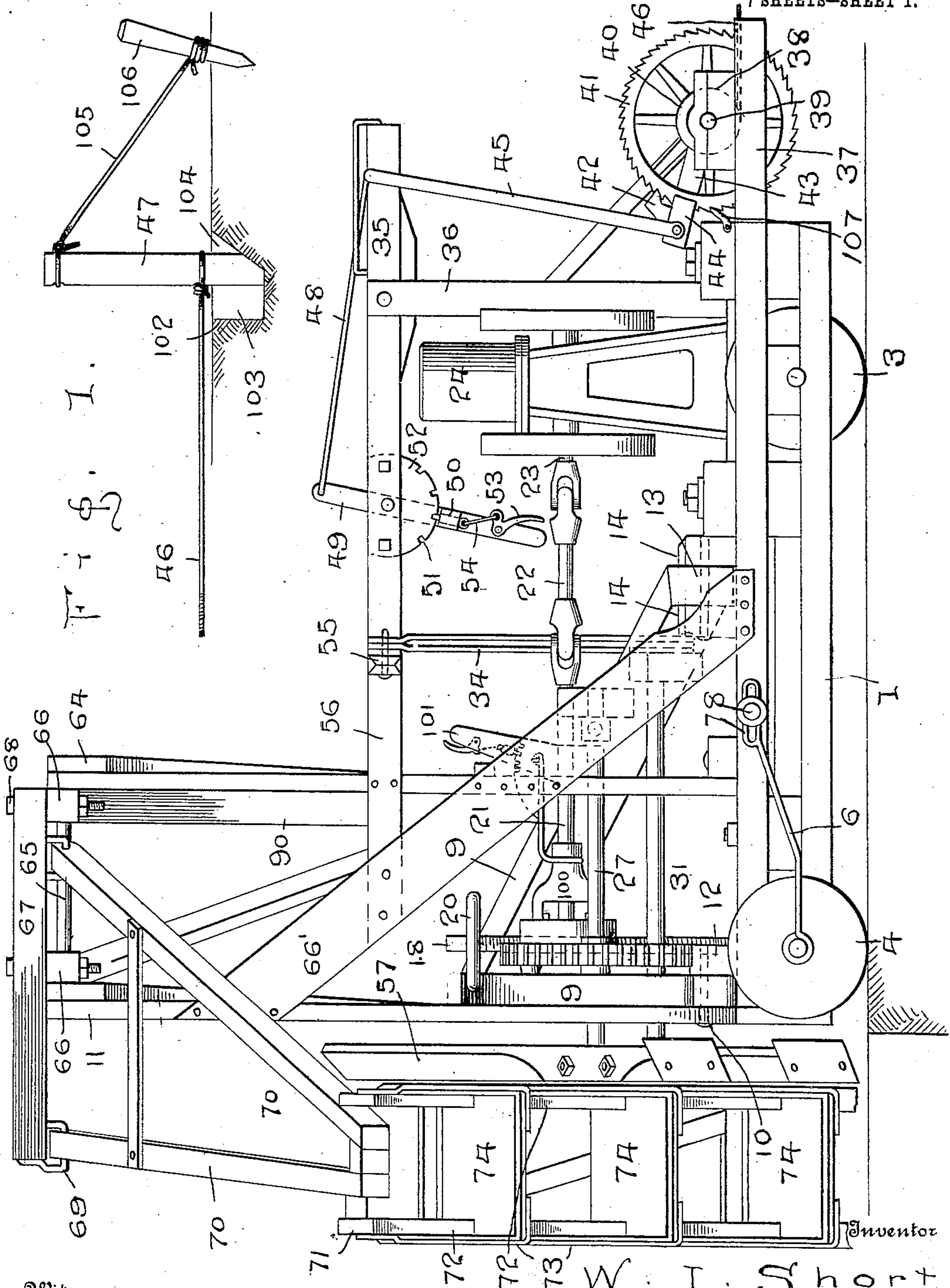


W. I. SHORT.  
DITCHING AND GRADING MACHINE.  
APPLICATION FILED MAR. 26, 1908.

935,240.

Patented Sept. 28, 1909.

