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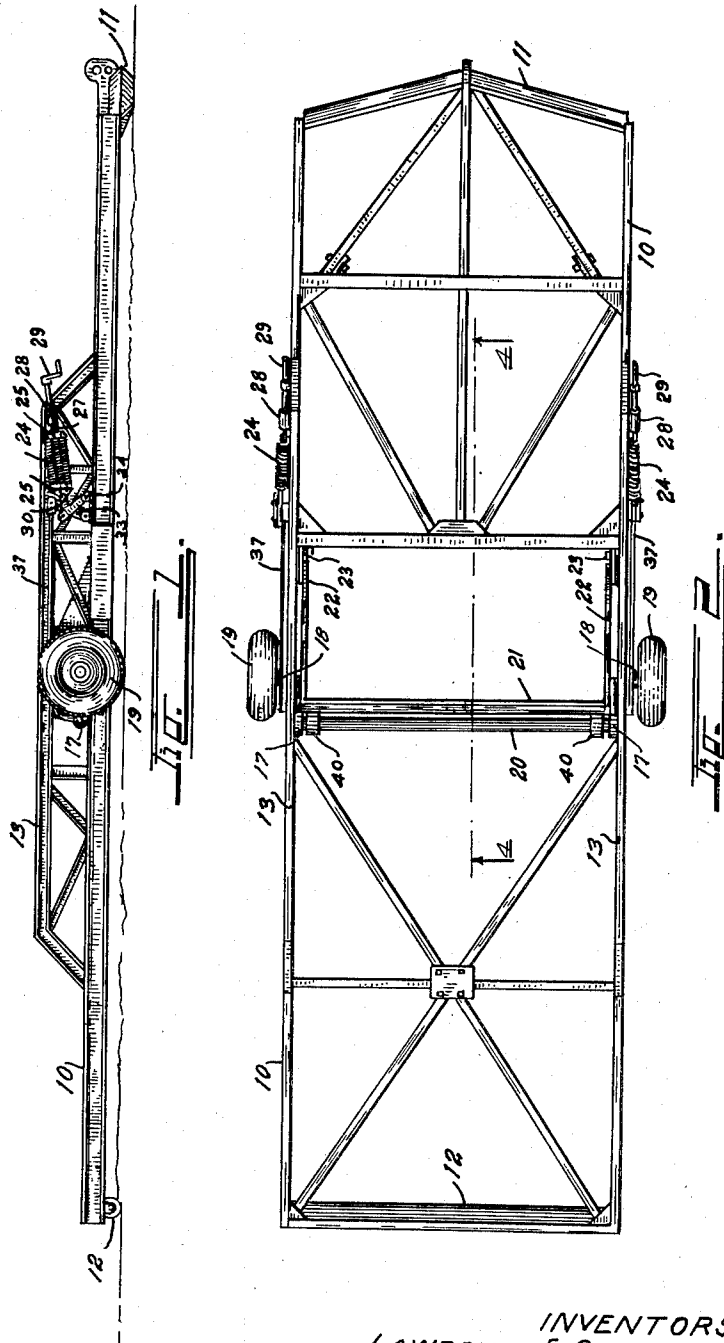
L. E. SHUMAKER ET AL

