

H. MATTHIES.  
 DITCHING MACHINE.  
 APPLICATION FILED JULY 11, 1910.

987,249.

Patented Mar. 21, 1911.

3 SHEETS—SHEET 1.

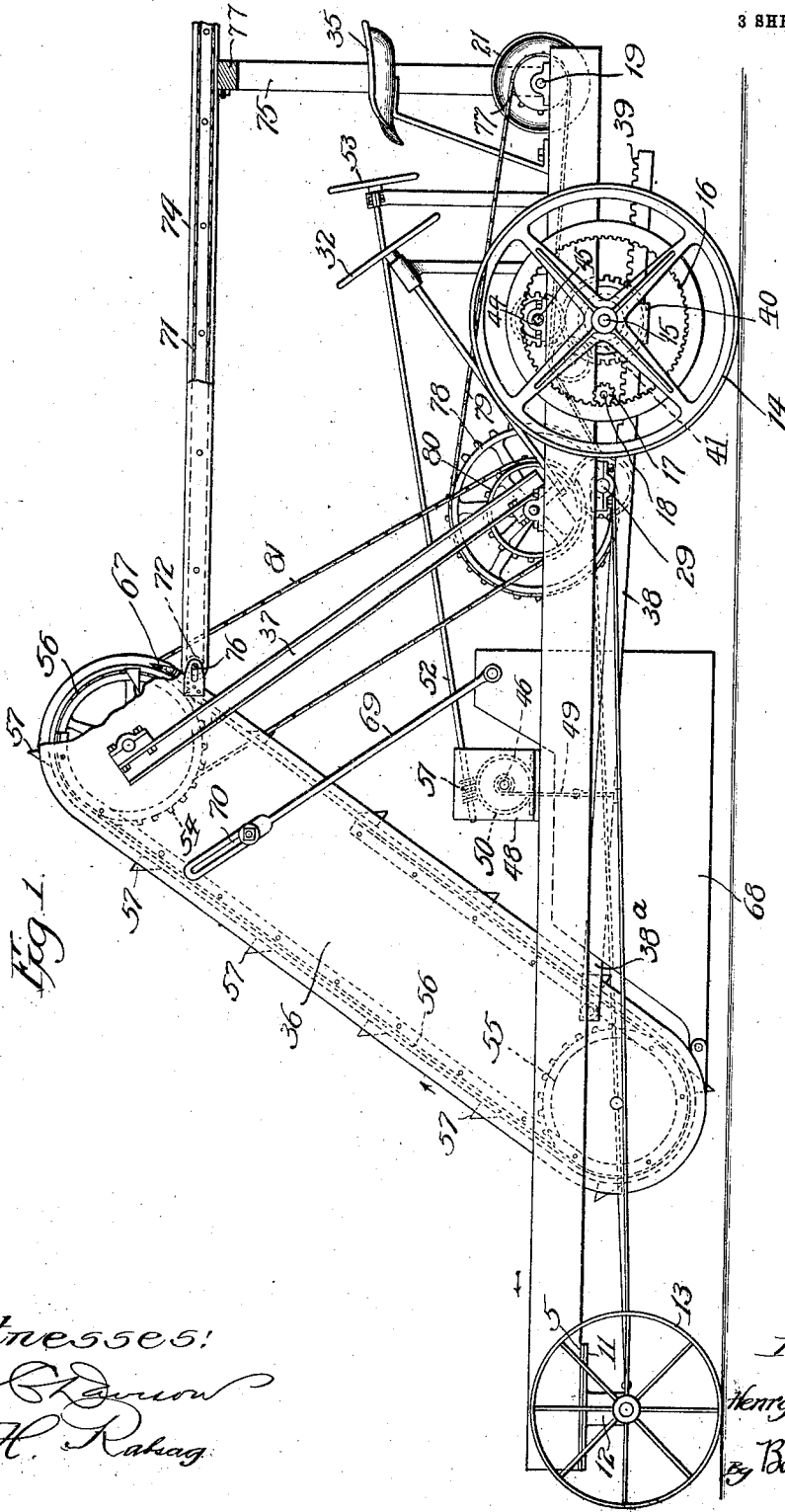


Fig. 1.