7 SHEETS—SHEET 1.



Witnesses

Thos. W. Riley  
W. C. Lawson

By

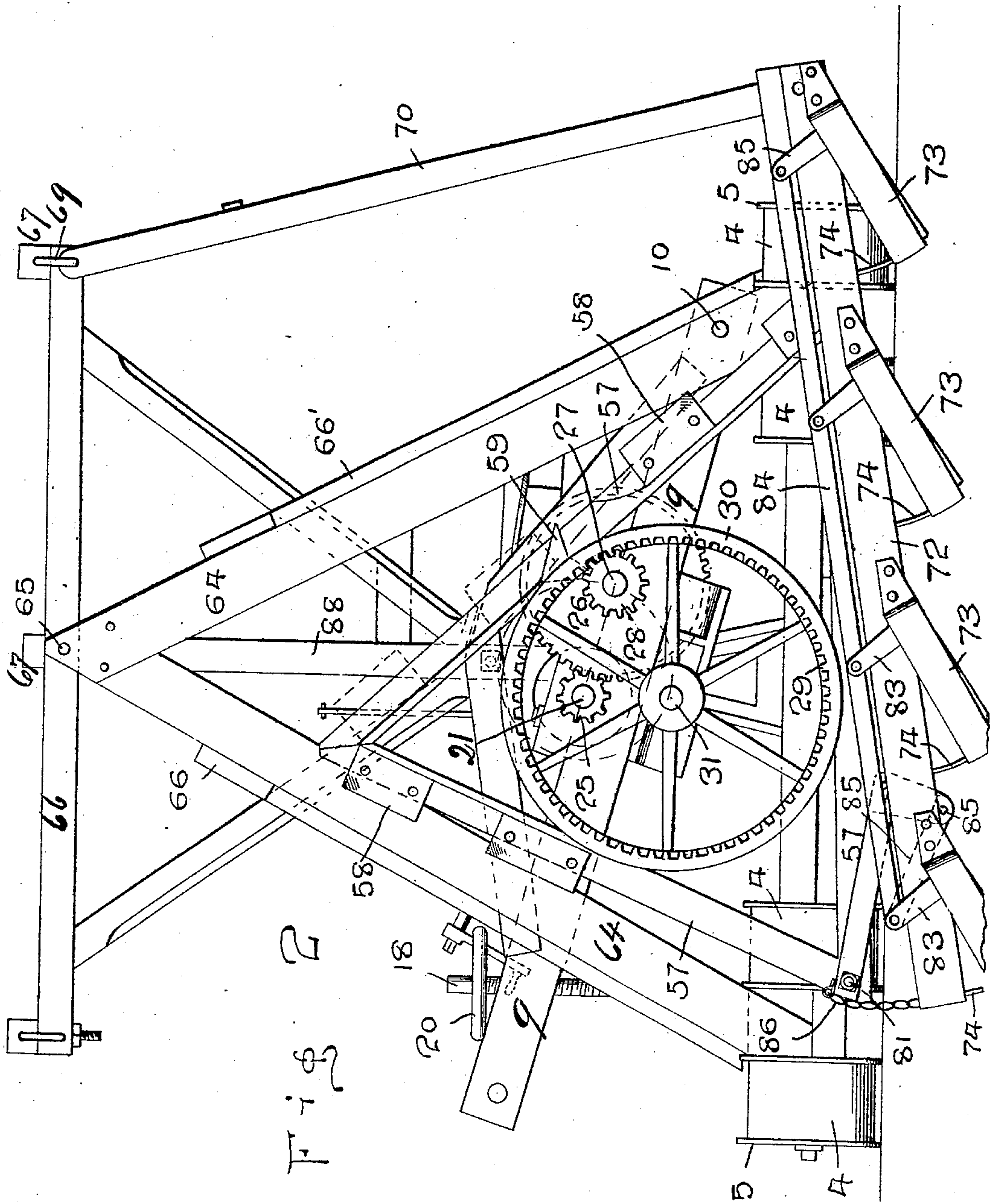
W. J. FitzGerald & Co.  
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7 SHEETS—SHEET 2.



WITNESSES:

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W. I. Short INVENTOR

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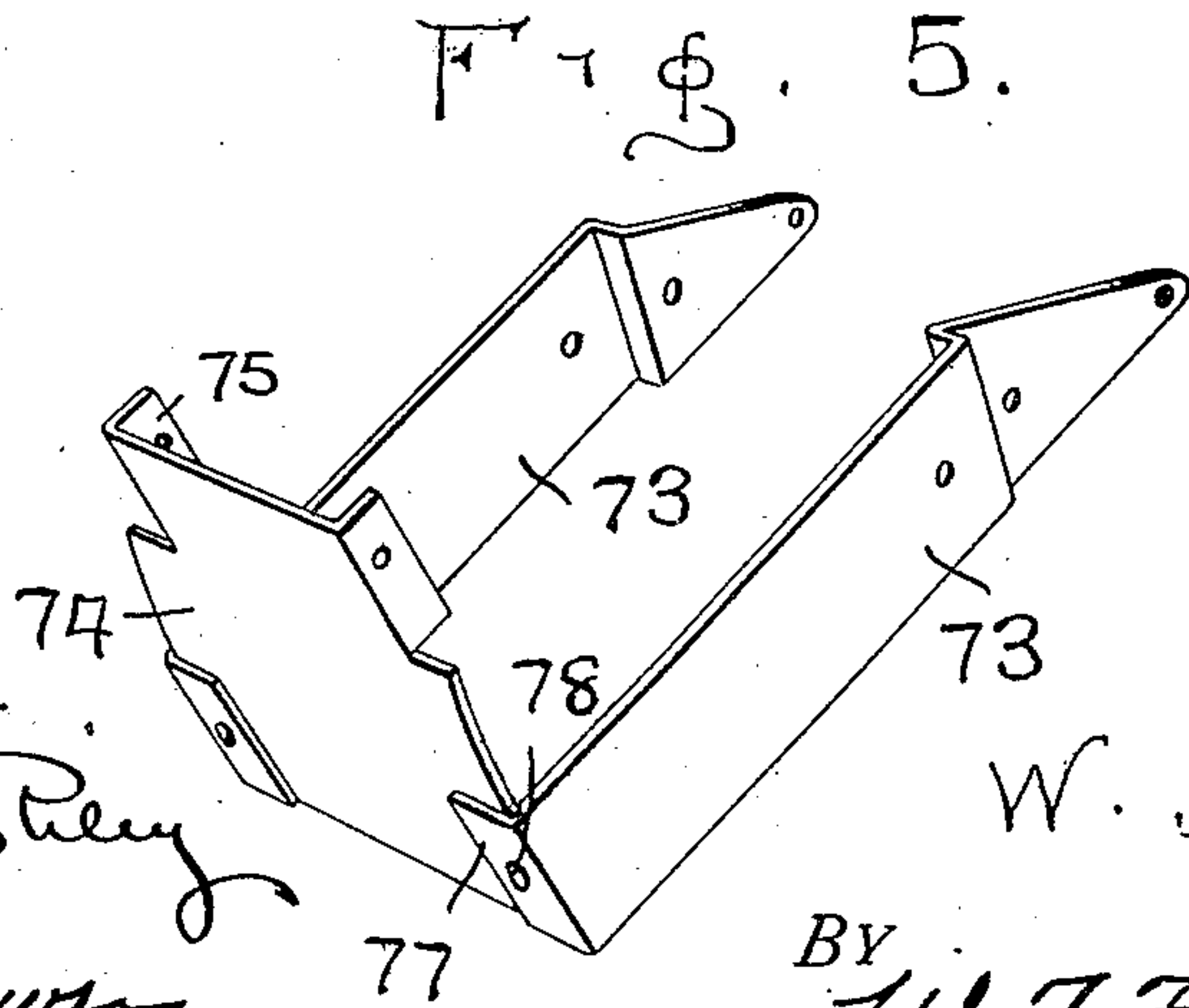
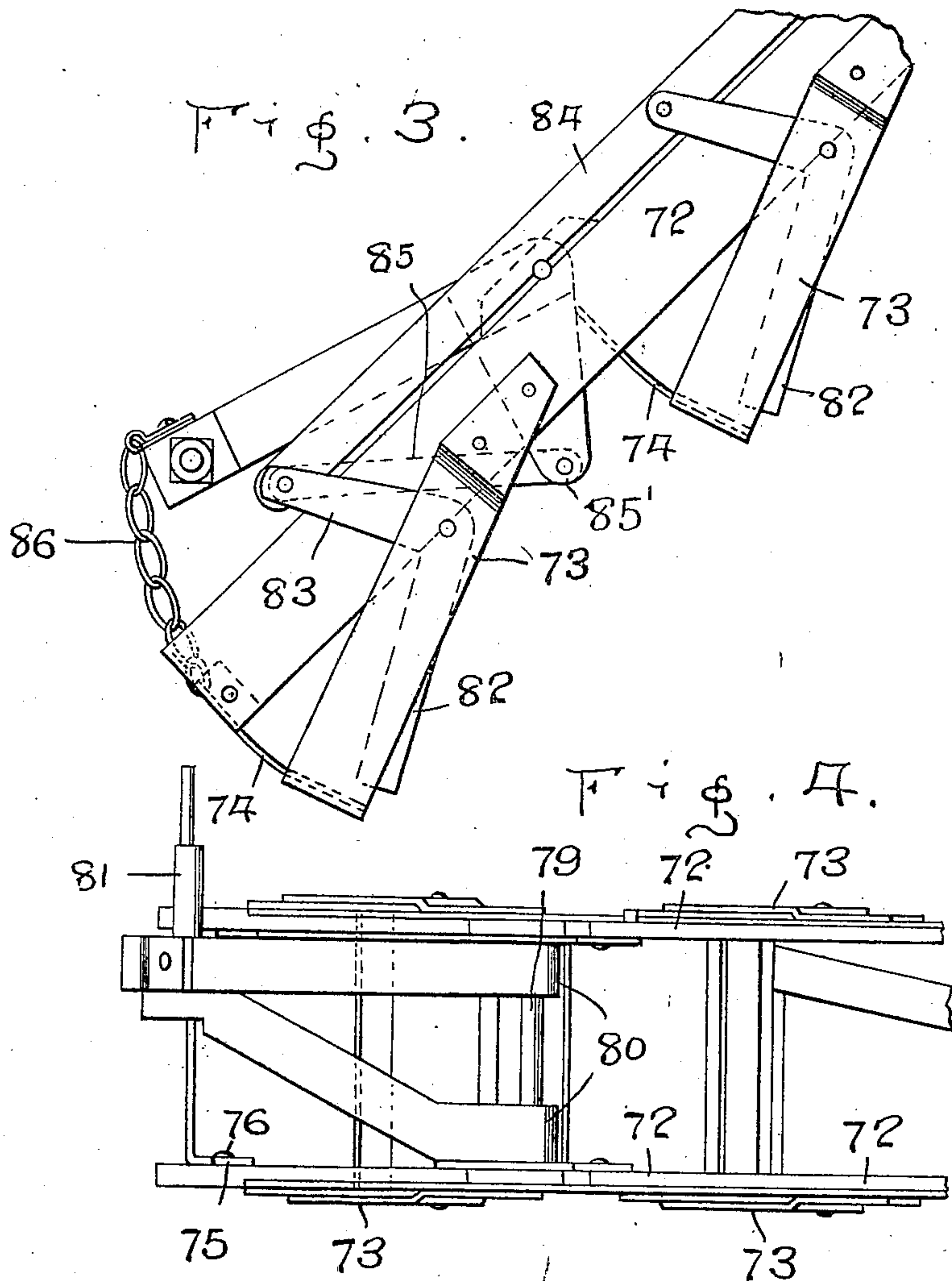


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7 SHEETS—SHEET 3.



WITNESSES:  
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W. C. Lawson

INVENTOR  
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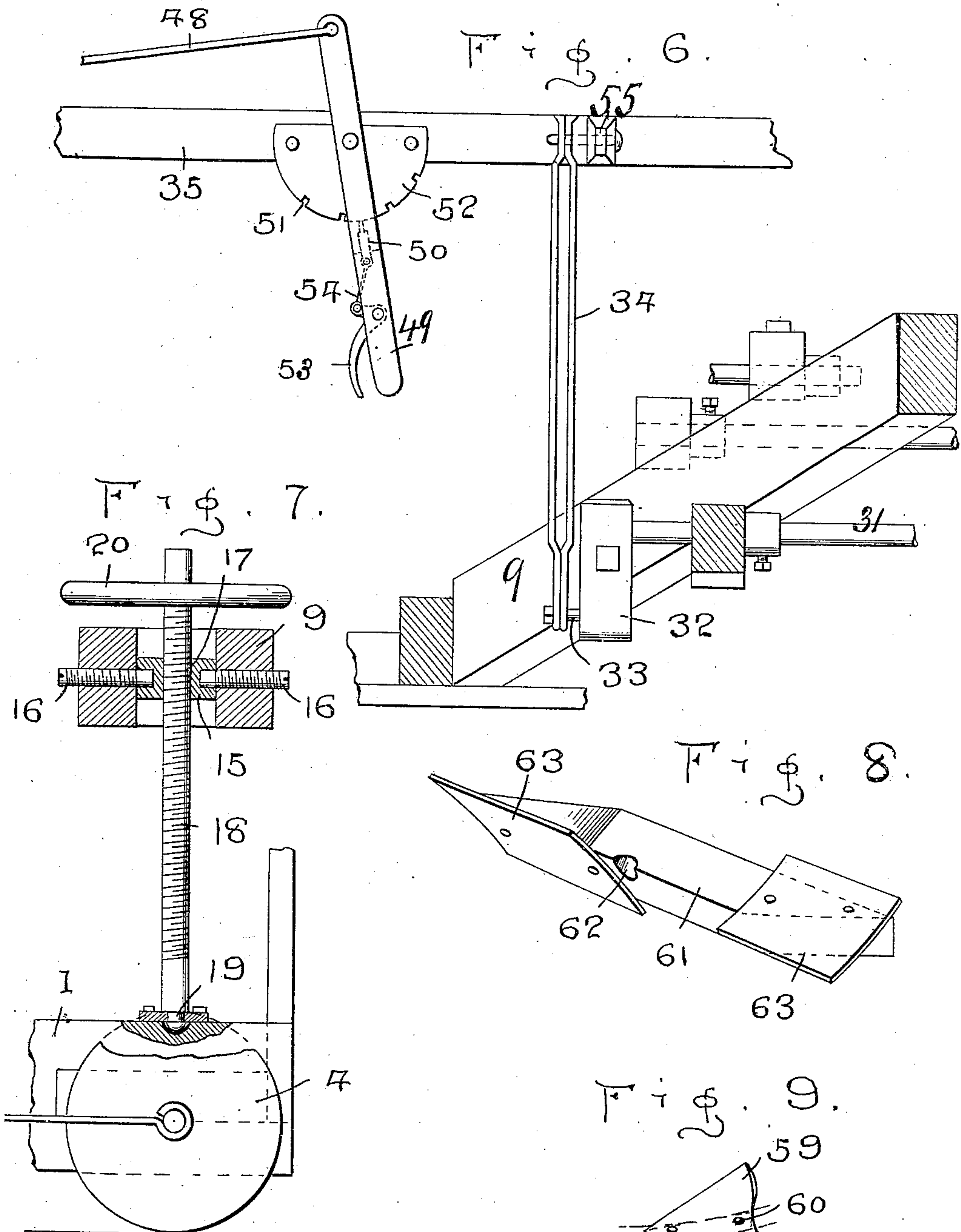
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7 SHEETS—SHEET 4.



