

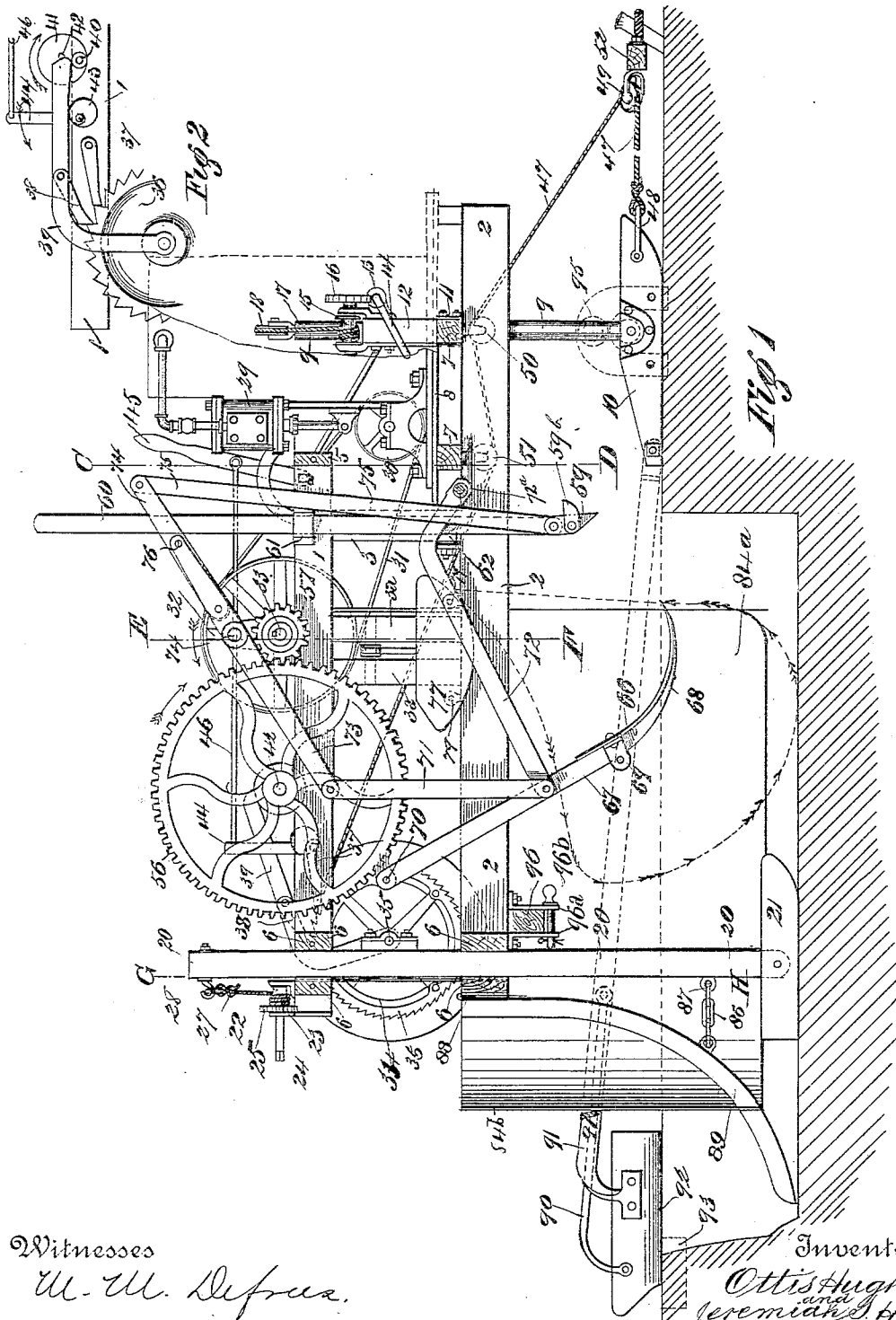
(No Model.)

3 Sheets—Sheet 1.

O. HUGHES & J. S. HULL.
DITCHING MACHINE.

No. 504,728.

Patented Sept. 12, 1893.