2,459,591

LAND LEVELING MACHINE

Filed Feb. 14, 1947

3 Sheets-Sheet 1



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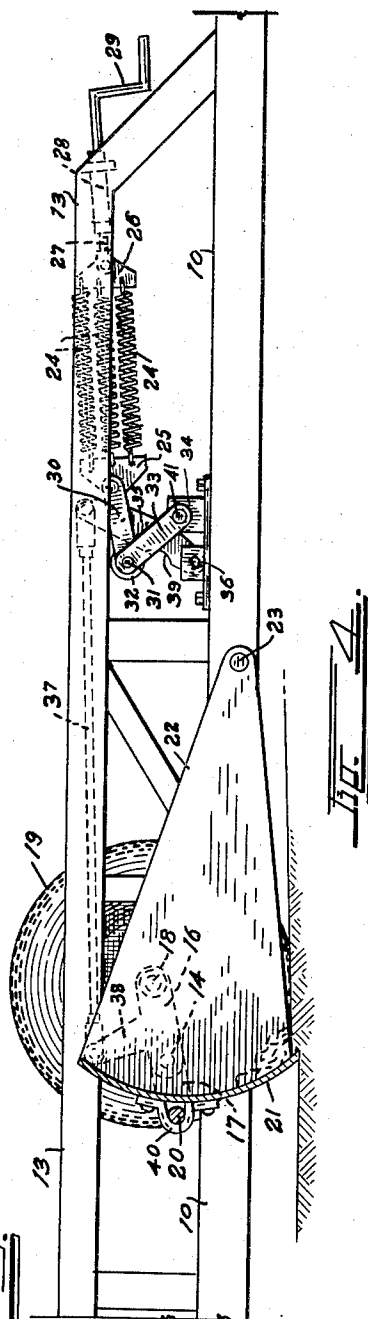
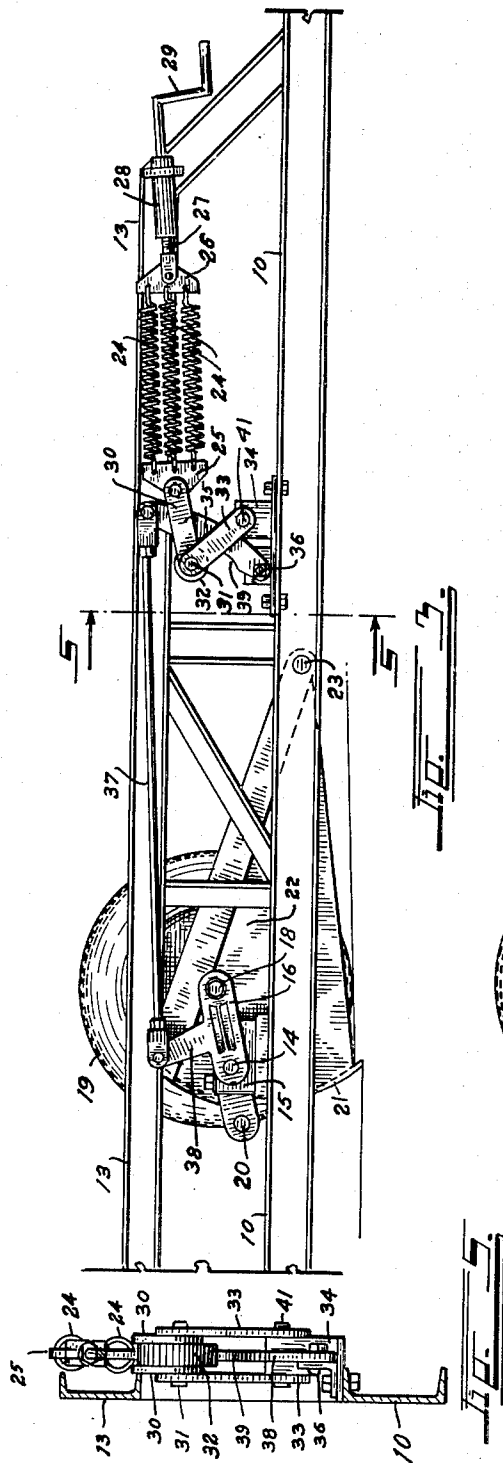
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3 Sheets-Sheet 2