WITNESSES:

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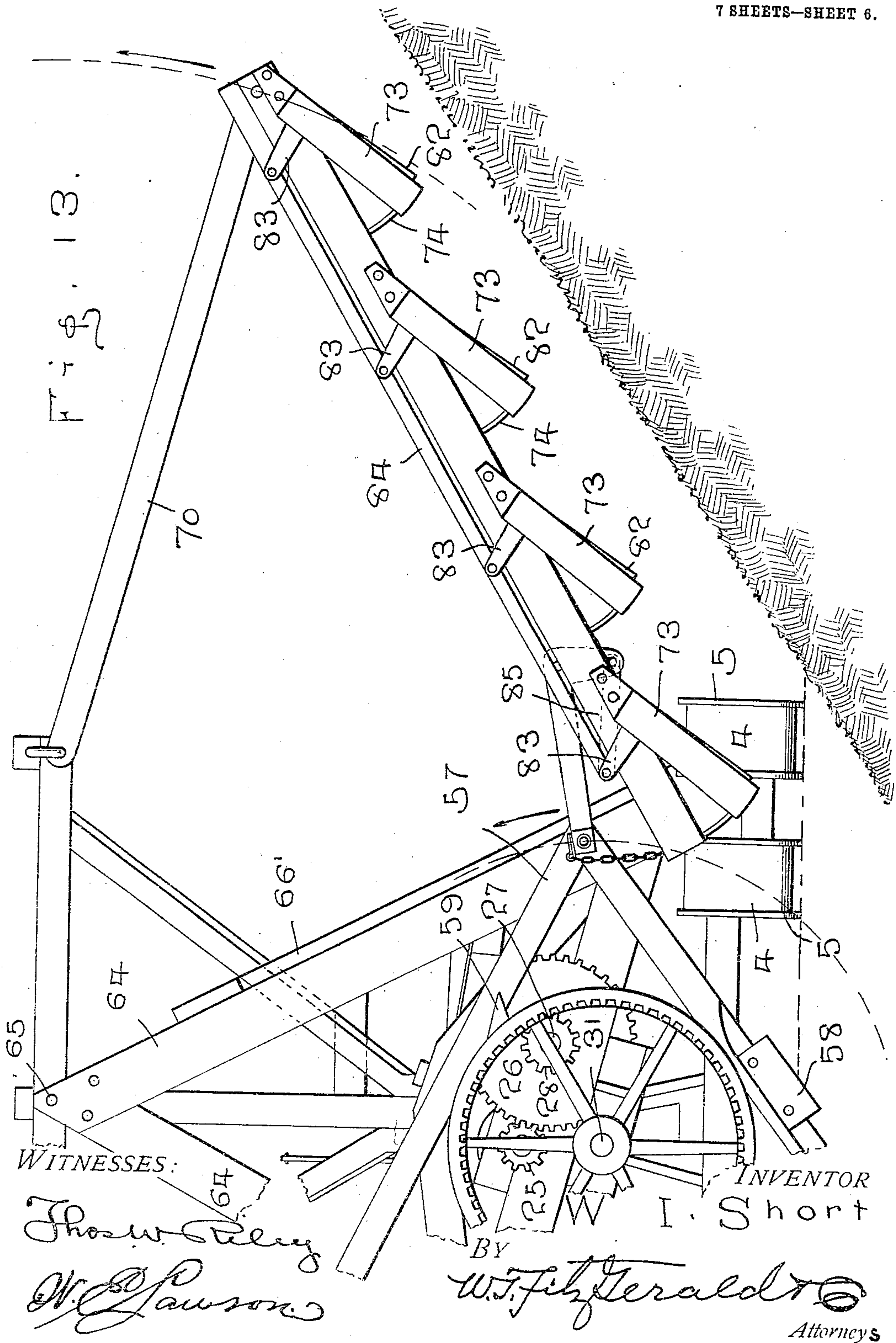




