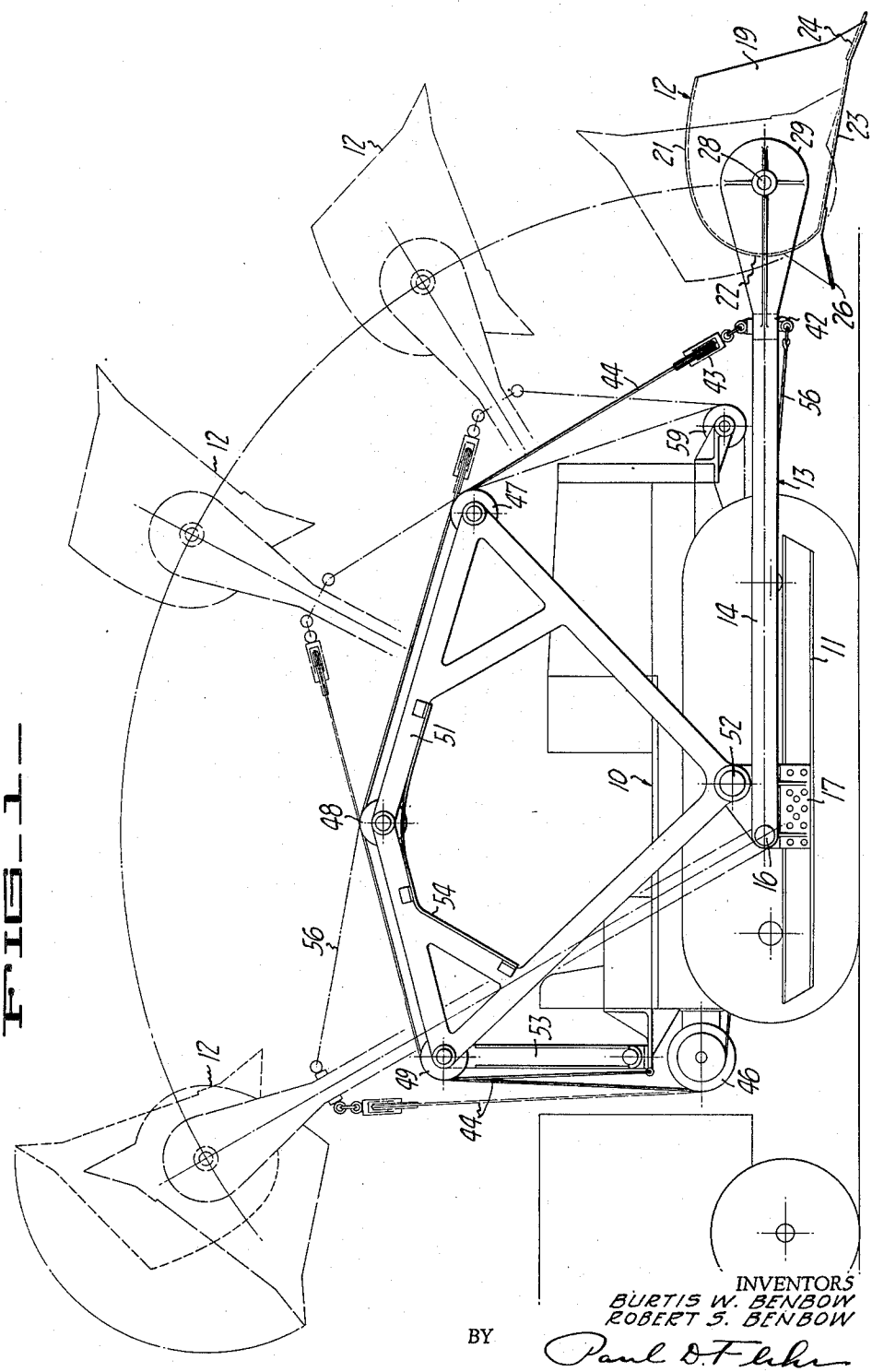
Jan. 7, 1941. B. W. BENBOW ET AL 2,227,624

