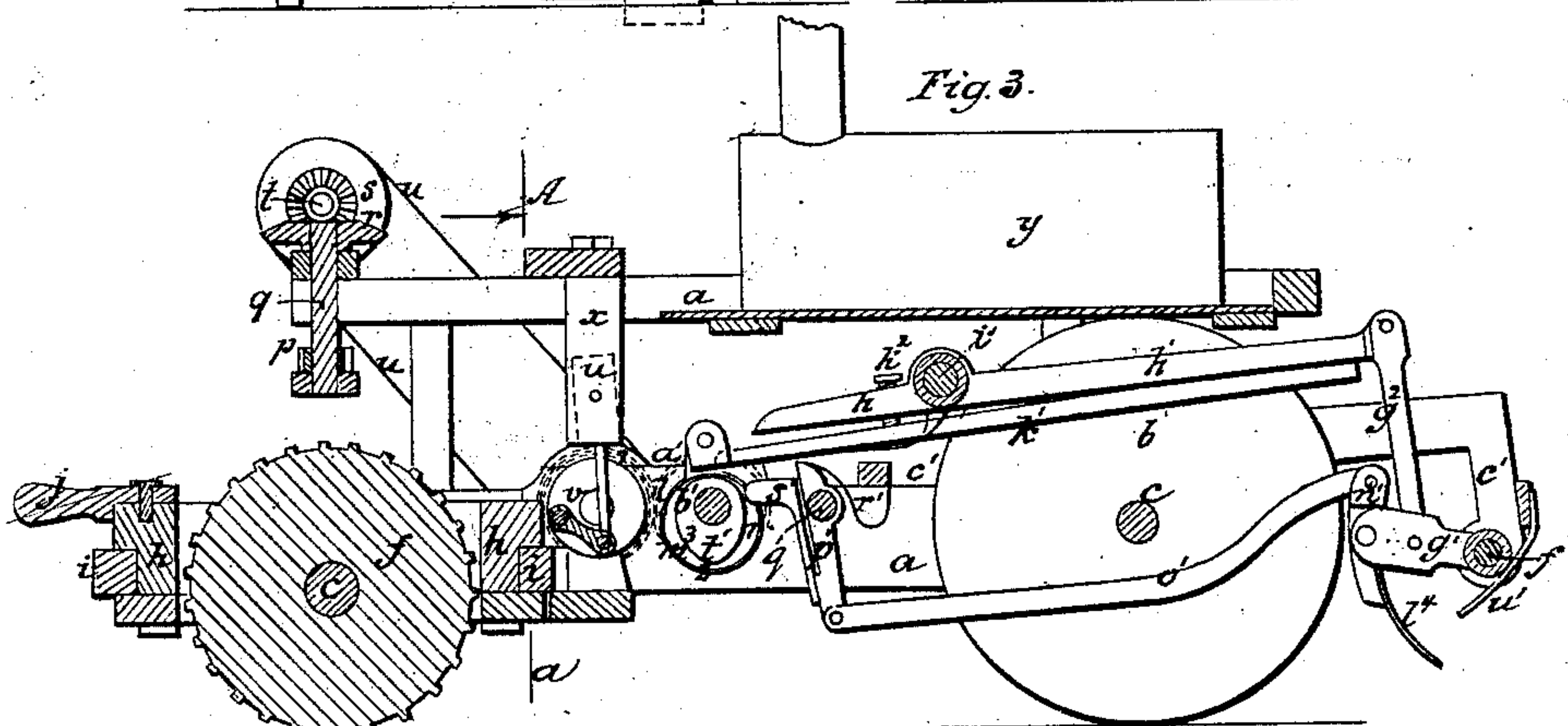


Steam Plow.

Patented Oct. 20, 1857.



Inventor,
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UNITED STATES PATENT OFFICE.

WM. E. WARD, OF PORT CHESTER, NEW YORK.

IMPROVEMENT IN MACHINES FOR SPADING LAND.

Specification forming part of Letters Patent No. 18,479, dated October 20, 1857.

To all whom it may concern:

Be it known that I, WILLIAM E. WARD, of Port Chester, Westchester county, and State of New York, have invented a new and Improved Machine for Spading Land by Locomotive-Power, whether steam or other motor; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a side elevation; Fig. 2, an elevation of the rear end; Fig. 3, a longitudinal vertical section, and Fig. 4 a cross-section taken at the line A *a* of Fig. 3.

The same letters indicate like parts in all the figures.

The object of my invention is to spade land by spades operated by locomotive-power as the machine progresses in the field; and to thoroughly break up, disintegrate, and turn over the sward more effectually than can be done by plows.

In my said invention the entire machine is propelled in the field in any direction required and turned at the will of the attendant, and the same power which does this operates a series of spades, which enter the land each in succession, cut into it in the arc of a circle, and, after cutting down to the required depth, suddenly throw up the cut slice against a shield-plate, so as to reverse it and at the same time break it up, so that when it falls down it will be thoroughly disintegrated, the forward movement of the machine determining the thickness of the slices to be cut by the spades.