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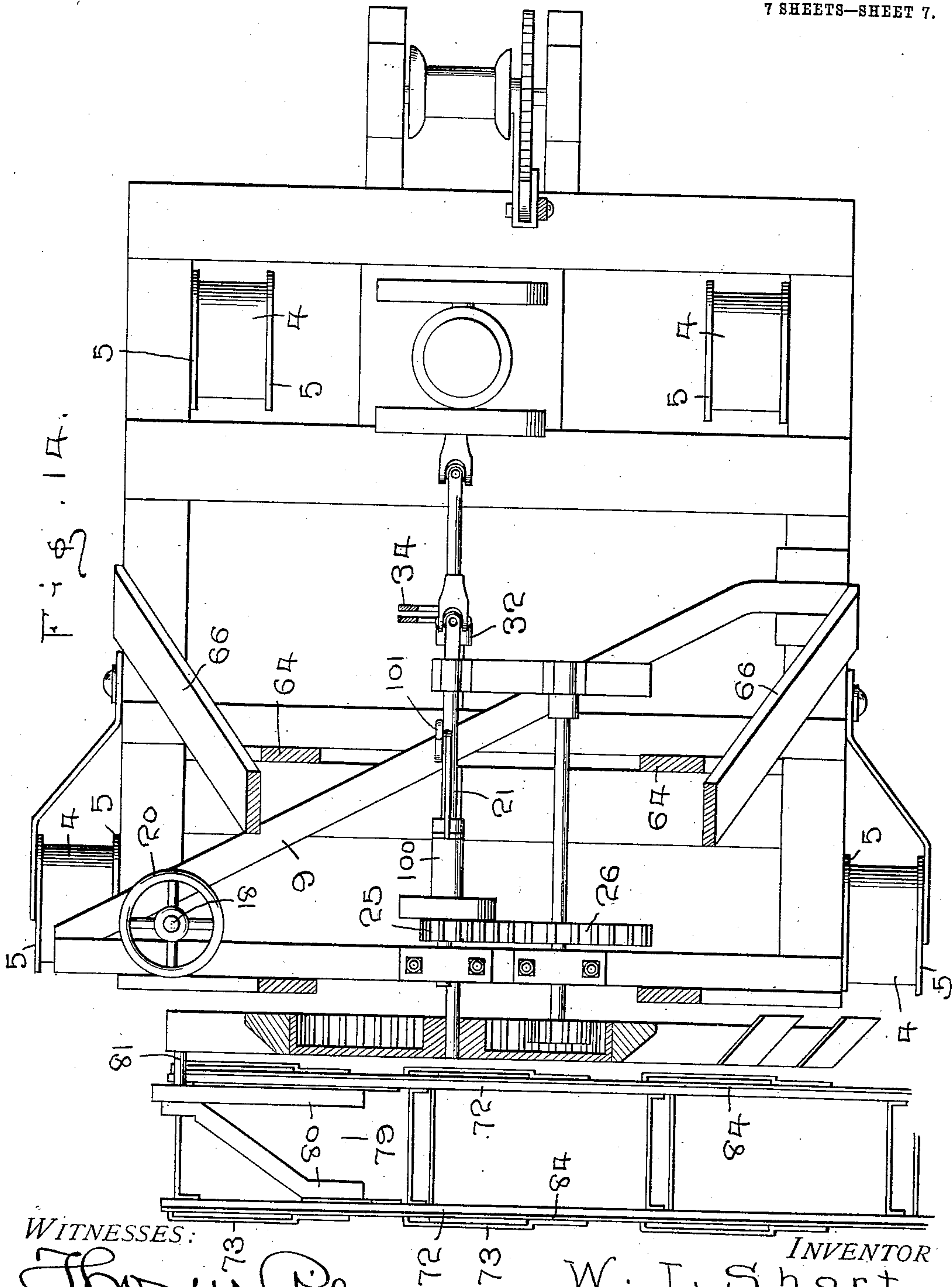
Patented Sept. 28, 1909.  
7 SHEETS—SHEET 6.



W. I. SHORT.  
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Patented Sept. 28, 1909.  
7 SHEETS—SHEET 7.



WITNESSES:

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Attorneys



# UNITED STATES PATENT OFFICE.

WILLIAM I. SHORT, OF QUINCY, ILLINOIS.

DITCHING AND GRADING MACHINE.

935,240.

Specification of Letters Patent. Patented Sept. 28, 1909.

Application filed March 26, 1908. Serial No. 423,459.

*To all whom it may concern:*

Be it known that I, WILLIAM I. SHORT, a citizen of the United States, residing at Quincy, in the county of Adams and State of Illinois, have invented certain new and useful Improvements in Ditching and Grading Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to new and useful improvements in excavating machines and it has primarily for its object to provide a novel device of this character for forming embankments such as required in the construction of levees, drainage ditches, railroad grading and the like.

It is furthermore an object of the invention to provide a novel device of this character wherein the angle of the embankment being formed can be varied to meet the requirements of practice.

It is also an object of this invention to provide a novel device of this character employing a cutting mechanism and a shovel mechanism, said shovel mechanism being connected to and operated by the cutting mechanism.

It is also an object of the invention to provide a novel device of this character containing means whereby the embankment can be formed either to the right or left of the machine as may be required.

It is also an object of the invention to provide a novel device of this character wherein the cutting mechanism can be adjusted for various depths.

It is also an object of the invention to provide a novel device of this character which has its cutting mechanism arranged at the rear of the machine.

The invention also has for its object to provide a novel device of this character which is caused to travel forward automatically, the mechanism for imparting the movement to the machine being under control of the cutting mechanism.

It is furthermore an object of the invention to provide in combination with a device of this character novel means whereby the speed of travel of the machine forward may be controlled.

It is also an object of the invention to provide a novel device of this character employing a plurality of buckets, said buckets

being caused to operate in unison by mechanism connected to the cutting means.

It is furthermore an object of the invention to provide a novel device of this character that will be simple in construction, efficient in practice and comparatively inexpensive to manufacture.

With the above and other objects in view the invention consists of the details of construction and in the novel arrangement and combination of parts, to be hereinafter referred to.