EARTH MOVING EQUIPMENT

Filed April 6, 1937 3 Sheets-Sheet 1

FIG. 1



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Filed April 6, 1937 3 Sheets-Sheet 2

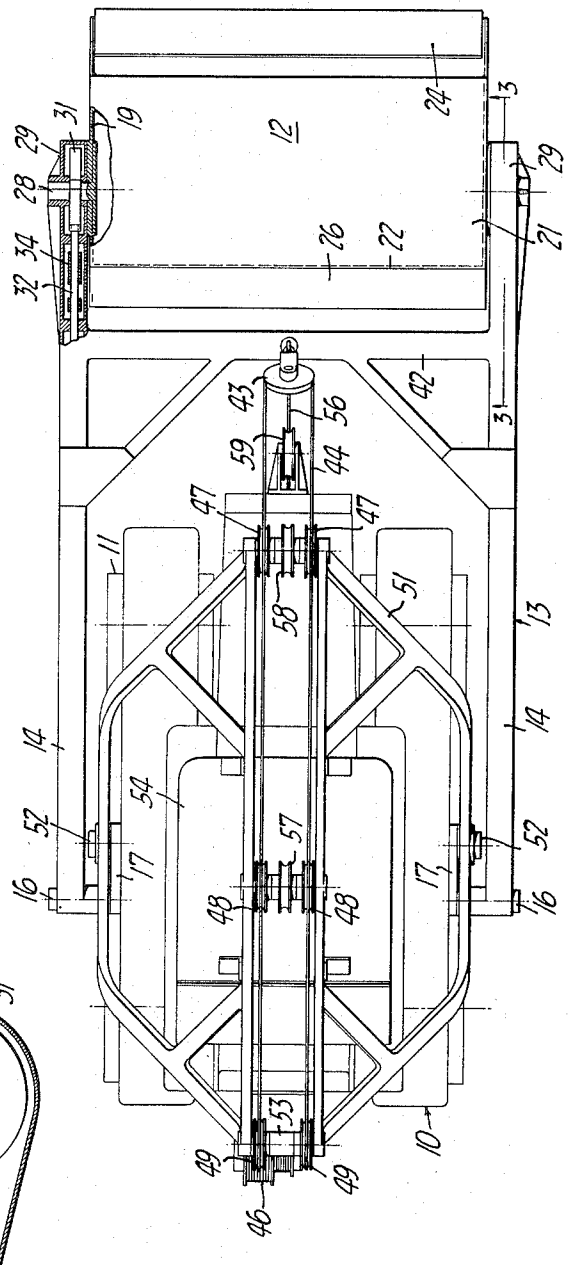

FIG. 2.

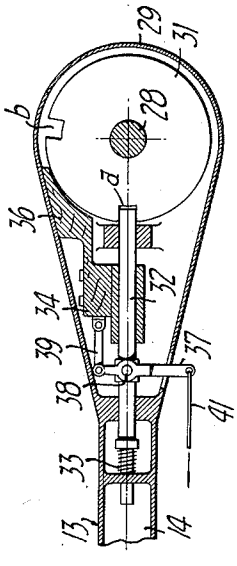

FIG. 3.