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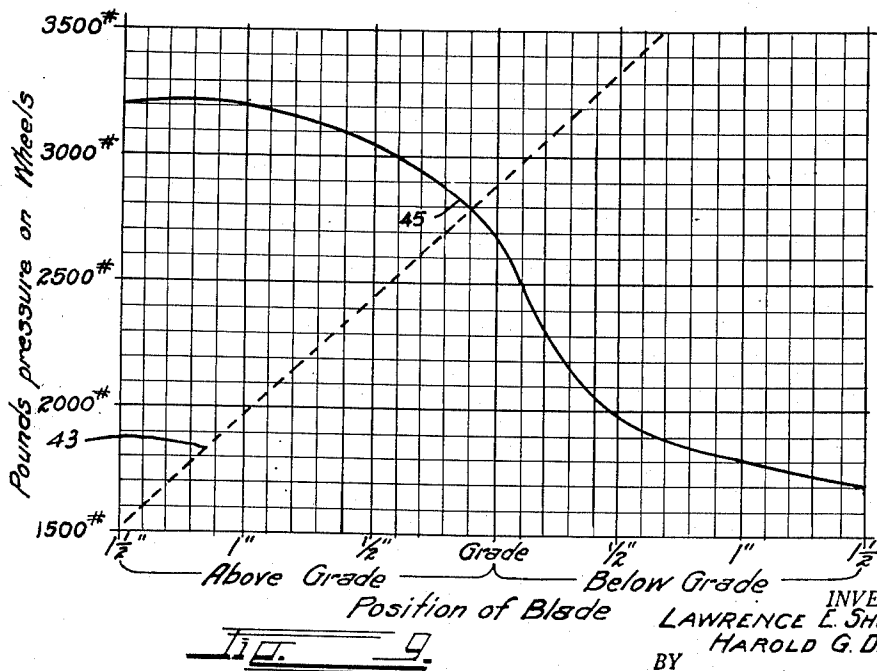
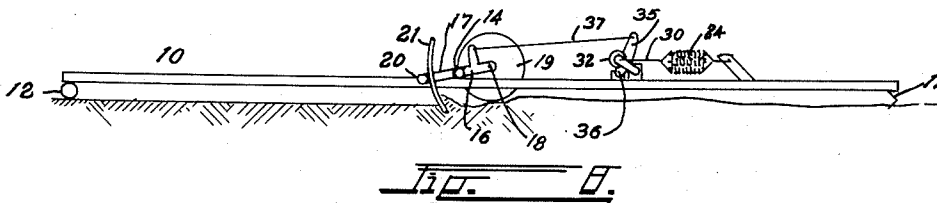
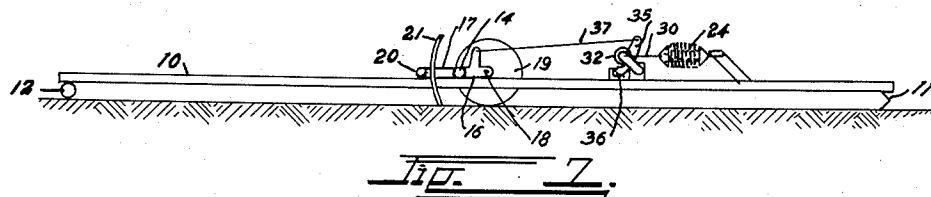
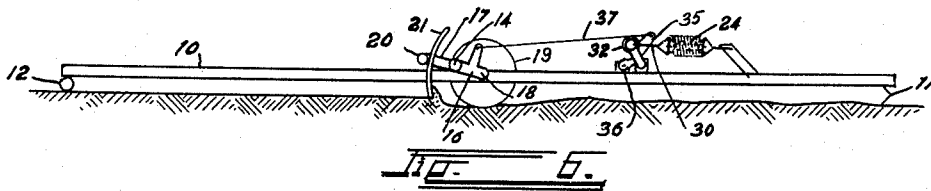
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LAND LEVELING MACHINE

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,459,591

LAND LEVELING MACHINE

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4 Claims. (Cl. 37-146)

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This invention relates to a land leveling device, and more particularly to the type of device illustrated in United States Letters Patent No. 2,277,889.

Briefly, such devices consist of a relatively long frame which rests upon the ground at its front and rear extremities. The frame carries a lever at each side pivoted intermediate its extremities. Wheels are mounted on the forward extremities of the lever and a scraper blade extends between the rear extremities thereof. The wheels follow the contour of the ground as the frame is drawn therealong. Should the wheels descend into a depression, they will raise the scraper blade to deposit earth in the depression. Should the wheels ride upon a high point in the ground, they will depress the scraper blade to cut away the high point.