In describing the invention in detail reference will be had to the accompanying drawings forming part of this specification, wherein like characters of reference denote corresponding parts in the several views, and in which,

Figure 1 is a view in side elevation of the invention. Fig. 2 is a rear view. Fig. 3 is a view in elevation of a lower fragment of the shovel beam and its intimate parts. Fig. 4 is a top plan view of Fig. 3. Fig. 5 is a view in perspective illustrating the construction of one of the shovels or buckets. Fig. 6 is a fragmentary view partly in elevation and partly in section illustrating the mechanism for imparting travel to the machine. Fig. 7 is a fragmentary view partly in section and partly in elevation illustrating the means for controlling the depth of the cutting mechanism. Fig. 8 is a perspective view, detached, of an auxiliary cutting means employed. Fig. 9 is a view similar to Fig. 8 illustrating an additional auxiliary cutting means. Fig. 10 is a fragmentary view in elevation illustrating the mechanism for controlling the angle of the embankment to be formed. Figs. 11 and 12 are views partly in elevation and partly in section illustrating a clutch mechanism employed in conjunction with the invention. Fig. 13 is a fragmentary view in side elevation illustrating the elevating mechanism in a position different from that disclosed in Fig. 2. Fig. 14 is a longitudinally sectional view of the machine.

In the drawings 1 denotes the base frame of the machine which may be of any desired construction. This frame is supported by the forward wheels 3 and the rearward wheels 4. All of these wheels are provided with flanges 5 to prevent a side-wise or lateral movement of the machine. The rear wheels 4 are preferably mounted through the medium of a rod 6 terminating in a loop



7 through which passes retaining bolts 8 projecting from the frame. This arrangement is shown in Fig. 1 and is employed in guiding the machine.

Adjacent the rear end of the frame and extending transversely thereof is an approximately V-shaped frame 9 pivotally secured at its base adjacent a longitudinal edge of the first referred to frame. The pivoting of this frame may be effected in any manner, but in the drawings the straight beam is shown as pivotally held by a bolt 10 passing through a vertical beam of the tower 11 and a block 12 secured to the frame. The end of the other beam of the frame 9 is pivoted to the bolt 13 supported in the blocks 14 carried by the frame. The apex or pointed end of the frame 9 has interposed between the beams a block 15 held against displacement by the threaded bolts 16 passing through the beams of the frame 9 and projecting within the block 15 as is shown in detail Fig. 7. The block 15 is preferably metallic and is provided with a threaded opening 17 through which passes a threaded rod 18 swiveled at its lower end as at 19 to the base 1. The upper end of the rod 18 has fixed thereto a hand wheel 20.

It is believed to be apparent from the drawings that by proper rotation of the hand wheel 20 the V-shaped frame can be either moved to or from the frame, and as this frame carries the cutting mechanism it will be clearly apparent how the depth of the cut may be regulated or controlled.

The cutting mechanism derives its power from a shaft 21 mounted on a beam of the frame 9 and projecting to either side thereof, the inner end of the shaft being united with a flexible shafting 22 which is in turn connected to a power shaft 23 of a motor 24, said motor being of any character desired. This shaft 21 is provided adjacent its one end with a pinion 25 which meshes with a gear wheel 26 secured to a shaft 27, mounted in the triangular frame 9. This shaft 27 has on its outer end a pinion 28 meshing with the internal teeth 29 of the main wheel 30 of the cutting mechanism. This wheel 30 is fixed on a shaft 31 mounted on the frame 9.

One end of the shaft 31 projects beyond a beam of the frame 9 and has fixed thereto a crank 32 having projecting therefrom a wrist pin 33. To the wrist pin 33 is secured an end of a pitman 34 which has its opposite end pivoted to a walking beam 35 which is pivoted intermediate its length to the upright 36 carried by the forward end of the frame.

The forward end of the frame is provided with an extension 37 having resting thereon the bearings 38 in which are mounted the axle 39 of a drum 40. This drum 40 carries an enlarged toothed wheel 41. The teeth of

the wheel 41 are engaged by an upwardly extending dog or pawl 42, pivotally held by an arm 43 fulcrumed to the axle 39 of the drum 40. The upper portion 44 of the arm 43 is bent back upon itself to straddle the wheel 41 so that the arm 43 will be held against undue lateral movement with relation to the wheel 41.

Pivotally secured adjacent the outer end of the arm 43 is the lower end of a rod 45 which has its upper end portion curved to embrace the outer end of the walking beam 35.

From the foregoing it will be seen that with every rotation of the main wheel 30 the walking beam 35 will be caused to oscillate, and this oscillation of the walking beam will, through the medium of the rod 45, arm 43 and pawl 42 cause the wheel 41 to rotate a predetermined distance. This rotation of the wheel 41 will cause a similar rotation of the drum 40. The drum 40 has secured thereto an end of a flexible member 46, which has its outer end portion securely attached to an anchor 47. It will be observed therefore that with every rotation of the main cutting wheel or of the cutting mechanism carried thereby (to be hereinafter referred to) the machine will be caused to advance a predetermined distance. This movement of the machine moreover occurs simultaneously with the movement or rotation of the cutting mechanism and thereby assures an engagement of the cutting mechanism with the soil to be excavated.

The angle of the rod 45 with relation to the arm 43 determines the amount of rotation imparted to the wheel 41. In order therefore that this angle or inclination may be varied to control the movement forward of the machine, the upper or curved end of the rod 45 has secured thereto a rigid link 48 which is pivotally engaged with the upper end of a lever 49. This lever 49 is pivoted intermediate its length to the walking beam and the lower end portion of the lever 49 terminates at a point easily accessible to the operator of the machine.

When the lever 49 is swung in either direction on its pivot the angle of the rod 45 is varied and the speed of the machine thereby controlled. Should the lever be moved outward from the engine 34 the speed of the machine is increased, and should it be moved in an opposite direction the speed is diminished and the difference of speed is controlled by the extent of movement given the lever 49. The lever 49 is held in its varied positions by a sliding latch 50, engaging the teeth 51 of a segment 52 secured to and depending from the walking beam 35. In order to release the latch from the segment a bell lever 53 is pivoted to the lower portion of the lever 49 and is connected with the latch 50 by a rigid link 54. It is thought to



be apparent from this description how the latch 50 can be engaged or disengaged from the teeth of the segment 52.