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EARTH MOVING EQUIPMENT

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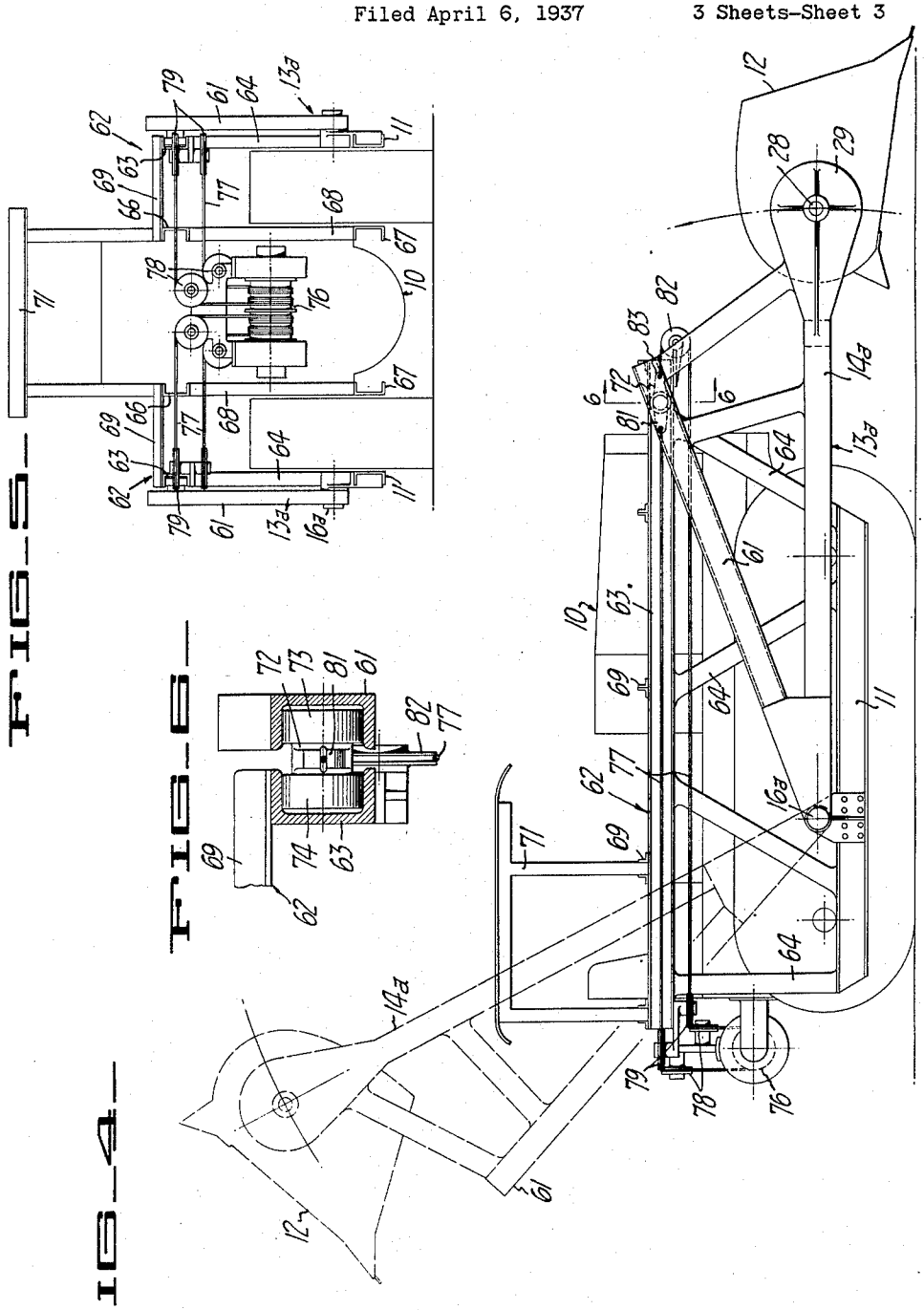

FIG-5-

FIG-6-

FIG-4-

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EARTH MOVING EQUIPMENT

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Application April 6, 1937, Serial No. 135,238

4 Claims. (Cl. 214—140)

This invention relates generally to earth moving devices of the type utilizing a motorized tractor.

It is an object of the invention to provide equipment of the above character which will facilitate transposing earth from a given location to a motor truck or other conveyance. In this connection the invention is characterized by the use of a bucket-like blade structure which extends in front of the tractor for normal operation, but which can be transposed upwardly and back over the tractor, to a dumping position at the rear of the tractor.

Another object of the invention is to provide equipment of the above character which can also be utilized as a land leveler or bulldozer. In this connection we prefer to make use of a special blade structure, which can operate either as a bucket, or as a bulldozing blade.

Further objects and characteristics of the invention will appear from the following description in which the preferred embodiment of the invention has been set forth in detail in conjunction with the accompanying drawings.