In the accompanying drawings, *a* represents a frame adapted to the purpose, and *b b* two running or sustaining wheels, which turn freely on an axle, *c*, in the rear part of the frame. The axle *c* extends through and is so mounted in the frame that it may be rotated by a crank-handle, *d*, at one end, and the said axle carries on each end a cam, *e*, for the purpose of elevating the spades above the surface of the land when the machine is required to be moved from place to place, and to regulate the depth to which the spades shall cut.

The forward end of the machine is sustained on a broad driving-wheel, *f*, the face of which is provided with spurs to take hold of the land to draw the machine forward at the required speed. This wheel is secured firmly to its

shaft, *g*, which has its bearings in a horizontal ring, *h*, fitted to turn in another ring, *i*, of the frame, so that the ring *h* may be turned to put the plane of the driving-wheel at any desired angle to determine the line of motion of the machine. The ring *h* has a flange above and below to embrace the ring *i* of the frame, the latter of which flanges is secured to the under part of the ring *h*, and the upper flange is provided with a handle, *j*, by which it can be turned when it is desired to change the line of travel of the machine; but, if desired, this flange may be cogged so as to admit of turning the ring by a pinion with a crank-handle, or the ring can be turned in any other suitable manner. The middle of the thickness of the driving-wheel is in the plane of the axis of the ring *h*, and on one face of this wheel there is a beveled cog-wheel, *k*, which is engaged by a pinion, *l*, on a vertical shaft, *m*, (shown by dotted lines in Fig. 1,) mounted in a bracket-piece, *n*, attached to the ring *h*, so as to turn therewith; and on the upper end of the shaft *m* there is a cog-wheel, *o*, deriving motion from a pinion, *p*, (see Fig. 3,) on another vertical shaft, *q*, mounted in the main frame, and having its axis in the line of the axis of the ring *h*, so that the cog-wheel *o* will always be in gear with the pinion *p* however the ring *h* may be turned to guide the machine. The shaft *q* derives motion by a bevel-wheel and pinion, *r s*, from a horizontal shaft, *t*, mounted in the main frame, and this shaft in turn receives motion by a belt, *u*, from the main driving-shaft, *v*, which is provided with two cranks at right angles, and operated by two oscillating steam-engines, *w w*, mounted between the standards *x x x* of the frame, which are hollow to form steam-exhaust pipes, the steam being supplied to the steam-pipes from the boiler *y* in any suitable manner; but, instead of oscillating engines, steam-engines of any other suitable construction, or any other motor, may be employed.

From the foregoing it will be seen that when the main shaft is rotated by the steam engine or engines, or other motor, motion will be imparted to the driving-wheel by the train of wheels above described, and that the relative motions of the main shaft and the driving-wheel will depend upon the proportions of the intermediate gearing, which proportions may be varied at the discretion of the constructor.

The motion of the driving-wheel must be such, however, that it will impel the machine at a velocity suited to the action of the spades, to be presently described, and so that they will cut the required thickness of slice. I wish it to be understood, however, that I do not limit myself to the special arrangement above described for imparting motion to the driving-wheel, as other and equivalent arrangements may be substituted.

On the main driving-shaft there is a spur-wheel, z , which engages a corresponding spur-wheel, a' , on a cam-shaft, b' , which said shaft is parallel with the main driving-shaft, and all the motions for operating the spades are derived from cams and eccentrics on this shaft. An auxiliary frame, c' , composed of two side and one end pieces at the rear end, sustains the spades and their appendages, and the forward ends of the side pieces of this frame are hung on the ends of the cam-shaft b' , where the ends project outside of the main frame, so that this auxiliary frame can vibrate on the cam-shaft as an axis, the side pieces being provided with projecting pins d' , which rest on the periphery of the cams e on the ends of the axle c of the running-wheels b , before described, so that by turning this axle with its cams the rear end of the auxiliary frame c' , with the spades, can be elevated or depressed at pleasure, either to determine the depth to which the spades shall cut or to make them clear the surface of the land when moving the machine to any place desired.

At the rear end of the auxiliary frame c' there is a rod, f' , which passes through the eye of and forms an axle for a series of vibrating arms, g' , equal in number to the required number of spades—in this instance five. This series of arms is connected by joint-links g^2 with the rear end of a corresponding series of levers, h' , which vibrate on a fulcrum-rod, i' , attached to standards $j'j'$ on the sides of the auxiliary frame c' .

