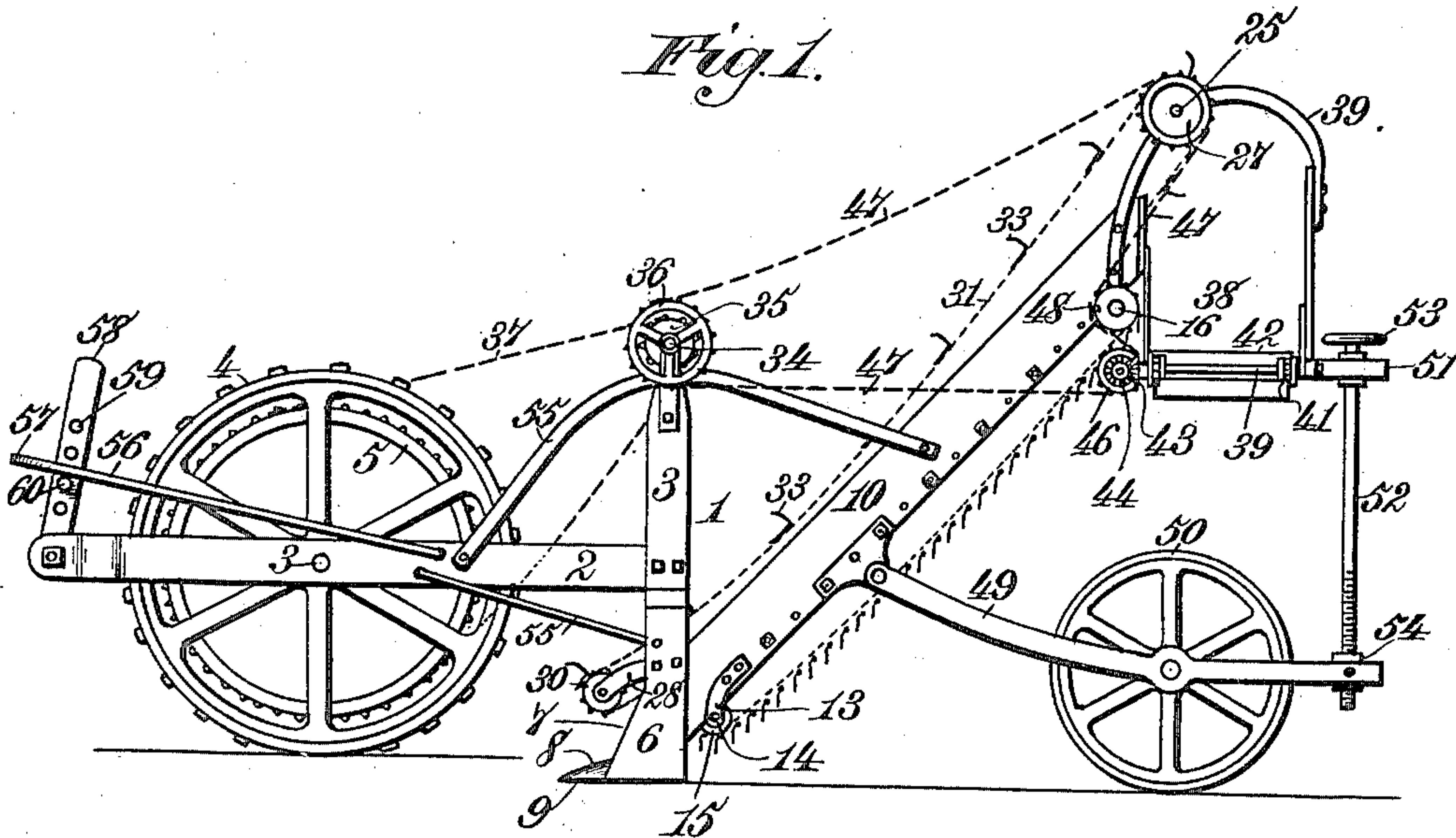
Patented Nov. 6, 1900.