Referring to the drawings:

Fig. 1 is a side elevational view, illustrating equipment in accordance with the present invention.

Fig. 2 is a plan view of the equipment illustrated in Fig. 1.

Fig. 3 is an enlarged cross-sectional detail, illustrating latching and braking means utilized in conjunction with the blade structure, the section being taken along the line 3—3 of Fig. 2.

Fig. 4 is a side elevational view, showing a modified form of equipment.

Fig. 5 is a rear end view of the equipment illustrated in Fig. 4.

Fig. 6 is a cross-sectional detail on an enlarged scale, taken along the line 6—6 of Fig. 4.

Referring to Figs. 1 and 2 of the drawings, we have shown a motorized tractor 10 of the well-known track laying type. In tractors of this kind the treads are carried by track supporting means, which include the side channels 11. It is to these structural members that bulldozers and like equipment, are generally connected.

Extending across the front of the tractor there is a blade structure 12, which is pivotally carried by a yoke-like frame 13. The frame is formed by structural members of suitable strength, including particularly the side arms 14, which have pivotal connections 16 to the journal brackets 17. Brackets 17 are in turn rigidly mounted upon the side channels 11. As will be apparent from the dotted line positions illustrated in Fig. 1, the frame 13 is so dimensioned that it will clear the hood and other parts of the tractor, when swung upwardly and rearwardly in a vertical plane. The total swinging movement utilized is through an angle of more than 90°, as will be presently explained.

The blade structure 12 is preferably of a special type, whereby it can be utilized either as a digging bucket, or as a pushing or bulldozing blade. Thus taking the position illustrated in solid lines of Fig. 1, it includes the end walls 19, top wall 21 which is curved and which merges with the rear wall portion 22, and a bottom wall 23. The forward edge portion of wall 23 is equipped with a blade plate 24. At the rear edge of the bottom wall 23, there is a substantially V-shaped digging edge 26. The purpose of the digging edge 26 is to form, together with the bottom wall 23, a bulldozing blade, when the bucket structure is positioned with the bottom wall 23 in a generally vertical position, as illustrated in dotted lines in the lower right hand portion of Fig. 1.

Associated with one of the pivotal connections between the blade structure and frame 13, latching means is employed for releasably retaining the bucket structure in a given operating position, and to control movement of the bucket structure to full dumping or discharging positions. Also associated with this latching means, there is a braking mechanism to avoid too abrupt movement of the blade structure. Thus referring to Figs. 2 and 3, the ends of the blade structure are provided with stub shafts 28, which are journalled in the forward end portions 29 of the frame 13. Also secured to each stub shaft 28, there is a disc 31, provided with notches A and B. A slidable latch part 32 cooperates with the aforesaid notches, and is urged towards engaged position by spring 33. Slidably mounted upon the latch rod 32, there is a block 34, which carries the brake shoe 36. An operating lever 37 is provided, which has a pivotal connection 38 with latch bar 32, and a connection by link 39, with the block 34. Thus when operating force is applied to lever 37, as by pulling upon a cable 41, latch bar 32 is moved towards disengaged position, and at the same time the braking shoe 36 is urged into frictional engagement with the periphery of disc 31. Notch B represents the so-called bulldozing position of the blade structure, indicated by dotted lines in Fig. 1. Notch A is the so-called bucket position illustrated in solid lines in Fig. 1.

Various expedients can be utilized for swinging the frame 13 through an angle of more than 90°