Each of the levers h' is provided with a spring-bar, k' , attached at the rear end to the under surface of the lever and extending forward beyond the forward end, where it is linked to the strap l' of an eccentric, m' , on the cam-shaft, so that the rotation of the series of eccentrics will vibrate the series of levers and the arms g' linked to them, as above described. Forward of the fulcrum each lever is provided with a set-screw, k^2 , the end of which bears on the top of the spring-bar k' for the purpose of adjustment, and, as the bar is only attached to the lever at the rear end and rests against the end of the set-screw, the whole of its length from the point of attachment to the set-screw and from the set-screw to the point of attachment with the strap of the eccentric will act as a spring to yield and prevent breaking whenever the spade, which is operated by this arrangement, as will be seen hereinafter, meets with some impediment. The position of the set-screw may be changed, and, if desired,

more than one such screw may be used on each lever.

The spades l^4 are attached each to the lower end of a short lever, n' , connected by a fulcrum-pin to the inner end of one of the series of arms g' , there being one spade and one such lever for each arm g' ; and the upper end of the levers n' are connected by connecting-rods o' with the lower end of an equal number of levers, p' , which I term the "tripping-levers," the said levers being hung on a fulcrum-rod, q' , passing through the whole of them and attached to the main frame. The upper end of these tripping-levers is forced forward by a series of springs, r' , for the purpose of drawing back the spades as soon as they are liberated. These tripping-levers, like the levers h' before described, are made in two parts, attached together at the lower end, that the forward part, s' , which is acted upon by cams, may have a springing action in case there should be any impediment to the motion of the spades, and thereby prevent breaking. The spring part s' of these levers is bent forward at the upper end, and is acted upon by a series of cams, t' , on the cam-shaft, for the purpose of throwing up or tripping the spades after they have been forced in to make the required cut in the earth.

The form of the cams and their relation to the eccentrics, as represented in Fig. 3, are such that the eccentrics in rising force down the spades, which, by reason of being hung to the vibrating arms g' , enter the ground in the arc of a circle of which the distance from the cutting-edge to the center of the rod f' is the radius, and so soon as the spades have reached the extent of their downward motion, which occurs as the eccentrics reach the upper dead-point, the part of the cams from 1 to 2 (see Fig. 3) acts on the tripping-levers p' and forces them back, the effect of which is to give the spades a sudden tilting motion backward and upward, vibrating on the axis of the levers n' , and as the cams rotate from the point 2 to 3 (see Fig. 3) they recede to permit the spades to be vibrated forward by the tension of the springs r' , which takes place by the time the eccentrics have elevated the spades preparatory to another operation. The object of the tripping or tilting of the spades by a sudden motion is to throw up and turn the earth over, and at the same time to disintegrate it, which operation is greatly aided by a shield-plate, u' , attached to the cross-piece of the auxiliary frame c' , the said plate extending downward and being curved forward, so as to extend over the spades as they are tilted or thrown back, and in consequence the slice of earth cut by each spade is thrown up against the face of this shield-plate in such manner that what was the lower end of the slice is carried up higher than what was the upper end, and as it is thus turned over and thrown up against the shield-plate the spade returns, and the slice, being no longer sustained by the spade,

falls to the place from whence it was cut, but upside down, and in falling breaks up, the process of disintegration having been commenced by the action of the spade in cutting and throwing it up against the plate. The spades are curved in the segment of a circle of which the arm g' is about the radius; and as the spade projects from the lower end of the lever n' , the cutting-edge describes the arc of a circle of greater radius than the curve of the face of the spade, so that the said curved surface of the spade clears the face of the ground from which the slice is cut and during the cutting action. This is necessary on account of the constant forward motion of the machine; for it will be seen that if the spade was of the same curvature as the line of cut the forward motion of the machine would force the face of the spade against the solid earth and strain the machine. All the spades have the same motion; but instead of moving simultaneous the cams and eccentrics are so arranged as to operate them in succession. The number of spades and their length and breadth can be varied at the pleasure of the constructor.

Instead of a cam by the side of each eccentric for giving the tilting or tripping motion to each spade, the same thing may be effected by other and equivalent means—as, for instance, by a projecting lug on the eccentric-strap and acting on the spring part of the tripping-lever.

Having thus described the mode of construction which I have planned for the application of my invention, I do not wish to be under-

stood as limiting my claim of invention to such mode of application, as other and equivalent modes of construction may be substituted; nor do I wish to be understood as limiting myself to the use of the several parts of my invention, as some of them may be used in connection with substitutes for the others.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The mode of operation of the mechanism, substantially as herein described, for imparting the cutting action to the spades, as set forth.

2. The mechanism for tilting the spades, substantially as described, in combination with the mechanism for giving the cutting action to the said spades, substantially as described.

3. In combination with the spades, operated substantially as described, the shield-plate, substantially as described, for aiding in disintegrating and reversing the slices as they are thrown up by the spade, as set forth.

4. In combination with the spades, operated substantially as described, the yielding or springing part of the levers for imparting the digging or cutting action to the spades, and the yielding or springing part of the tilting levers, as set forth, and for the purpose of preventing the mechanism from being broken when the spades meet with any obstruction, such as stones.

WM. E. WARD.

Witnesses:

WM. H. BISHOP,
JNO. M. CARR.