D. F. KAIN.
DITCHING MACHINE.

(Application filed Feb. 9, 1900.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses,
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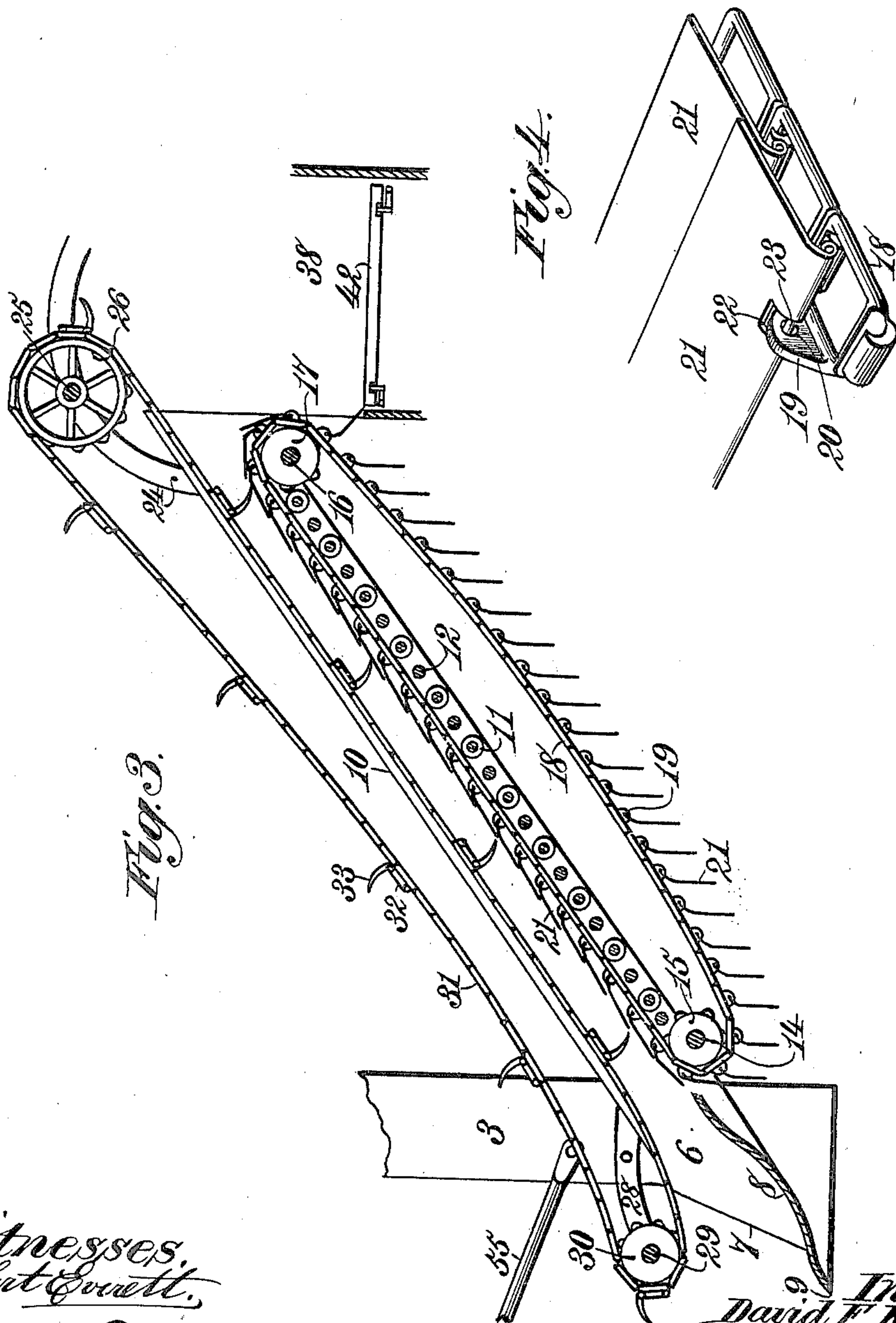
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UNITED STATES PATENT OFFICE.

DAVID F. KAIN, OF BLUFFTON, INDIANA.

DITCHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 661,405, dated November 6, 1900.

Application filed February 9, 1900. Serial No. 4,677. (No model.)

To all whom it may concern:

Be it known that I, DAVID F. KAIN, a citizen of the United States, residing at Bluffton, in the county of Wells and State of Indiana, have invented new and useful Improvements in Ditching-Machines, of which the following is a specification.