Witnesses

W. W. DeFries.

C. F. R. Hapenham

Inventors

Ottis Hughes
Jeremiah S. Hull

By their Attorney

Thompson & Bell

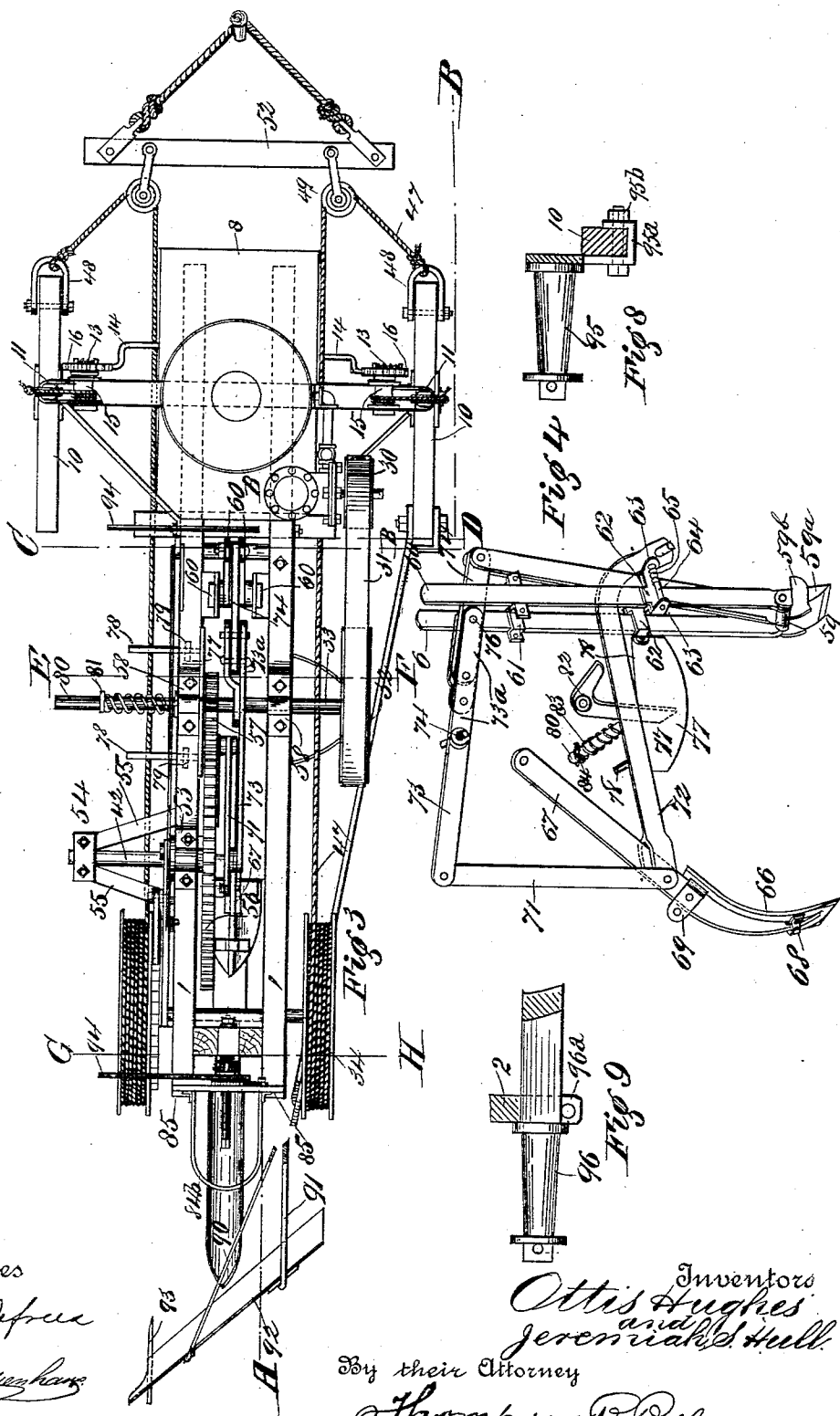
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