In prior devices of this character springs have been employed to pull the wheels into engagement with the ground. Such devices have not been satisfactory, due to the fact that when the wheels are in a depression and require the greatest service from the springs, the latter are in their shortened position so as to give the least pulling power. Also with present spring locations, as shown in the said prior patent, the wheels will be forced against the ground under the extreme action of the springs when they are being forced upwardly by a high place in the surface. At this particular time it is desirable to have the least spring action so that the greatest pressure will be on the blade and not on the wheels.

The principal object of this invention is to provide means for controlling the reaction of the springs so that the greatest effort will be exerted when the wheels have descended into a depression, and the least action will be exerted when the wheels elevate over a rise.

Other objects and advantages reside in the detail construction of the invention, which is designed for simplicity, economy and efficiency. These will become more apparent from the following description.

In the following detailed description of the invention, reference is had to the accompanying drawing which forms a part hereof. Like numerals refer to like parts in all views of the drawing and throughout the description.

In the drawings:

Fig. 1 is a side elevation of a land leveling machine with the invention applied thereto;

Fig. 2 is a plan view thereof;

Fig. 3 is an enlarged, fragmentary side eleva-

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tion of the mid-portion of the device with the rear wheel removed;

Fig. 4 is a fragmentary, enlarged longitudinal section, taken on the line 4-4, Fig. 2;

Fig. 5 is a still further enlarged detail section taken on the line 5-5, Fig. 3;

Figs. 6, 7, and 8 are diagrammatic views, illustrating the action of the device at various periods of its operation; and

Fig. 9 is a graph showing diagrammatically the reaction of the springs in the improved land leveling device.

The leveler comprises a flat horizontal frame 10 supported at its forward extremity on a V-shaped drag 11 and at its rearward extremity on a ground roller 12. The entire weight of the frame 10 is supported upon the drag 11 and the roller 12. A stiffening frame 13 projects upwardly from each side member of the frame 10 to prevent the latter from bowing downward at its middle.

A lever shaft 14 is mounted in a journal box 15 on each side member of the frame 10. Each lever shaft is provided at its outer extremity with a forwardly extending wheel lever 16, and at its inner extremity with a rearwardly extending scraper blade lever 17. The wheel levers 16 are provided with axle studs 18 upon which ground-engaging wheels 19 are mounted. A scraper bar 20 extends between the rear extremities of the blade levers 17, and a horizontal, arcuate scraper blade 21 is suspended from the scraper bar 20 in any desired manner such as by means of attachment clips 40.

The scraper blade 21 is provided with suitable side plates 22 forming levers which extend forwardly to hinge pins 23 on the side members of the frame 10. As the bar 20 raises and lowers, the blade 21 and its plates 22 will be raised and lowered, swinging about the pins 23 as pivots.

It can be readily seen that, as the wheels 19 descend into a depression, that is, to a level below the grade between the drag 11 and the roller 12, they will simultaneously swing the wheel levers 16 downwardly and the blade levers 17 upwardly so as to lift the scraper blade 21. Should the wheels ride onto an elevation above the grade of the drag 11 and the roller 12, they will lift the wheel levers 16 and simultaneously depress the blade levers 17 to cause the blade to cut into the earth, as shown in Fig. 4.

As thus far described, the device is very similar to that shown in United States Patent No. 2,277,889. Some means must be provided, however, for resiliently holding the wheels against

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the ground so that they will accurately follow the contour thereof. This is accomplished by means of two sets of helical tension springs 24, one set being positioned at each side of the frame 10.

Each of the sets of springs is tensioned between two spring plates 25 and 26. The plates 26 are mounted on the extremities of threaded shafts 27 which extend into elongated nuts 28, each of which can be rotated by means of a crank 29 to place any desired tension in the springs 24.

Each plate 25 is secured by means of a pair of links 30 to a roller shaft 31.