Witnesses:  
 Geo. E. Brown  
 W. H. Rakag.

Inventor  
 Henry Matthies  
 by Barton & Folk,  
 Attys.

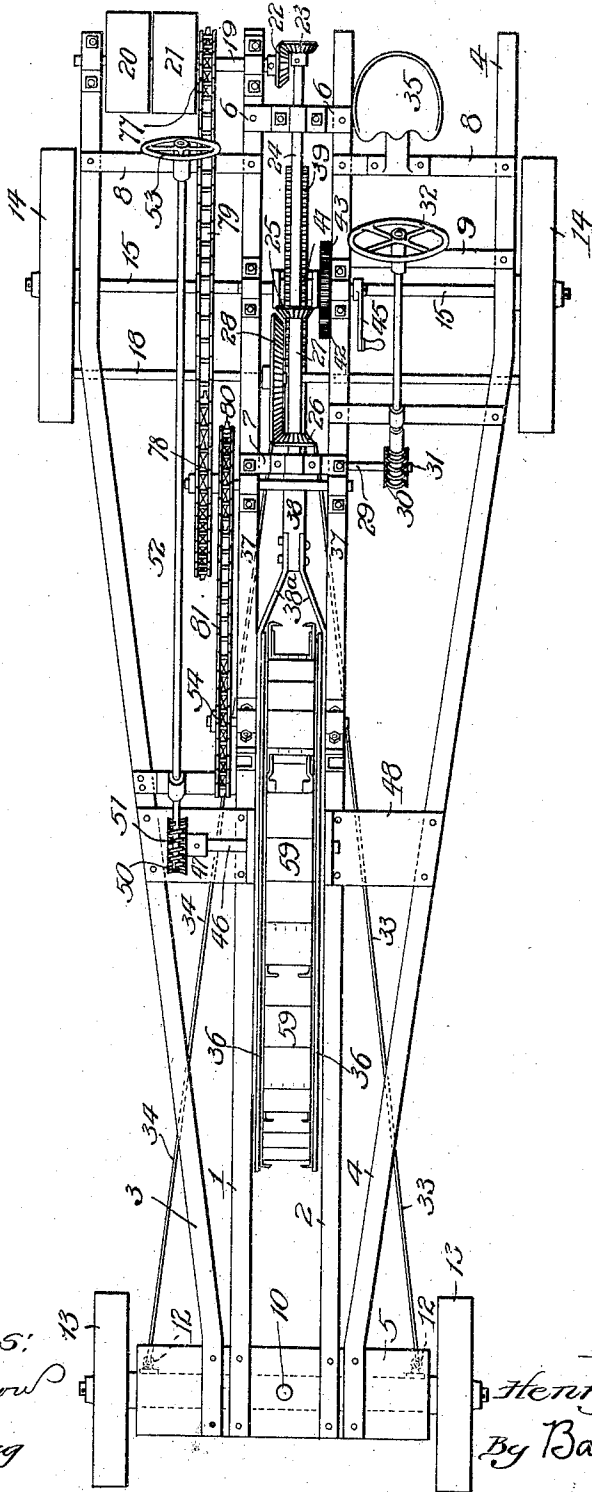
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3 SHEETS—SHEET 2.