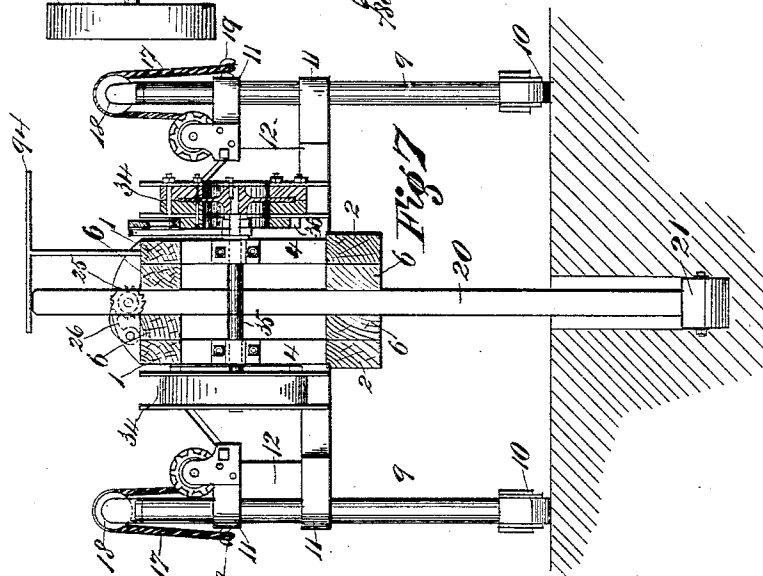
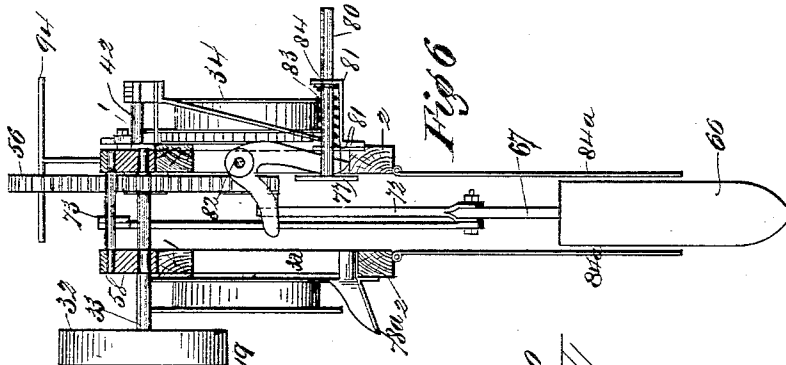
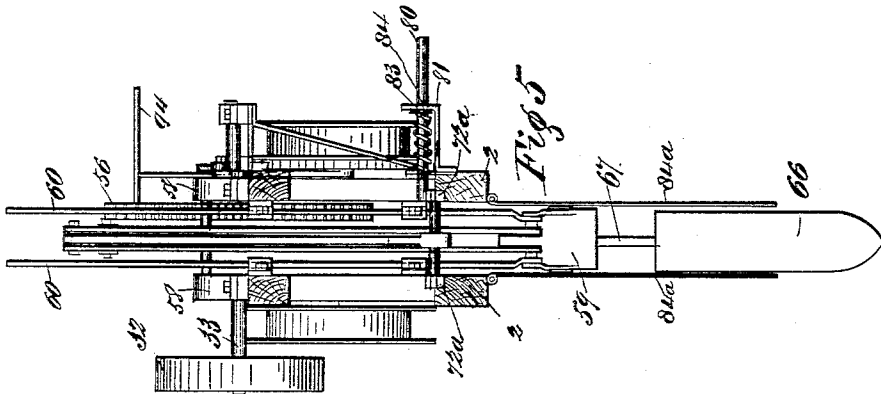
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UNITED STATES PATENT OFFICE.