from a normal operating position to a so-called dumping position, with the blade structure to the rear of the tractor. One desirable arrangement is that illustrated, which makes use of a hoisting cable, operating from a power take-off on the tractor. Thus attached to the forward cross member 42 of the frame 13, there is a cable block 43, engaged by the cable 44. At the rear of the tractor one end of this cable is anchored and the other end engages the winding drum 46. In order to afford a proper direction of pull, we make use of several pairs of guide sheaves 47, 48 and 49 which are carried by a supplemental supporting frame 51. This frame is made of suitable structure members, and is so dimensioned that it is readily cleared by the frame 13. In this instance it is provided with three points of connection to the tractor, two points being pivotal connections 52 to the side brackets 17, and the third point being through the structural member 53, to a rear part of the tractor. A frame of this character affords adequate support for the sheaves 47, 48 and 49, and at the same time can serve as a protecting cab for the operator. Thus protecting sheet metal plates 54 are shown attached to the frame 51, to extend over the general locality occupied by the tractor operator. The grooves afforded by sheaves 47, 48 and 49 are generously proportioned, so that they are readily engaged by the cable 44. As the frame 13 swings upwardly and backwardly, the pull is first from sheaves 47, and as the frame 13 moves beyond the region of these sheaves, the pull is from sheaves 48. After the cable leaves sheaves 48, the pull is from sheaves 49, until substantially the final position is reached as shown in Fig. 1.

Some suitable means must be provided for moving the frame 13 back past the vertical dead center position, so that thereafter its weight will cause it to swing back to normal position. A simple expedient is to utilize a pull-back cable 56, which is attached to frame 13, and which can engage the sheaves 57 and 58, carried by the frame 51. At the front of the tractor a special sheave 59 can be provided over which the cable 56 is entrained, and from thence the cable can extend to the rear of the tractor, for engagement with an operating drum.

Operation of my equipment can be reviewed as follows: With the scraper structure 12 in position to form a digging bucket, the tractor is operated to force the bucket into a ground formation whereby the bucket is loaded. Power drum 46 is then put into operation (with or without backward movement of the tractor) thereby causing the blade structure to swing upwardly and rearwardly to the dumping position illustrated at the upper left hand portion of Fig. 1. A motor truck or like conveyance is awaiting to the rear of the tractor, and when dumping position has been reached, the operator trips the latching means by pulling upon cable 41, so that the blade structure pivots with respect to the frame 13 to full dumping position. This latter individual movement of the blade structure can not occur too abruptly, because of the braking action of shoe 36. Thereafter the blade structure is swung back to its normal operating position at the front of the tractor, and the latching means again operated to permit the blade structure to return to the position illustrated in solid lines in Fig. 1.

Whenever the operator desires to utilize the equipment as a bulldozer, the blade structure is swung to a position with the bottom wall 23 in a general upright position, as illustrated in dotted lines in the lower right hand portion of Fig. 1. While the equipment is being used as a bulldozer, the blade structure can be raised or lowered as desired, by operation of the drum 46.

A modification is illustrated in Figs. 4 to 6 inclusive, in which novel cam means is utilized for swinging the blade structure. Thus in this instance the frame 13*a* includes the channels 61, which extend at an angle to the side arms 14*a*, and which form elongated cam tracks. In place of utilizing a frame extending over the tractor as in Figs. 1 and 2, a pair of frames 62 are provided, which are suitably attached to the tractor. Each frame 62 includes the horizontal channel 63, which is attached to outer tractor members 11 by structural member 64, and the additional channel or structural member 66, which is attached to the inner member 67 of the tractor, by the members 68. Channels 63 and 66 are shown interconnected by transverse structural members 69. An additional structure 71 can be provided to form a cab for protecting the operator. As shown more clearly in Fig. 6, trunnions 72 are provided on each side of the tractor, and these trunnions carry rollers 73 and 74, which engage respectively within the channels 61 and 63.

At the back of the tractor there is a power driven drum 76, engaged by two cables 77. The two bights of each cable 77 are shown extending over the sheaves 78, thence laterally over the sheaves 79, and then forwardly towards the associated trunnion 72. One bight connects directly with the trunnion 72 as indicated at 81, while the other bight extends over a forward sheave 82, and from thence extends backwardly and has a point of connection 83, with the trunnion 72. It will be evident that for one direction of rotation of the drum 76, trunnions 72 will be moved in unison towards the rear of the tractor, while for the other direction of rotation, the two trunnions will be moved forwardly.