*Fig 2.*



*Witnesses:*  
 Geo. Davison  
 A. H. Ralsag

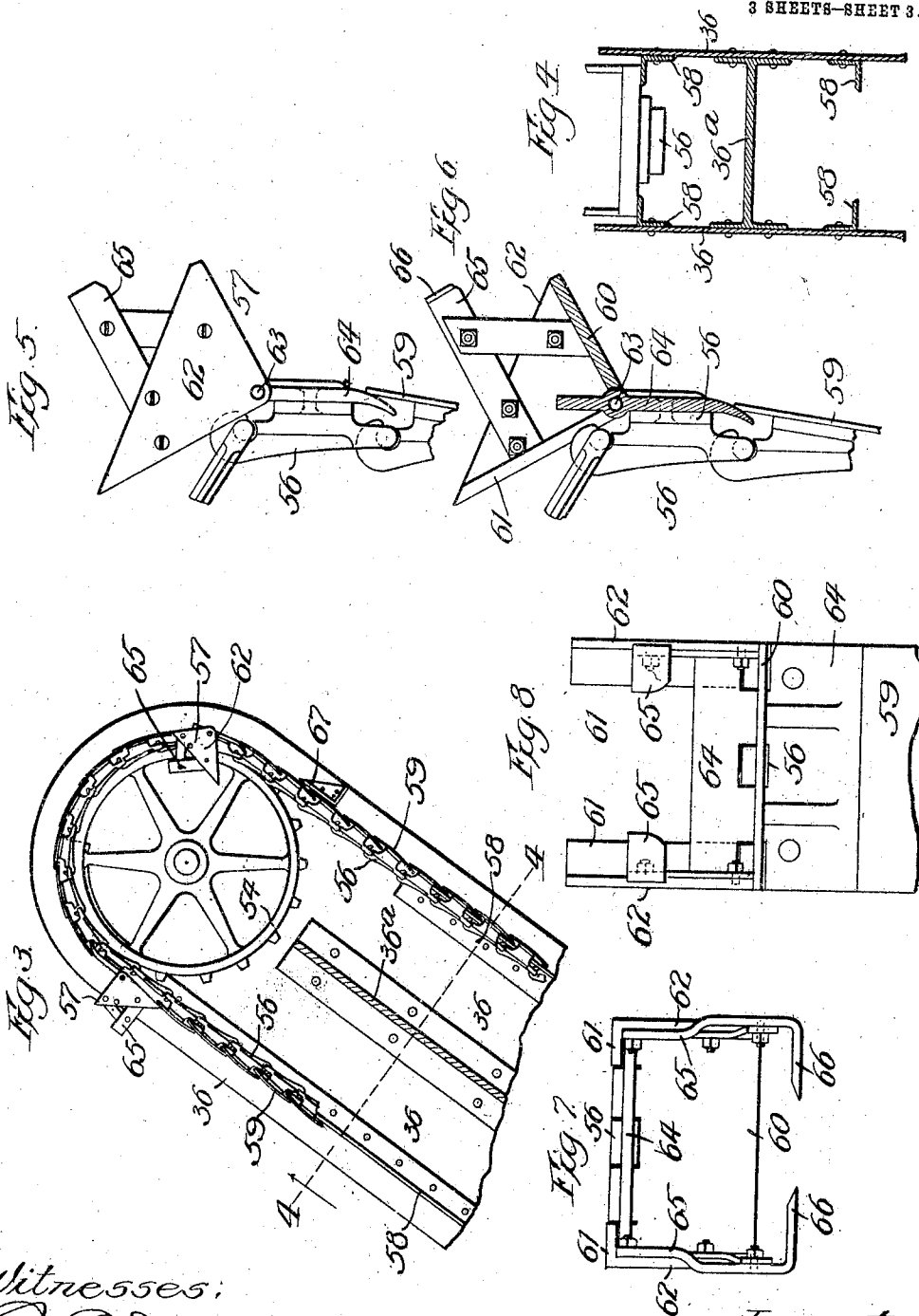
*Inventor:*  
 Henry Matthies  
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3 SHEETS—SHEET 3.



Witnesses:  
*Ed. G. Quinn*  
*W. H. Rating*

Inventor  
*Henry Matthies*  
 By *Barton & Folk*  
*Attys.*

# UNITED STATES PATENT OFFICE.

HENRY MATTHIES, OF CHICAGO, ILLINOIS.