OTTIS HUGHES, OF VERNON, AND JEREMIAH S. HULL, OF LOCK SPRING,
INDIANA.

DITCHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 504,728, dated September 12, 1893.

Application filed June 6, 1892. Serial No. 435,690. (No model.)

To all whom it may concern:

Be it known that we, OTTIS HUGHES, residing at Vernon, and JEREMIAH S. HULL, residing at Lock Spring, Indiana, citizens of the United States, have invented new and useful Improvements in Ditching-Machines, of which the following is a specification.

Our invention relates to certain improvements in ditching machines and its object is to provide more effective means whereby the machine will be traversed in either a direct or a curvilinear path and will be more easily controlled while in motion; also, to provide simple means whereby the digging mechanism will not be subjected to undue stress to break or distort the parts, as in the case when the digger spade should strike a hard and unyielding substance as a rock embedded in the ground.

To this end our invention consists in the improved construction and arrangement of mechanism hereinafter more fully set forth and particularly pointed out in the claims of this specification.

In the accompanying drawings illustrating our invention similar numbers of reference designate like parts throughout the several views.

Figure 1. is a sectional side elevation of our machine taken through the line A—B. See Fig. 3. Fig. 2. is a detail view of the pawl mechanism for rotating the winding drums. Fig. 3. is a plan view of the machine. Fig. 4. is a perspective view of the shovel and digging bit mechanism. Fig. 5. is a transverse sectional elevation of the machine through the lines C, D. See Figs. 1. and 3. Fig. 6. is a transverse sectional elevation through the line E, F. See Figs. 1. and 3. Fig. 7. is a transverse sectional elevation through the line G, H. See Figs. 1. and 3. Fig. 8. is a detail view of one of the forward removable axles which is removably secured to the forward runners of the machine when it is required to transport it, and Fig. 9. is a detail view of a portion of the rear removable axle.

The main frame of our machine is composed of the upper and the lower side sills 1. and 2., the front, intermediate and rear posts 3, 3^a, and 4. and the front and rear top and bottom cross or distance bars 5 and 6, all of which are firmly bolted and braced together.

On the top sides of the prolonged forward ends of the side sills 2. are secured the floor beams or joists 7. whereon the operator's platform 8. is laid and secured and which supports the motive power by which the machine is operated.

The movable supporting posts 9 of the forward portion of the frame have their bottom ends hinged to their runners 10. in any suitable manner and are loosely clamped in the guide clips 11, wherein they are free to slide vertically and in the direction of their lengths.

On the ends of the forward beam 7. are secured and firmly braced the uprights 12. to which the guide clips 11. are firmly secured.

The worms 13, having the operating cranks 14. the cable-drum 15 secured firmly to the worm wheel 16 with which said worm meshes, are journaled in suitable bearings firmly secured on the top ends of the uprights 12. by suitable securing bolts or other securing devices.

The cables 17. extend from the drums 15, pass over the pulleys 18. secured on the movable posts 9., and is secured at its end to suitable engaging hooks 19. secured on the upper guide clips 11. Thus by turning the cranks 14. the forward portion of the frame of the machine is caused to move on its supporting posts 9. to increase or decrease its distance from the ground and to adjust, and perfectly align the machine.

The rear end of the frame of the machine is supported by a single post 20. hinged at its bottom end to the runner 21. and is adapted to loosely fit and slide longitudinally in its guide ways formed by the upper and lower distance rails 6. of the main frame.

The cable drum 22. is journaled in suitable bearings 23. firmly secured on the upper rail 6. and to the ends of the longitudinal upper sills 1. and is rotated by a suitable removable crank adapted to fit the square end of the drum shaft. (not shown) 24. The cable drum 22. is held from rotating by means of the ratchet wheel 25 secured thereon and engaging with its pawl 26.

The cable 27. is secured to the drum 22. at one end and has its opposite end looped over the retaining hook 28. secured on the top end of the post 20. It is clear, that, by turning the handle of the shaft 24. to wind the cable 27. on its drum 22. the rear end of the frame

of the machine will be moved upwardly on its post 20. and by disengaging the pawl 26. to unwind the cable the frame of the machine may be lowered as required.

5 The engine 29. or other suitable motive power for driving the machine is firmly secured on the operating platform 8. at the front end of the frame and is provided with the driving pulley 30. which transmits motion
10 through the driving belt 31. to the driven pulley 32. secured on the shaft 33.

34. designates the winding drums of the traversing cables, mounted on the ends of the shaft 35. which is journaled in suitable bearings secured on the uprights 4. of the frame.

15 To one of the drums 34. is firmly secured, on the inner side thereof, the ratchet wheel 36. which is adapted to engage the retaining pawl 37. and the feed pawl 38. pivoted on the swinging lever 39. The lever 39. is pivoted
20 at one end to the shaft 35. and is bent to a right angle at a point intermediate between its pivotal point and its free or swinging end which latter is operated or raised by means
25 of the crank pin 40. secured on the disk 41 of the shaft 42. Thus as the lever 39 is raised its pawl 38 engaging with its ratchet wheel 36 rotates the winding drums 34.