Each roller shaft 31 carries a roller 32 and each is mounted between the extremities of a pair of swinging levers 33. Each pair of swinging levers 33 is pivoted on a block 34 on each side member of the frame 10. A cam lever 35 extends from a pivot 36 on each side member of the frame 10 upwardly between the pairs of levers 33 and links 30. Each roller 32 rides on the forward face of one of the cam levers 35.

The upper extremity of each cam lever is connected by means of a draw bar 37 with a spring lever 38. Each of the spring levers is formed on and extends upwardly from one of the wheel levers 16.

It can be seen that the tension of the springs 24 causes the rollers 32 to act against the cam levers 35, tending to swing the latter forwardly. The forward movement of the cam levers 35 is communicated to the wheel levers 16 to tend to urge the wheels 19 downwardly and the scraper blade 21 upwardly.

If the springs 24 were connected directly to the spring levers 38, they would increase in length and in pulling power in direct proportion to the height of the wheels 19. This is not desirable. In fact, it is desired to have less spring tension when the wheels are elevated than when the wheels are lowered so as to transfer greater downward pressure to the blade when it is required to do its maximum work.

The desired result is accomplished by the coaction of the levers 33, the cam levers 35, and the rollers 32 and the contour of the roller face of the cam levers 35.

It can be readily seen that, when the wheels are at their lowermost position, the rollers 32 will be at their uppermost position on the cam levers 35, thereby exerting the full force of the springs on the draw bars 37. On the other hand, when the wheels 19 are raised, the rollers 32 will move to a lower position on the cam levers 35 so as to approach the axis pivots 36 of the latter and exert a lesser pull upon the draw bars 37, due to the extended leverage of the cam levers 35.

The pull of the springs at the lowermost elevation of the blade is still further decreased by forming depressions 39 in the faces of the cam levers 35 adjacent the hinge pivots 36. When the wheels approach the level or grade position of Fig. 7, the rollers 32 will enter the depressions 39 to reduce the proportionate stretch of the springs and more rapidly relieve the spring load on the wheels and increase the digging effect on the blade.

In Figs. 6, 7, and 8 the above-described action is illustrated diagrammatically and the resultant wheel pressure is indicated on the graph of Fig. 9 by the pressure curve 45.

In Fig. 6 the wheels have dropped into a depression, allowing the rollers 32 to approach to almost direct alignment with the draw bars 37.

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In the actual machine, with the wheels $1\frac{1}{2}$ " below grade the springs are usually adjusted by means of the cranks 29 to place a pressure of approximately 3200 pounds on the wheels as indicated by the curve 45 of Fig. 9.

In Fig. 7 the wheels are shown on grade, that is on a level with roller 12 and the drag 11. This swings the spring levers 38 and without this improvement would increase the stretch in the springs to create a greater pressure on the wheels than in Fig. 6. The action of the levers 33 and 35 is such, however, that the rollers have moved downward toward the pivot pins 36 so that in this position, in actual practice, a pressure of only 2700 pounds is exerted on the wheels.

In Fig. 8 the wheels are shown upon a hump or raise in the ground. This swings the cam levers 35 rearwardly so that the rollers closely approach the axis pins 36 and enter the depressions 39. Although this stretches the springs still further the pressure on the wheels is reduced by the shortened leverage and the depressed cam face so that with a rise of $1\frac{1}{2}$ " the wheel pressure will be reduced to approximately 1750 pounds as shown by the curve 45 of Fig. 9.

The normal action of the springs is indicated on the chart of Fig. 9 by the broken line curve 43 and the converted reaction thereof with the use of this invention is indicated by the solid wheel pressure curve 45. It will be noted that reaction curve 45 is almost the direct reverse of the direct action curve 43 due to the action of the cam levers 35 and the swinging levers 33.

While a specific form of the improvement has been described and illustrated herein, it is desired to be understood that the same may be varied, within the scope of the appended claims, without departing from the spirit of the invention.