This invention relates to ditching-machines, and especially to that class of ditching-machines employed for cutting and excavating ditches for the reception of drainage-tiles and other conduits, and it is in the nature of an improvement on the ditching-machine for which I obtained Letters Patent No. 555,010, dated February 18, 1896.

The present invention has for one object to provide improved elevator and carrier aprons so constructed that after they have discharged the earth and are returning to receive a succeeding supply the aprons open and shake off or drop the earth that adheres to the aprons, thereby keeping the latter clean and preventing them from depositing dirt on the platform-rollers and operative parts that drive the aprons.

It has for a further object to provide an endless series of rakes that are arranged to travel above and in unison with the elevator to aid in carrying the earth up to the carrier-apron.

It also has for its object to provide improved means for reducing the friction and facilitating the traveling of the elevator-apron.

It has for another object to improve the means for adjusting the ground-wheel; and, finally, it has for its object to improve and simplify the construction and render more efficient the operation of the machine generally.

To these ends my invention consists in the features and in the construction, combination, and arrangement of parts hereinafter described, and particularly pointed out in the claims following the description, reference being had to the accompanying drawings, forming a part of this specification, wherein—

Figure 1 is a side elevation of my improved ditching-machine. Fig. 2 is a top plan view thereof. Fig. 3 is a longitudinal central sectional view, and Fig. 4 is a detail view of a portion of one of the aprons.

Referring to the drawings, the numeral 1

indicates the frame of my improved machine, consisting of two parallel beams 2, united at their forward ends and at their rear ends rigidly attached to two vertical standards or arms 3, hereinafter referred to. Secured to the beams 2 are bearings 3, in which is journaled the shaft of a traction-wheel 4, said wheel being formed with or having attached thereto a sprocket-rim 5. The periphery of the wheel 4 is provided with teeth in a well-known manner for increasing the traction of the wheel.

To the rear ends of the beams 2, as before stated, are rigidly secured two vertical arms or standards 3, the lower ends 6 of which are inclined slightly forward, as shown, and are provided with knife-edges 7, which constitute vertical cutters. Between the lower ends of the cutters 6 is rigidly secured a share 8, which is inclined forward and downward and terminates at its lower end in a pointed and sharpened cutting edge 9, as shown. Fixed to the cutters 6 in rear of the share 8 is the elevator carrier comprising two rearwardly and upwardly inclined plates or flat beams 10, in which are journaled a plurality of rollers 11, and fixed in said beams between the rollers are tie-rods 12, which not only serve to brace and stiffen the elevator-frame, but also operate, in connection with the rollers 11, to form a table or platform. Journaled in suitable bearings 13, attached to the lower ends of the beams 10, is a shaft 14, having fixed thereon two sprocket-wheels 15, and a corresponding shaft 16, provided with sprocket-wheels 17, is journaled in suitable bearings attached to the upper ends of said beams. Passing about the sprocket-wheels 15 and 17 are two chains 18, each link of said chains being provided with a lug or ear 19, that projects outward at a right angle to the link and has formed therein a perforation 20. Pivotally connected at one edge to each two corresponding links of the chains 18 is a flat metallic plate 21, the free edge of each plate being adapted to overlap the pivoted edge of the succeeding plate. As shown most clearly in Fig. 4 of the drawings, the plates are pivotally attached to the links in the following manner: The inner edge of each plate is provided with two slots 22, adapted to receive the lugs or ears 19 on

the chain-links, and said inner edge of the plate is bent up at a right angle to the body of the plate. A rod 23 is passed through the perforations in the two lugs or ears and is
 5 laid against the face of the bent-up edge, after which the latter is crimped or bent tightly about the rod, which latter forms a pintle for hinging the plate or leaf 21 to the ears or lugs. The chains 18, together with the plates 21,
 10 travel above and below the table or platform formed by the rollers 11 and tie-rods 12, the rollers forming a rolling support for the apron formed by the chains and plates, thereby reducing friction and effecting an economy in
 15 the power necessary to actuate the apron and reducing wear on the latter. As the apron travels up over the platform the plates overlap one another and form practically an inperforate carrier which operates to elevate the
 20 earth from the excavation; but as the apron travels beneath the platform or table the plates drop to a vertical position by gravity, shaking off any earth that may have adhered thereto and permitting dirt that may have
 25 dropped onto the upper side of the apron to drop through between the chains, thereby keeping the apron clean and preventing dirt from accumulating on the sprocket-wheels and the platform-rollers. The shaft 14 is
 30 journaled beneath the share 8, whereby the excavated earth is discharged onto the lower end of the elevator-apron, as will be hereinafter referred to.