## DITCHING-MACHINE.

987,249.

Specification of Letters Patent. Patented Mar. 21, 1911.

Application filed July 11, 1910. Serial No. 571,271.

### *To all whom it may concern:*

Be it known that I, HENRY MATTHIES, citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Ditching-Machines, of which the following is a full, clear, concise, and exact description.

My invention relates to a machine for digging ditches. Its object is to provide a traction ditching machine of simple construction, in which the excavating elements are mounted upon an adjustable auxiliary frame carried by the main frame of the machine in such manner that the said excavating elements can be readily adjusted to cut a ditch of the required depth, and in which the excavated material is automatically removed, carried to the rear of the machine, and again deposited into the ditch, after the tile or piping has been laid therein, or in which such material is otherwise suitably disposed of.

One feature of my invention relates to the manner in which the auxiliary frame is mounted upon the main frame and to the means whereby said auxiliary frame is adjusted both vertically and longitudinally with respect to the main frame.

Another feature of my invention relates to the manner in which the excavating elements are mounted on the auxiliary frame.

Another feature of my invention relates to the gear mechanism by which the machine itself and the several traveling elements thereof are driven from some suitable source of power.

Another feature of my invention relates to the provision of adjustable guard-wings located immediately in the rear of the excavating elements to prevent the side walls of the ditch from caving in upon the excavating elements.

Other features of my invention relate to the structure of the excavating shovels, to the manner in which they are mounted on an endless chain, and to the means whereby the material removed by the shovels is automatically dumped at a predetermined point in the travel of said shovels.

Another feature of my invention relates to the construction and arrangement of the conveyer by means of which the dumped material is carried back into the ditch which has been cut, after the pipe or drain tile has been laid.

These and other features of my invention may be more readily understood by reference to the accompanying drawings in which—

Figure 1 is a side elevation of a machine embodying my invention; Fig. 2 is a plan view thereof; Fig. 3 is an enlarged, fragmentary view of the auxiliary frame and the excavating mechanism carried thereby; Fig. 4 is a section on the line 4-4 of Fig. 3; Fig. 5 is a side elevation of my improved form of shovel, showing a fragment of the endless chain upon which the shovels are mounted; Fig. 6 is a central, vertical section of the shovel shown in Fig. 5; Fig. 7 is a plan view of said shovel; and Fig. 8 is a front elevation of the shovel as it appears in its downward travel.

Similar letters of reference refer to similar parts throughout the several views.

The main frame of the machine preferably comprises four horizontally extending channel irons 1, 2, 3 and 4 connected at their forward ends to the cross member or plate 5. The channel irons 1 and 2 extend longitudinally and centrally of the machine in parallel relation to each other. At the rear portion of the machine the irons 1 and 2 are connected by transverse bearing blocks 6 and 7. The irons 3 and 4 flare outwardly toward the rear and their rear ends are connected to the irons 1 and 2 by struts or braces 8 and 9, respectively. Located beneath the plate 5 and pivoted thereto is a plate 11 having downwardly extending ears 12 in which is journaled the axle of the front wheels 13, 13. The front portion of the main frame is therefore supported upon said wheels. The rear portion of the main frame is supported upon the driving wheels 14, 14 which are mounted upon the axle 15.