To the side of the sill 1. and on the same
30 side with the swinging lever 39 is pivoted the throw-out cam or eccentric 43. to which is secured the lever 44 connected to the operating or throw-out lever 45. by the connecting-rod 46. The lever 45 is pivoted to the side sill 1.
35 and may be provided with a graduating or notched segment of any suitable kind by which the amount of the throw of the swinging lever 39. may be regulated. It will thus be clearly seen that as the lever 44 is moved
40 backward in the direction of the arrow (see Fig. 2.), the eccentric 43. will be rotated to raise the swinging lever 39 from the crank-pin 40. to reduce its swing and consequently diminish the amount of rotation of the winding drums 34. or to completely throw the lever
45 out of operation when so desired. By this means the amount of traverse of the machine is readily adjusted and regulated without stopping the machine.

50 The cables 47. are secured to the clevises 48. removably secured on the front of the runners 10. passed over the yoke pulleys 49. and the guide pulleys 50. and 51. to the winding drums 34. whereon they are wound.

55 The yokes 52. to which the pulleys 49. are secured, are firmly and securely held by a stake in the ground in advance of the machine and as the cables 47 are wound up on their winding pulleys 34., to traverse the machine the extent the cables will permit, the
60 cables are unwound from their drums and the stake reset at a distance farther in advance of the machine, either in a right line with its previous positions, or if it is desired
65 that the machine shall traverse a curvilinear path, the stake is set forward out of the direct line so as to produce the desired curva-

ture and this operation is continued as the construction of the ditch proceeds.

The shaft 42. is journaled in the bearing 53. secured on the side sill 1. and the bearing 54 secured on a suitable supporting brace 55. firmly bolted to the side of the top and bottom sills 1. and 2. Said shaft has its gear-wheel 56. mounted thereon and adapted to mesh with its driving pinion 57. secured on the shaft 33. which latter is journaled in suitable bearings 58. secured on the sills 1. of the frame.

The digging or cutting bit 59. comprises a cross knife 59^a, and cross cutters 59^b secured to the sides of the cross knife and projecting in front thereof, and is firmly secured on the ends of the parallel and vertically reciprocating guide-rods 60. with its face at an angle of advance which guide rods slide longitudinally in their guide ways or bearings 61. and 62. which are bolted to the sills 1. and 2. The lower guide 62. has the lugs 63. formed thereon and adapted to overlap the edges of the intermediate uprights 3^a. with a liberal allowance of play between said lugs and uprights, and are loosely secured by the pins 64. passing through said lugs and uprights, thus retaining said bearings in a fixed position vertically but permitting a backward or receding movement horizontally and in a direction transversely with the motion of the guide rods 60.

Encircling the retaining pin 64 intermediate between the forward lugs 63. and the front edge of the uprights 3 are the coiled springs 65. or other suitable resilient material, as rubber, is intervened which are provided for the purpose of permitting the bearing 62. to yield or recede to relieve the digging bit 59 from undue or excessive stress when it contacts with an impenetrable material.

The shovel 66., for raising the earth loosened or broken by the digging bit 59., is slightly concaved transversely on its upper surface and is also curved longitudinally, and is securely mounted on the swinging end of the shovel-bar 67. by means of suitable securing clips 68. and 69. which are firmly secured to said shovel blade and handle or bar. The shovel-bar 67. is pivoted at its top end to the crank pin 70 which is secured on a lug formed integral on or secured to the gear-wheel 56.

To the shovel-bar 67, intermediate between the shovel and the crank end thereof, is pivoted the connecting-rod 71. and the radius rod 72. which latter rod is pivoted at its front end in suitable bearings 72^a. secured to the side sills 2. See Fig. 5.

The oscillating lever 73. has its trunnions 74. journaled in suitable bearings formed in the top boxes 58. and has its rear arm formed of one rigid piece and its opposite forward arm 73^a forked or bifurcated to receive the arm 74^a. wherein the latter is pivoted and is held in position therein and in alignment with the rigid arm 73. by the set pin 76 which is preferably of a baser material than that of

the lever and may be made of wood of suitable strength, and will be hereinafter more particularly referred to.

To the ends of the arms 73. and 73^a are pivoted the top ends of the connecting-rods 71 and 75. the opposite end of the latter rod being pivoted to the digging bit 59. intermediate between its guide-rods 60. thus completing the connections between the driving gear, shovel and digging bit to cause the latter to descend as the former ascends.

The pin 76. is preferably of wood or other yielding material for the purpose of permitting it to be shorn off when undue stress is applied to the end of the lever 73^a as would be the case when the digging bit would meet with an obstruction which would, were there no provision of this kind made, break the parts of the mechanism and thereby be a source of expense in repairs.