In order that the walking beam may be held against any possible undue or lateral movement it has connected thereto one end of the beam 55. The opposite end of this beam 55 is pivotally held by a beam 56, projecting inwardly from the tower 11 hereinbefore referred to. This means for preventing lateral movement of the walking beam 35 is most essential as it assures positive engagement of the pawl 42 with the toothed wheel 41.

Secured in any desired manner to the inner face of the rim of the main wheel 30 is an equi-lateral triangle 57. Secured to the face of the triangle frame and projecting beyond the outer edge thereof is a series of cutter blades 58.

It has been found best in practice that there be two series of blades, positioned adjacent a point of the frame. It has been found still further to be of advantage to have the blades opposed in order to distribute the strain or resistance to the main wheel 50.

In Fig. 2 the arrangement of the frame 57 and its cutter blades 58 are shown. The blades indicated by dotted lines denote the position of the blades should the main wheel be operated in a reverse direction.

When the main wheel 30 is in operation and when its adjusting means may be inserted at its lowermost positions it has been found best to employ the auxiliary cutter 59 secured to one of the beams of the frame 57 adjacent its attachment with the wheel 30. This cutter may be of any desired form, but in practice it has been found best to employ a cutter of the form of a lister shaped shovel as is particularly shown in detail, Fig. 9. The manner of securing this auxiliary cutter may be as desired, but it is preferred that bolts 60 be employed, as this means will afford the ready application or removal of the attachment. At times it is also found desirable to employ the additional cutting means illustrated in Fig. 8. This means comprises a beam 61 having an opening 62 receiving the shaft 31 of the main wheel 30. This beam 61 carries cutter blades 63 projecting beyond opposite edges of the beam 61 and arranged in angular position one with relation to the other. It will also be noted that the blades 63 are disposed one at a greater distance from the opening 62 in the beam 61, than the other blade, whereby the action of one blade will follow up the action of the other so as to produce a continuous cut in the ground. Also by means of this arrangement, a cutting action is effected at points intermediate of the diameter of the wheel 30, while the attachment 59 provides

for effecting a cutting action upon the remaining surface or space.

The tower 11 hereinbefore referred to consists of vertically arranged converging beams 64 secured at their lower ends to the frame 1. These beams 64 form two side frames united or connected by the rod 65 as is more particularly shown in Fig. 1. It may be well to state at this point that the frames formed by the beams 64 are paralleled and are held in such paralleled position by the rod or shaft 65. The tower is further held in position by the inclined brace beams 66 secured to the beams 64 and the frame 1. The rod or shaft 65 acts as a central pivot for a rocking frame. This rocking frame comprises longitudinal beams 66 positioned to extend between the frames of the tower 11, and are united by cross beams 67 interposing thereabove and held thereto by the bolts 68. These transverse beams are positioned centrally of the longitudinal beams 66 adjacent the ends thereof. The end beams 67 extend beyond the outer beams 66 as is indicated in Fig. 1. In other words the end beams 67 project over and beyond the main wheel 30 and its intimate parts.

Adjacent each end the end beams 67 are provided with depending loops 69. The loops 69 of one of the end beams 67 is pivotally engaged by a suspending frame 70 having its opposite end pivotally secured to the shovel frame 71. The attachment of the frame 70 to the frame 71 and loops 69 is detachable. This arrangement is provided to permit an embankment being formed either to the right or to the left of the machine as desired.

In the drawings the bucket frame is shown in position to be swung to the right, but should it be desired to swing the bucket frame to the left the frame 70 is detached and applied to the end beam on the opposite end of the rocking frame and to the opposite end of the bucket frame and the other connections (to be referred to) of the bucket frame are changed accordingly.

The bucket frame comprises two parallel side members 72 having secured to their outer surface the ends of the sides of the ends 73 of the buckets. These sides are arranged on a depending incline with relation to the sides 72 and have their ends connected to base plates 74 of the bucket which projects above the side plates 73. The upper end portion of the base plate 74 has inwardly projecting flanges 75 which are intended to contact with the inner surface of the side frame 72 and be secured thereto by bolts 76. The manner of attaching the side frames to the base plate 74 is effected in the drawings by bending the lower ends of the side plate 73 at approximately right angles as shown at 77, Fig. 5. These angu-



lar portions 77 are secured adjacent the lowermost edge of the plate 74 by rivets 78. This mode of attachment is not essential in the successful operation of the invention and

5 any other means may be employed that will serve with equal facility. These buckets may be of any number and the frames 72 of any length, the number and length being determined by the size of the operation.

10 The frame 72 adjacent their lower ends and at the upper edges thereof are provided with a transverse shaft 79 which has mounted thereon the ends of a push frame 80. The opposite end of the push frame is mounted  
15 on a wrist pin 81 affixed or carried by a corner of the triangular cutting frame 57, such corner or point being the one adjacent the portion of the frame not provided with the cutting blades.

20 It will be readily understood that with the rotation of the main wheel 30 and the frame 57, carried thereby the bucket frame will be pushed outwardly and upwardly from the medium of this connection with the frame  
25 57 and the suspending frame 70. This forward and upward movement of the buckets is afforded by a half rotation of the wheel 30, and is returned to its operative position by the remaining rotation of the wheel.

30 The soil loosened by the various cutter blades is scraped or pushed to form an embankment by the various buckets, and this movement is such as to comminute the soil and will thoroughly mix the top soil with the  
35 sub-soil. This is of great advantage, as after the completion of the embankment vegetation can be applied thereto.

In the handling of soil there is a great tendency for the soil to adhere or stick to  
40 the sides of the buckets. To obviate this disadvantage scrapers 82 are pivoted to the sides 73 adjacent their forward ends, and the pivoted ends of the scrapers are provided with the levers 83 approximately at  
45 right angles thereto. The upper ends of the levers 83 are pivotally secured to a rod 84 arranged above the upper edge of the frame 72. The rods 84 are further pivotally secured by links 85 to the lower angular portions 85<sup>1</sup> of the push frame. By this arrangement when the buckets start on their  
50 return movement the movement of the push frame will be such as to cause the rods 84 to reciprocate, which will cause an oscillation of the scrapers 82 and thus thoroughly clean the sides of the buckets of soil as well as the rear of the buckets.