The driving wheels 14 are provided with internal gear teeth 16 which are engaged by pinions 17 carried upon the outer ends of the shaft 18. A shaft 19 is suitably mounted upon the rear of the machine, as for example, with its ends journaled in bearings supported upon the channel irons 1 and 3, respectively. Said shaft 19 carries two pulleys 20, 21, one of said pulleys, for example, pulley 21, being fixed to the shaft and the other an idler. Power can thus be transmitted to the shaft 19 in a well-known manner from any suitable source of power. Since it is old to mount upon the frame of ditching machines the engine or other driv-

ing power, I have not deemed it necessary to show the means by which the pulley 21 is driven. One end of the shaft 19 is provided with a beveled gear 22 which meshes  
 5 with a beveled gear 23 upon the end of the shaft 24. Said shaft 24 is at its opposite end is provided with a sliding sleeve 27 which carries two opposed beveled gears 25 and 26. Mounted upon the shaft 18 in  
 10 proximity to the beveled gears 25 and 26 is a beveled gear 28 adapted to engage with one or the other of said beveled gears 25 and 26. By thus adjusting the sleeve 27 in any well-known manner, power may be transmitted from the pulley 21 to the driving  
 15 wheels 14 to cause said wheels to travel either forward or backward, as may be desired.

Suitably journaled on the irons 1 and 2 is  
 20 a transverse shaft 29 provided with a worm wheel 30. Meshing with said worm wheel is a worm 31 carried upon the lower end of the shaft of the steering wheel 32. Wound upon the shaft 29 in opposite directions, in  
 25 a well-known manner, are flexible steering cords or chains 33, 34 which are secured at their opposite ends to the ears 12 of the plate 11. It thus appears that by turning the steering wheel 32, one of said steering cords  
 30 will be lengthened and the other shortened, thereby guiding the machine either to the right or to the left as may be desired. Mounted upon the frame of the machine at the rear of the steering wheel 32 is a driver's  
 35 seat 35.

Adjustably mounted on the main frame of the machine is an auxiliary frame comprising side plates 36 suitably connected together, for example, by I-beam 36<sup>a</sup>. At its  
 40 upper end, said auxiliary frame is connected to the main frame by braces 37, pivoted at one end to the upper end of said auxiliary frame 36 and their lower ends to the main frame of the machine. The lower end of  
 45 the plates 36 have a horizontally extending bar 38 provided at its forward ends with bifurcated arms 38<sup>a</sup> which are pivotally connected to the side plates 36, the auxiliary frame being thus supported by said bar 38.

The bar 38 is provided at its rear end with a rack or series of teeth 39. The rack 39 extends through a U-shaped yoke 40 and is held thereby into engagement with a pinion wheel  
 50 41. Said pinion wheel 41 is carried upon a sleeve which likewise carries the toothed wheel 42, said sleeve being mounted in any suitable manner, as for example, loosely on the shaft 15. Meshing with the toothed  
 55 wheel 42 is a gear wheel 43, the stub shaft 44 of which is journaled upon the main frame. Fitting upon the end of the shaft 44 is a crank handle 45 which may be made removable if desired. It is apparent therefore that by turning the handle 45 motion  
 60 is transmitted through the gears 42, 43 and

pinion 41 to the rack bar 39, thus adjusting said rack bar longitudinally and varying the inclination or angle of the auxiliary frame. Means are also provided whereby  
 70 the auxiliary frame can be raised or lowered to adjust the depth to which the ditch is cut. The means shown in the drawings comprises a shaft 46 journaled in the angle  
 75 irons 47, 48 mounted upon the main frame of the machine. Wound about the shaft 46 is a flexible cord 49, the lower end of which is connected to the bar 38. It is thus apparent that by turning the shaft 46, the rack bar 38 can be raised or lowered, thereby  
 80 raising or lowering the auxiliary frame. As a means for turning the shaft 46, I preferably arrange upon one end thereof a worm wheel 50 which is engaged by a worm 51 carried upon one end of a shaft 52, the other  
 85 end of which is provided by a hand wheel 53. By turning the hand wheel 53, it is apparent therefore that the auxiliary frame 36 can be adjusted to any desired vertical position.