The shovel cleaner or earth ejector 77. has its bottom edge curved to conform with the longitudinal curve of the shovel 66. and is provided with the guide bars 78 adapted to slide in the guides 79 and the intermediate guide-bar 80. which slides longitudinally in the guides 81. secured on the main frame. By the latter guides the scraper or cleaner 77. is maintained in its vertical position throughout its motion across the face of the shovel 66.

The bell-crank lever 82. is pivoted to the intermediate upright 3^a. of the main frame and has its longer depending arm projecting down through a slot formed in the intermediate guide bar 80 of the shovel cleaner (see Fig. 6.) and its shorter horizontal arm extending transversely across the path of motion of the swing lever 72. with which it contacts, at a time when the shovel 66. has almost completed its ascent to cause said shovel cleaner 77 to move across the face of said shovel to remove the earth therefrom to the discharge chute 78^a and to the ground. The scraper or shovel cleaner 77. is moved backwardly to its normal position by means of the returning spring 83. surrounding the guide bar 80. and contacting with the retaining collar 84.

Hinged on the bottom sides of the sills 2. and on each side of the shovel 66. are the earth fenders 84^d. which extend downwardly into the ditch and form a shield or fender for retaining the earth on the shovel 66. in its ascent to the chute 78^a, and also retain the earth and prevent it from returning into the ditch. The rear fender 84^b which is removably secured on the rear ends of the sills 2. by the ways 85. at its top end, and secured at its bottom end by a suitable retaining hook and chain 86. engaging an eye 87. secured on the rear bottom edge of the post 20. said fender provided for the purpose of preventing the falling earth from filling on the tiles before they are adjusted in place and as they are fed into the ditch.

Suspended on the cross-bar 88. of the fender 84^b is the feed spout 89. which is provided for the purpose of conducting the tiles

to the bed of the ditch and adjusting them therein during the movement of the machine in a forward direction. See Fig. 1.

The molding plow 92. is provided for the purpose of returning the earth into the ditch made by the machine as the tiles are placed therein, and is provided with the draft braces 90, and 91. which are pivotally secured, at their forward ends by a bolt or other suitable pivotal device, to the rear end of the forward runner 10. The molding plow is also provided with a runner 93 secured edgewise thereto, which projects into the earth, and serves to prevent the vibration or springing of the molding plow while returning the earth into the ditch.

In order that the machine may be guided in a direct straight line we provide the T-sights 94. removably secured on the top edges of the side sills 1. thereby setting the ends of the T's in alignment with a fixed point or post and thereby maintaining the path of the machine in a direct straight line.

Any required degree of grade or fall of the ditch is readily obtained by adjusting the inclination of the machine, the T's 94. of which are sighted to align with an ordinary survey stake secured in the ground to the rear of the machine, by means of the worm screw gearing secured on the ends of the uprights 12. and by which the machine is raised or lowered on its forward end on its supporting posts 9.

When it is required to transport the machine from place to place we provide the forward carrying axles 95. removably secured on the forward runners 10. of the machine by means of the looped ends 95^a of the arch bar of the axle 95 wherein the said runners are held by the bolts 95^b. or other suitable securing device; and the rear removable axle 96. removably secured on the bottom edges of the sills 2. at the rear of the frame by the axle jaws 96^a. and the removable pin 96^b. On these axles are mounted suitable carrying wheels whereby the machine is transported from place to place by suitable horse-power.

Having thus fully described the nature and operation of our invention, what we claim as new and useful, and desire to cover by Letters Patent of the United States therefor, is—

1. In a ditching machine, the combination with a vertically adjustable frame, a gear-wheel mounted in said frame and having a suitable crank formed thereon, of a shovel bar pivoted on said crank, a radius bar pivoted on said shovel beam intermediate between the ends thereof and to the main frame, a vertically moving digging bit, an oscillating lever connecting said shovel and digging bit and means for rotating said gear-wheel, substantially as set forth.

2. In a ditching machine, the combination with the shovel and the vertically moving digging bit thereof arranged and connected on a movable frame as described, of an oscillating beam having one of its ends bifurcated and a

lever pivoted in said bifurcation, a set-pin of a baser material than that of the lever passing through said bifurcations of said oscillating lever and pivotal lever, substantially as set forth.