Attached to the upper ends of the beams
 35 10 are two upwardly and rearwardly projecting bracket-arms 24, in the upper ends of which is journaled a shaft 25, having fixed thereon three sprocket-wheels, two of said wheels being indicated by the numeral 26 and
 40 the third by the numeral 27. Two bracket-arms 28 are attached to the lower ends of the plates or arms 3 and at their free ends project over the share 8. In said free ends of the bracket-arms is journaled a shaft 29, on
 45 which are fixed two sprocket-wheels 30, and about the sprocket-wheels 26 and 30 are passed endless chains 31. Carried by the chains 31 is a series of rakes 32, said rakes being arranged at equal and suitable dis-
 50 tances apart and each consisting of a plurality of curved teeth 33, that project outward at right angles to the plane of the chains. The chains travel above the elevator-apron, as shown and in the manner hereinafter de-
 55 scribed, and the rakes operate to grasp the earth as it moves up the share 8 and draw it onto the elevator-apron, and as the rakes move in unison with the apron they hold the earth on the latter as it moves upward and
 60 prevent it from slipping or dropping back in front of the excavating-share.

Journaled in the upper ends of the arms 3 is a shaft 34, on the opposite ends of which are fixed sprocket-wheels 35 and 36. An endless
 65 chain 37 passes about the sprocket-wheel 35 and about the sprocket-rim 5 on the traction-

wheel 4 and rotates the shaft 34 and sprocket-wheel 36, from which latter the elevator-belt and the rakes are actuated in the manner presently to be described.

Attached to the upper ends of the beams 10
 70 is a transverse frame 38 and is also supported by bracket-arms 39, which are attached at their lower ends to said frame and at their upper ends are loosely sleeved on the shaft
 75 25. Journaled in the opposite ends of the frame 38 are shafts 39 and 40, having fixed thereon sprocket-wheels 41, about which passes an apron 42, similar in all respects to the elevator-apron before described. Fixed
 80 on the end of the shaft 39 is a beveled gear-wheel 43, which gears with a beveled gear-wheel 44, fixed on the end of a shaft 45. The shaft 45 is journaled in suitable bearings fixed to the frame 38, and fixed on the end of
 85 said shaft opposite the beveled gear-wheel 44 is a sprocket-wheel 46. An endless chain 47 passes about the sprocket-wheels 36 and 27, about a sprocket-wheel 48, fixed on the end of the shaft 16, and about the sprocket-
 90 wheel 46. The shaft 35 being rotated by the traction-wheel 4 in the manner before described, the sprocket-wheel 36 and chain 47 rotates the sprocket-wheel 27 and shaft 25 and actuates the chains carrying the rakes.
 95 Simultaneously the chain 47 rotates the shaft 16 and actuates the elevator-apron and through the medium of the gearing described also actuates the transverse delivery-apron 42. The excavated earth is elevated by the
 100 elevator-apron and the rakes, and at the upper end of the elevator-frame the elevator-apron turns downward and the rakes turn upward, thus disengaging and breaking up
 105 the earth and discharging it onto the delivery-apron 42, which operates to discharge the earth to one side of the machine.

Pivoted at their forward ends to the beams 10 are two flat bars or arms 49, and journaled in said arms intermediate their ends is a
 110 ground-wheel 50, that is adapted to run along the bottom of the ditch. Fixed to the delivery-apron frame 38 is a bolster 51, in which is rotatably arranged a vertically-depending screw 52, provided at its upper end with a
 115 hand-wheel 53 or similar device, by means of which the screw may be turned. The lower end of the screw 52 engages a nut 54, secured between the rear ends of the arms 49. By turning the screw 52 the ground-wheel 50 may
 120 be raised and lowered to regulate the depth to which the excavator will cut.