The auxiliary frame has journaled in its  
 90 upper and lower ends, respectively, sprocket wheels 54, 55 with which engage the links of an endless sprocket chain 56. At suitable intervals on the sprocket chain are mounted the shovels 57, the structure of which will  
 95 hereinafter be more fully described. Arranged upon the inside of the plates 36, at some distance from the edges thereof, are opposed longitudinally extending angle plates 58, 58 forming a track, between which  
 100 the sprocket chain 56 travels. Each link of the sprocket chain has mounted on the top thereof a short plate 59 of sufficient width to project upon the opposite sides of the sprocket chain. Each succeeding plate is  
 105 overlapped by the preceding one. These plates 59 rest upon the track formed by the angle plates 58 and thus in effect produce a continuous but flexible plate which extends around the sprocket wheels 54, 55. Pivotally  
 110 mounted at suitable intervals upon the sprocket chain 56 are the shovels 57. Each shovel preferably comprises a blade 60, rising perpendicularly from the sprocket chain, and a rearwardly extending bifurcated base  
 115 61 adapted to straddle the sprocket chain 56 and, like the plates 59, to rest upon the track formed by the angle plates 58. The legs 61 are braced to the plates 60 by triangular shaped side braces 62. The parts 60, 61 and  
 120 62 are preferably formed of a single casting. At the vertex of the angle formed by the legs 61 and the plate 60, the shovel is pivoted, as at 63, to a plate 64 mounted upon the sprocket chain 56 in the same manner as the plates 59. Arranged at the rear of the blade 60 and projecting a short distance beyond the outer edge of the same is a cutting element preferably in the form of opposed  
 125 metallic strips 65 having inturned ends 66, 130

said inturned ends constituting the cutting knives. At the upper end of the said auxiliary frame, the angle plates 58, 58 are cut away or omitted for a short distance.

5 Where such plates are cut away or omitted, the bifurcations of the base 61 of the shovel are no longer supported upon the tracks and said shovel drops by gravity into the position indicated at the top of Fig. 3, thus per-  
10 mitting the shovel to pass under the scraper 67 by which the dirt or excavated material is removed from the shovel.

Hinged to the bottom of the auxiliary frame upon the opposite sides and at the  
15 rear thereof are two wings 68 which are adapted to trail at the rear of the shovels and form temporary walls for preventing the sides of the ditch from caving in. In order that said wings may be adjusted to corre-  
20 spond to different angles at which the main frame is adjusted, they are connected at their upper portions by brace rods 69 which are pivoted at their lower ends to said plates 68 and which are secured to the plates 36 by  
25 bolts which extend through slots 70 in the upper end of said brace rod 69.

The material scraped or unloaded from the shovel may be disposed of in any convenient manner. However, I preferably  
30 dump such material from the shovels on an endless conveyer 71 which passes over the wheel 72, said conveyer lying in a trough-shaped frame 74 suitably supported at its rear end upon the main frame by a brace 75.  
35 Said trough 74 at its forward end is supported upon the shaft 76 of the wheel 72, which shaft may be journaled in the plates 36, 36 of the auxiliary frame. The shaft 76 is preferably made flexible, thus allowing  
40 the rear end of the conveyer to be shifted on the cross arm 77 so that the dirt may be dropped either into the ditch or to one side thereof, as may be desired.

The manner in which the machine oper-  
45 ates may be briefly described as follows:— The auxiliary frame which carries the excavating elements may be adjusted, so that a ditch may be cut to the desired depth, by turning the wheel 53, thereby raising the bar  
50 38, and by turning the crank 45, thereby adjusting the bar 38 horizontally. The power transmitted to the driving pulley 21 is transmitted, through the gear mechanism hereinbefore described, to the driving wheels 14  
55 and the machine is thus propelled forward. Mounted upon the shaft 19 of the driving pulley 21 is a sprocket wheel 77 from which the sprocket wheel 78 is driven through the medium of the chain 79. Mounted on the  
60 same shaft with the wheel 78 is a sprocket wheel 80 from which the sprocket wheel 81 is driven through the medium of the chain 81. Therefore, as the machine is propelled forward, the sprocket wheel 81 transmits  
65 motion to the endless chain 56 upon which