3. In a ditching machine, the combination with the vertically adjustable and portable frame thereof, of a gear-crank wheel mounted in said frame, a shovel-beam pivoted on the crank of said gear-wheel, a digging bit rigidly secured on vertically moving side rods, guide-ways wherein said rods move, an oscillating lever having a bifurcated arm, a lever pivoted in said bifurcated end of lever, and a set-pin of a baser material than the lever passing through said bifurcations of the oscillating lever and said pivotal lever intermediate between the ends thereof, suitable rods pivoted to said shovel digging bit, and oscillating lever and means for imparting motion thereto, substantially, as and for the purpose set forth.

4. In a digging machine, the combination with a vertically adjustable and portable frame, of a gear crank-wheel mounted on said frame, a shovel beam pivoted on said crank having a concave shovel mounted on its lower swinging end, a shovel cleaner adapted to move across the face of said shovel, a digging-bit secured on vertically moving side rods, upper rigid and lower horizontally yielding guide-ways wherein said guide rods slide vertically, an oscillating lever having a yielding arm, suitable rods connecting said oscillating lever, digging-bit and shovel, and means for operating the same, substantially as set forth.

5. In a ditching machine the combination with a vertically moving digging bit having parallel side sliding rods, to which said digging bit is loosely connected guides wherein said rods slide longitudinally, an oscillating lever and suitable means for connecting, and imparting motion to said oscillating lever and digging bit, substantially as set forth.

6. In a ditching machine the combination with a vertically moving digging bit having parallel vertically-sliding side rods secured thereto, guides wherein said rods slide longitudinally, an oscillating lever having a fixed and a bifurcated arm, a lever pivoted in said bifurcations, a set pin passing through said bifurcation and pivotal lever, and suitable means for driving and a frame for supporting the mechanism, substantially as set forth.

7. In a ditching machine, the combination with a vertically moving digging bit comprising a cross knife, cross cutter secured on and projecting in front of said knife, and parallel vertically sliding side rods to which said bit is secured with its face at an angle of advance, substantially as set forth.

8. In a ditching machine the combination with a vertically moving digging bit comprising a cross knife, side cutters projecting in front of the face of and secured on the sides of said cross knife, parallel side rods rigidly secured on said bit, upper rigid and lower yielding guide ways wherein said guide

rods slide, substantially as and for the purpose set forth.

9. In a ditching machine the combination with a vertically moving digging bit, and its side rods of an upper fixed and a lower yielding guide way wherein said rods slide substantially as and for the purpose set forth.

10. In a digging machine the combination with a vertically moving digging knife, having vertically projecting side rods, yielding receding guide-ways wherein said rods slide longitudinally, substantially as set forth.

11. In a digging machine the combination with a vertically moving digging knife, having vertically projecting guide rods, horizontally yielding guide-ways secured on the frame of the machine, an oscillating lever having a bifurcated arm, a lever-arm pivoted in said bifurcations, a pin of a baser material passing through said bifurcations and pivotal lever, a rod pivoted to said pivotal lever and digging bit, and suitable means for operating said lever and digging bit, substantially as set forth.

12. In a ditching machine the combination with a portable frame and a winding drum mounted on said frame, a rocking pawl lever and its operating crank disk, of a rocking lever throw-out cam pivoted on said frame and whereby the fall of the said rocking lever is adjusted, substantially as set forth.

13. In a ditching machine the combination with a vertically adjustable frame mounted on runners, winding drums mounted on the sides of said frame, of an equalizing beam secured to the ground at a point in advance of the machine, return pulleys secured on the ends of said beam, and suitable cables extending from said winding drums round said return pulleys, and to said runners, substantially as set forth.

14. In a ditching machine the combination of a portable frame, the vertically moving shovel, the shields hinged on the frame on each side of the shovel, a rear shield secured on the end of the frame and to the rear of said shovel, and a tile conducting spout suspended to said rear shield, substantially as and for the purpose set forth.

15. In a ditching machine, the combination of a portable frame, a wheel mounted to revolve thereon, means for driving the wheel, a shovel bar pivoted on said wheel, and a radius rod pivotally connected to said bar and to the frame, a winding drum, and an operative connection between said winding drum and the shaft of said wheel, substantially as described.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

OTTIS HUGHES.
JEREMIAH S. HULL.

Witnesses:

ULYSSES B. HILL,
MATHIAS DITLINGER.