Having thus described the invention, what is claimed and desired secured by Letters Patent is:

1. In a land leveling machine of the type having an elongated, rigid, horizontal frame with means for supporting the frame above the ground, at its front and rear extremities means for leveling the ground between the front and rear supports comprising: a rocking lever rotatively mounted at each side of said frame and having a wheel lever portion extending forwardly and a blade lever portion extending rearwardly of its fulcrum point; a scraper blade mounted between the blade lever portions; a ground engaging wheel mounted on the forward extremity of each wheel portion; a spring lever extending upwardly from each rocking lever; a connecting rod extending forwardly from each spring lever; cam levers pivoted to and extending upwardly from said frame forwardly of said wheels to a hinged connection with said connecting rods; a roller riding on the rearward face of each cam lever; swinging levers extending forwardly and downwardly from each roller to a hinged connection on said frame; and spring means urging said swinging levers forwardly to cause said rollers to travel upwardly along said cam levers to force said wheels against the ground.

2. In a land leveling machine of the type having an elongated, rigid, horizontal frame with means for supporting the frame above the ground, at its front and rear extremities means for leveling the ground between the front and rear supports comprising: a rocking lever rotatively mounted at each side of said frame and having a wheel lever portion extending forwardly and a blade lever portion extending rearwardly of

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its fulcrum point; a scraper blade mounted between the blade lever portions; a ground engaging wheel mounted on the forward extremity of each wheel portion; a spring lever extending upwardly from each rocking lever; a connecting rod extending forwardly from each spring lever; cam levers pivoted to and extending upwardly from said frame forwardly of said wheels to a hinged connection with said connecting rods; a roller riding on the rearward face of each cam lever; swinging levers extending forwardly and downwardly from each roller to a hinged connection on said frame; connecting links extending forwardly from said rollers; and spring means drawing said connecting links forwardly to urge said rollers upwardly on said cam levers in an arc defined by the radius of said swinging levers.

3. In a land leveling machine of the type having an elongated, rigid, horizontal frame with means for supporting the frame above the ground, at its front and rear extremities means for leveling the ground between the front and rear supports comprising: a rocking lever rotatively mounted at each side of said frame and having a wheel lever portion extending forwardly and a blade lever portion extending rearwardly of its fulcrum point; a scraper blade mounted between the blade lever portions; a ground engaging wheel mounted on the forward extremity of each wheel portion; a spring lever extending upwardly from each rocking lever; a connecting rod extending forwardly from each spring lever; cam levers pivoted to and extending upwardly from said frame forwardly of said wheels to a hinged connection with said connecting rods; a roller riding on the rearward face of each cam lever; swinging levers extending forwardly and downwardly from each roller to a hinged connection on said frame; connecting links extending forwardly from said rollers; and spring means drawing said connecting links forwardly to urge said rollers upwardly on said cam levers in an

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arc defined by the radius of said swinging levers; and a depression formed in the forward face of each cam lever adjacent the axis thereof into which said rollers may enter as they approach said axis.

4. In a land leveling machine of the type having an elongated, rigid, horizontal frame with means for supporting the frame above the ground, at its front and rear extremities means for leveling the ground between the front and rear supports comprising: a rocking lever rotatively mounted at each side of said frame and having a wheel lever portion extending forwardly and a blade lever portion extending rearwardly of its fulcrum point; a scraper blade mounted between the blade lever portions; a ground engaging wheel mounted on the forward extremity of each wheel portion; a spring lever extending upwardly from each rocking lever; a connecting rod extending forwardly from each spring lever; cam levers pivoted to and extending upwardly from said frame forwardly of said wheels to a hinged connection with said connecting rods; a roller riding on the rearward face of each cam lever; swinging levers extending forwardly and downwardly from each roller to a hinged connection on said frame; connecting links extending forwardly from said rollers; spring plates secured at the forward extremities of said links; tension springs extending forwardly from said spring plates; and adjustable means securing the forward extremities of said springs to said frame.

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REFERENCES CITED

The following references are of record in the file of this patent:

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