the excavating elements are mounted. The shovels 57 scoop up the earth, the knives at the same time cutting or loosening the earth for the next succeeding shovel. Normally the plates 59 and 64, carried by the endless  
70 chain 56, rest upon the angle plates 58, but at the upper part of the auxiliary frame the angle plates 58 are cut away, as hereinbefore described, thereby permitting the buckets to fall back by gravity and pass be-  
75 neath the scraper 67 by which latter the earth is removed from the shovels to the endless conveyer 71. The dirt or other excavated material is carried by the endless conveyer to the rear of the machine and is  
80 finally dumped either to one side of the ditch, or, if desired, into the ditch itself.

The gear for propelling the machine and the gear for causing a travel of the excavating elements, though driven from the same  
85 source of power, may be operated independently of each other. The machine may therefore be propelled over the roads to its destination. Then the machine may be made  
90 to stand still while the digging apparatus is set in motion. When the required depth of cut is reached, the traction apparatus is set in motion at a suitable speed to cut a ditch of the required depth. It will be noted that the depth of cut can be regulated continu-  
95 ously while the machine is in motion, thus insuring a ditch of suitable grade despite inequalities of the surface of the ground over which the machine travels in cutting  
100 said ditch.

What I claim is:

1. In a ditching machine, excavating elements comprising an endless chain, means for imparting travel thereto, a series of  
105 plates mounted upon said chain, shovels pivotally mounted at intervals upon said plates, said shovels each comprising a blade and a bifurcated base extending rearwardly from the blade, and a pair of opposed excavating knives mounted upon each side of  
110 the shovel.
2. In a ditching machine, excavating mechanism comprising an auxiliary frame, two parallel tracks extending longitudinally of said auxiliary frame, an endless chain  
115 mounted to travel between said tracks, a series of overlapping plates carried by said chain and supported at their side edges upon said tracks, and shovels mounted upon said  
120 plates.
3. In a ditching machine, excavating mechanism comprising an auxiliary frame, two parallel tracks extending longitudinally around said auxiliary frame, said tracks being  
125 cut away at the rear of the upper portion of said auxiliary frame, an endless chain mounted to travel between said tracks, and shovels pivoted at intervals upon said chain, said shovels having a bifurcated base  
130 supported upon said tracks.

4. In a ditching machine, excavating mechanism comprising an auxiliary frame, two parallel tracks extending longitudinally around said auxiliary frame, an endless chain mounted to travel between said tracks, and shovels pivotally mounted at intervals upon said chain, said shovels each comprising a blade and a bifurcated base extending rearwardly from the base and supported upon said tracks.

5. In a ditching machine, excavating mechanism comprising an auxiliary frame mounted upon said main frame, said auxiliary frame comprising side plates arranged in parallel relation and suitably spaced apart, a track mounted upon the inner faces of each of said plates inwardly from the edges thereof, sprocket wheels journaled in the opposite ends of said auxiliary frame, an endless chain driven from such sprocket wheels and lying between said tracks, a series of overlapping plates of greater width than said chain carried by said chain and supported at their side edges upon said

tracks, and shovels pivotally mounted at intervals upon said plates.

6. In a ditching machine, excavating mechanism comprising an auxiliary frame mounted on said main frame, two parallel tracks mounted longitudinally of said auxiliary frame, said tracks being omitted at the rear of the upper portion of the auxiliary frame, an endless chain mounted to travel between said tracks, shovels pivoted at intervals upon said chain, said shovels each comprising a blade and a bifurcated base adapted to be supported upon said tracks, and a scraper secured to said auxiliary frame at a position thereon at which said tracks are omitted, whereby said shovels are adapted to fall back by gravity and pass immediately underneath said scraper.

In witness whereof, I hereunto subscribe my name this 27th day of June, A. D., 1910.

HENRY MATTHIES.

Witnesses:

GEORGE E. FOLK,  
MARSHALL SOLBERG.