The beams 2 and arms 3 are preferably braced and stiffened by brace rods or straps
 125 55, attached at their opposite ends to said beams and arms, and pivotally attached to said beams in rear of the traction-wheel 4 is a bail 56, the forward end of which is bent to form a loop 57, that serves as a clevis. The
 130 loop or clevis embraces an upright 58, secured at its lower end between the forward ends of the beams 2 and provided with a se-

ries of perforations 59, in any one of which is adapted to be inserted a pin 60, that serves to hold the bail at any desired elevation.

The operation of my improved ditching-machine is as follows: The draft is applied to the clevis 57 of the bail 56, said bail being adjustable at different elevations in the manner described to accommodate it to the depth of the ditch being excavated. As the machine is moved forward the inclined share 8 of the excavator is forced into the earth and makes a lateral cut to form the bottom of the ditch. The traction-wheel 4 travels in advance of the excavator, and through the medium of the chains 37 and 47 and the gearing described actuates the rakes, the elevator-apron, and the delivery-apron. The rakes operate to draw the earth over from the share onto the elevator-apron and in connection with the latter elevate and discharge the earth onto the delivery-apron, which latter discharges the earth to one side of the ditch. As the rakes and apron separate and move in opposite directions at the upper end of the elevator-frame the earth is disengaged and broken up in the manner before described and discharged onto the delivery-apron by gravity. As the elevator-apron travels up over the platform the plates 21 overlap one another and form practically an imperforate carrier to receive the earth raked thereon from the excavator; but as the apron travels beneath the platform or table the plates drop to a vertical position by gravity, shaking off any earth that may have adhered thereto and permitting dirt that may have dropped onto the upper side of the apron to drop through between the chains, thereby keeping the apron clean and preventing dirt from accumulating on the platform-rollers and sprocket-wheels. The same is true also of the delivery-apron. The rakes move in unison with the elevator-apron and not only serve to draw the excavated earth from the excavating-shore onto the elevating-apron, but also assist the latter to elevate the earth into position to be discharged onto the delivery-apron.

Having described my invention, what I claim is—

1. In a ditching-machine, the combination with a frame carrying an excavator, of an inclined elevator-frame comprising two parallel plates or beams, a table or platform comprising rollers journaled in said plates or beams and tie-rods secured at their opposite ends in the respective plates or beams, the rollers and tie-rods alternating with one another, and an apron carried by the elevator-frame and arranged to travel on said table or platform, substantially as described.

2. In a ditching-machine, the combination

with a frame carrying an excavator, of an inclined elevator-frame carrying an endless apron, two parallel endless sprocket-chains arranged to travel above the apron, rakes attached to said chains at uniform distances apart, each of said rakes comprising a plurality of curved teeth projecting outward from the chains at substantially right angles between the chains, and a transverse delivery-apron arranged beneath the upper end of the elevator-frame, and means for driving said aprons and rake, substantially as described.

3. An endless apron comprising two endless sprocket-chains each link whereof is provided on its inner side with an outwardly-projecting perforated lug or ear, a rod journaled in each two corresponding perforated lugs or ears, and metallic plates each bent or crimped at one edge about one of said rods and arranged to overlap at its opposite edge the pivoted edge of the succeeding plate, substantially as described.

4. In a ditching-machine, the combination with a frame carrying an excavator, of an inclined elevator-frame provided with a table or platform, and an apron traveling about said table or platform, said apron comprising two parallel endless sprocket-chains each link whereof is provided on its inner side with an outwardly-projecting perforated lug or ear, a rod journaled at its opposite ends in each two corresponding perforated lugs or ears, and metallic plates each provided at one edge with two slots arranged to receive said lugs or ears, the edge of the plate being bent or crimped about said rod and its free edge arranged to overlap the pivoted edge of the succeeding plate, substantially as described.

5. In a ditching-machine, the combination with a frame carrying an excavator, of a rearwardly-inclined elevator-frame carrying an endless apron adapted to receive and elevate the excavated earth, a delivery-apron arranged beneath the rear end of and transversely to the said endless apron, means for driving said aprons, two arms pivoted at their forward ends to the elevator-frame and having journaled therein a ground-wheel, a screw rotatably mounted in a fixed support and engaging a nut on the rear ends of said arms, and means for turning said screw to raise and lower the ground-wheel and thereby regulate the penetration of the excavator, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

DAVID F. KAIN.

Witnesses:

WM. B. LITTLE,
G. H. ERNST.