When the blade structure 12 is in normal operating position such as shown in Fig. 4, the trunnions 72 are necessarily near the forward ends of the channels 61 and 63, and considerable leverage is afforded, to raise or lower the blade structure, by rearward or forward movement of the trunnions. However, as the trunnions move rearwardly and the blade structure swings upwardly and rearwardly, the leverage decreases rapidly until channels 61 are in substantially vertical position. It will be evident that such automatic variation in the leverage or mechanical advantage afforded, is consistent with the forces encountered, particularly since relatively heavy forces may be required to raise a loaded blade structure, or to crowd the same downwardly into a formation, while forces of much less magnitude will be required when the blade structure is near the top of its arc of movement. When the trunnions 72 are moved rearwardly at a substantially constant rate, the automatic variation in leverage causes accelerated movement as the blade structure is raised, with the movement of greatest velocity taking place when the channels 61 are near vertical position.

The modification of Figs. 4 to 6 inclusive lends itself more readily to bulldozing operations, than the arrangement of Figs. 1 to 3 inclusive. This is because in bulldozing operations it is frequently necessary to force or crowd the bulldozing blade downwardly into the formation. It will be ap-

parent that this can be readily carried out by the apparatus of Figs. 4 to 6 inclusive, while with the first described form of the invention, one must rely upon the downward force components created by the angle of the blade, to cause the blade to dig down into a formation.

It will be noted from the foregoing that if the latch bar **32** is not released as the blade structure is swung forwardly to normal position, the blade structure will be in bulldozing position. This is an advantage, because it is frequently desirable to carry out scraping or bulldozing operations following removal of a quantity of earth. It will also be noted that we may resort to forward dumping, as by merely lifting the blade structure a limited distance, followed by tripping of latch bar **32**.

We claim:

1. In earth moving equipment making use of a motorized tractor, an excavating structure adapted to normally extend across the front of the tractor, a frame serving to connect said blade structure to the tractor, said connecting frame affording a pivotal connection to the tractor whereby the connecting frame together with said structure, can be swung in a vertical plane over the tractor, and power means for swinging the connecting frame and said structure through an angle of more than 90°, whereby the structure is transposed from a normal position in front of the tractor to a dumping position to the rear of the tractor, said last means including a pair of elongated cam tracks carried by said frame and a cooperating pair of cam tracks carried by the tractor, rollers engaging said cam tracks, and power means for moving said rollers longitudinally of the cam tracks.

2. In earth moving equipment for use with a tractor of the track laying type, an excavating structure adapted to normally extend across the front of the tractor, said structure serving either as a bucket or as a bull-dozer, a yoke-like frame to which said structure is connected, said frame affording side arms extending along the sides of the track supporting means of the tractor, said side arms being of a length substantialy greater than one-half the length of the tractor, means for pivotally connecting the ends of said arms, which are remote from said structure, to said track supporting means, the axis of said pivotal connection being intermediate the front and rear ends of the tractor and near a medial point, whereby said frame can be swung in a vertical plane from a normal substantially horizontal position in front of the tractor to a position to dump beyond the rear end of the tractor, and power operated means for swinging the frame together with said structure from said normal position to said dumping position.

3. In earth moving equipment of the character described, adapted for use in conjunction with a tractor, a frame adapted to be carried by the tractor, and an excavating structure mounted upon said frame for either one of two operating positions, said structure being in the form of a bucket and including a bottom wall having two spaced ground engaging blades, said structure in one operating position of the same operating as a bucket with the bottom wall being generally horizontal and with one of the blades disposed at the forward end of the structure for digging, said structure when in its other operating position having its bottom wall generally upright for bulldozing and the other blade lowermost to engage the ground.

4. In earth moving equipment of the character described, adapted for use in conjunction with a tractor, a frame adapted to be carried by the tractor, and an excavating structure pivotally secured to said frame for movement to either one of two operating positions about an axis transverse to direction of movement of the tractor, said structure being in the form of a bucket and including a bottom wall having two spaced ground engaging blades, said structure in one operating position of the same operating as a bucket with the bottom wall generally horizontal whereby one of the blades is at the forward end of the structure for digging, said structure in its other operating position serving for bulldozing with the bottom wall generally upright and the other blade lowermost to engage the ground.

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