Undue movement of the frame 72 with relation to the push rod 80 is prevented by  
60 the flexible connection 86 secured to the upper edge portion of the lowermost bucket and the upper end of the push frame 80.

It is essential in the practical application of the invention to provide means

whereby the angle of the embankment to be  
65 formed may be varied. This is done by the movement of means for swinging the rocking frame on its pivot 65.

To the inner beam 66 of the rocking frame is the upper end of a vertically arranged  
70 beam 87 and to the second beam 66 is secured the brace beam 88 which has its lower end secured to the beam 87 by the bolt 89. The additional brace beams 90 are employed, extending from the outer ends of the inner  
75 beam 66 to the beam 87 at a point adjacent its connection with the beam 88.

To one of the beams 64 of the adjacent side frame of the tower 11 is anchored a pulley 91, while to the opposite beam 64 is  
80 held a second pulley 92 having teeth 93 meshing with the worm gear 94 on the shaft 95. Wound around the pulley 92 is a flexible member 96 which has one end portion thereof secured to an eye 97 carried by the  
85 lower end of the beam 87, the opposite portion of the connection 96 passes around the pulley 91 and has its end portion secured to the eye 98 on the opposite side of the beam 87 to that of the eye 97.  
90

The shaft 95 is provided with an operating crank 99. When it is desired to tilt the frame in either direction the desired rotation is given the shaft 95 through the medium of the crank 99 when proper pull  
95 will be exerted on the beam 87 by the connection 96. It is the inclination of the rocking frame that determines the line of travel of the buckets and it is the line of travel of the buckets that produces the angle of  
100 the embankment, as is, it is thought, fully appreciated by those skilled in the art to which this invention appertains.

When for any cause it is desired to stop the operation of the machine momentarily  
105 it is a disadvantage to stop the motor. To obviate this disadvantage the shaft 21 is provided with a clutch 100 operated by the lever 101 so positioned as to be within easy access of the operator. The form of the  
110 clutch employed forms no part of this invention, but in Figs. 11 and 12 a clutch is illustrated which has been found in practice to fully meet the requirements, but a detail thereof is believed unnecessary.  
115

The anchor 47 hereinbefore referred to can be any stationary object possessing the required resistance. The anchor in the drawings consists of a vertical beam having its lower end inserted within a shallow trench  
120 102 and positioned between two cross beams 103 and 104 of any desired length. The upper end of the anchor is comprised of a flexible connection 105 having one end portion secured to the beam and its opposite  
125 end portion to the stake 106.

While not shown in the drawings it is to be stated that in lieu of the supporting



wheels 3 and 4 a boat-like structure may be employed which will permit the device to operate on water and thus obviate the necessity of waiting for the dry season.

5 A great advantage possessed by a device constructed according to the present invention resides in the fact that all of the operating mechanism including the supporting frame is always above the excavation.

10 Attention is directed to the fact that the wheel 41 is held against retrograde movement by a pawl 107 carried by the frame engaging the teeth of the wheel.

What I claim is:

15 1. In a device of the character described, the combination of a forwardly movable frame and a cutting means carried by the rear thereof, said cutting means being movable transversely of the frame.

20 2. In a device of the character described, the combination of a movable frame, a cutting mechanism carried thereby, movable transversely thereof and means under control of the cutting mechanism for imparting  
25 movement to the frame.

3. In a device of the character described, the combination of a forwardly movable frame, and a vertically adjustable cutting mechanism carried by the rear of the frame,  
30 said cutting means being movable transversely of the frame.

4. In a device of the character described, the combination of a movable frame, movable transversely thereof cutting means carried by the frame, means operated by the  
35 cutting means for imparting movement to the frame, and means for controlling the speed of travel of the frame.

5. In a device of the character described,  
40 the combination of a movable frame, a cutting mechanism carried thereby, movable transversely thereof means operated by the cutting mechanism for imparting movement to the frame, and means carried by the moving means for controlling the speed of movement.  
45

6. In a device of the character described, the combination of a cutting means, and an elevating means pivotally connected to the  
50 cutting means.

7. In a device of the character described, the combination of a cutting means, an elevating means pivoted to the cutting means, and means for adjusting the direction of  
55 movement of the elevating means.

8. The combination in a device of the character described; of a cutting means, pivoted to an elevating means operated by the movement of the cutting means, and a cleaning means for the elevating means operated by  
60 the movement of the cutting means.

9. In a device of the character described, the combination of a frame, and a transversely movable cutting mechanism adjacent one end thereof extending beneath the frame.  
65

10. In a device of the character described, the combination of a rotary member, cutting means carried by said rotary member and a shovel mechanism pivoted to the rotary member.  
70

11. In a device of the character described, the combination of a frame, a tower thereon, a rotary member carried by the frame, cutting means carried by the rotary member and a shovel mechanism pivotally connected to  
75 the rotary member and to the tower.

12. In a device of the character described, the combination of a frame; a movable tower carried thereby and a shovel mechanism pivotally engaging the rotary member to the  
80 tower.

13. In a device of the character described, the combination of a frame; a movable tower carried thereby, a shovel mechanism pivotally engaging the rotary member to the  
85 tower and means for imparting movement to the tower.

14. In a device of the character described, the combination of a frame; a tower swingingly held by the frame, a rotary member  
90 carried by the frame, cutting means carried by the rotary member and a shovel mechanism pivotally connecting the tower to the rotary member.

15. In a device of the character described, 95 the combination of a rotary member, a shovel mechanism pivotally connecting the rotary member and means whereby the shovel mechanism is caused to dump when the pivotal connection of the rotary member to the  
100 shovel mechanism has assumed a certain position.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM I. SHORT.

Witnesses:

JOHN L. DUKER,  
J. A. JONES.