HINGED TEETH FOR BULLDOZER MOLDBOARDS

Filed July 1, 1940

INVENTOR C. E. WILLIAMS ET AL.

2 Sheets-Sheet 1

INVENTOR
Claude E. Williams
BY Fifer & Hoy
ATTORNEYS
Our present invention relates to the art of dirt and rock handling equipment of the type normally referred to as bulldozers and more particularly the invention relates to hinged teeth for bulldozer moldboards.

This device consists essentially of pivoting a plurality of steel scarifier teeth to the upper portion of a moldboard of the type used on bulldozers, graders, and the like. These teeth may be joined together so that they operate as a unit in order to insure rigidity against sideways. They are mounted so that for many uses the bulldozer may be driven ahead with the teeth in the lowered position extending below the lower cutting edge of the bulldozer moldboard. In such a position they are useful to loosen hard ground, hardpan, rocky material, or for loosening and removing roots and loosenin soil in land clearing. However, with our hinged arrangement when it is desired to back up the mold board, in what is known as “floating dirt backwardly,” it is common in both power driven graders and bulldozers, the teeth, without any attention on the part of the operator, swing outwardly and upwardly so as not to interfere with the floating operation, yet the instant the machine again proceeds forward they bite into the ground and serve their intended purpose. By having the teeth pivoted at a point well up on the moldboard they can be conveniently raised and secured in their raised position. Thus, while they may be quickly put back into service, they can be in their raised position in a way they can accept the normal use to which the moldboard is put, whether this be on a bulldozer, grader, or any of the various forms of scrapers using a moldboard scraper.

The use of bulldozers is now being accepted as the most practical method in earth moving projects of moving dirt short distances. However, instead of always to carry a full load on each trip and can quickly acquire the load, it has been necessary in many instances to use various means such as independent scarifying machines, or hand-operated picks, or light blasting to loosen up the firm material so that the blade of the bulldozer can break the same into a loosened form capable of being transported. This is in the past been an expensive operation requiring either expensive equipment or tedious and expensive hand-breaking of the firm material.

Some operators have endeavored to solve the loosening up of the material by fixedly securing teeth to the moldboard of the scraper or bulldozer, and using the same to loosen an area after which the teeth would be removed and the bulldozer used in its normal manner. This, even where relatively large areas are being graded, is a very slow labor consuming operation and particularly is it expensive because the bulldozer itself, which is an expensive piece of equipment, is out of commission during such operation. If it is to be gainfully employed, the bulldozer must of necessity be working constantly, as its depreciation is high and a comparatively large crew is required in its operation and care. Consequently, the various attempts to bolt on teeth, or otherwise fixedly secure them to the moldboard, has not proved satisfactory even where large areas are being worked.

When, however, the area worked is relatively small as in foundation work, excavation of basements, narrow cut work as on roadways and the like, the time required for the changing of teeth is so large a portion of the available working time that such practice is not economically possible, and hand labor to break up the material must be employed. It is under such conditions that our present device is particularly useful.

The principal object of our present invention, therefore, is to provide a plurality of scarifier teeth that are hingedly secured to a scraper moldboard and which may be used at will by the operator without loss of time while changing from a dirt handling moldboard to this scarifying type.

A further object of our invention is to provide scarifier teeth that can be readily swung up out of the way when not in use and which, when in such position, will in no way affect the general usefulness of the moldboard.

Another object of our invention is to provide pivoted teeth which, when the moldboard is backed up, is necessary when ground is “floated,” automatically rise out of the ground and drag backward over the surface—again in no way interfering with the operation of floating, yet being instantly available for loosening material when required.

Another important object of our invention is to provide a tie member across the lower portion of the plurality of teeth, of which there are a varying number of suit conditions. This tie member adds rigidity to the teeth and permits any one tooth that may meet unusual resistance to be mutually supported by the teeth on opposite sides of it. Further, this tie bar is provided with a sharp bend, on each end, adapted to fit over the side closure member of the moldboard so as to give exact positioning of the teeth. This makes it possible for the teeth to be used while the bulldozer is making circular movements, without in any way disarranging the teeth or bending them due to the side movement.

A further object of our invention is to provide means for easily raising the teeth, as a unit, and securing them in the raised position by means that are simple and do not involve auxiliary equipment that would be both ex-
pensive and difficult to maintain under service conditions. Other and more specific objects will be apparent from the following description taken in connection with the accompanying drawings, wherein

Figure 1 is a side elevation of a bulldozer showing the teeth generally thereto and further showing, as a matter of convenience in illustration, a simple means employed to raise the teeth.

Figure 2 is a perspective view showing a bulldozer with its teeth secured thereto in a raised position, with the bulldozer trailing a scraper such as is used in transporting dirt considerable distances, showing the ease with which the bulldozer can go about its normal functioning without in any way being handicapped by the addition of our equipment.

Figure 3 is a perspective view showing a bulldozer moldboard with its teeth secured in their raised position.

Figure 4 is a fragmentary view of the front of a bulldozer, showing the moldboard and the teeth secured in their raised position.

Figure 5 is a further perspective view showing the arrangement of our scarifying teeth as they appear in their working position, and illustrating in dashed line a single auxiliary tooth secured to the moldboard and tie bar.

Figure 6 is a fragmentary side elevation, in section, showing the manner in which the moldboard may be used in its normal manner and illustrating how our teeth may be raised out of the way to avoid their interference with the normal functioning of the moldboard.

Figure 7 is a side elevation, in section, showing our teeth in the operation of loosening up firm ground such as hardpan, or rocky ground where the moldboard itself would not be able to bite into and remove the dirt.

Figure 8 is an elevational view in section showing the operation of "floating" dirt back and forth and illustrating how our teeth swing outwardly and upwardly so as not to interfere with the operation of the moldboard.

Referring to the drawings, throughout which like reference characters indicate like parts, there is shown, generally, one type of dirt-handling machine known as a bulldozer, with which our scarifier assembly can be most profitably used. It is to be understood, however, that our toothed assembly may be used with any of the blade-type earth scrapers. However, for simplicity of illustration, we have throughout the accompanying drawings shown our device as secured to a bulldozer. Equipment of this order is normally driven by a track-laying belt as 12 and is provided with a moldboard arrangement 14 which, through power cylinders and suitable linkage (all of which is well developed and which form no part of this present invention) is adapted to raise and lower the moldboard assembly 14 and to adequately support it as the moldboard is driven forwardly or rearwardly. The moldboard assembly consists essentially of the moldboard proper 16, to which is preferably secured a high-carbon cutting edge 18 and in order that its dirt-handling capacity may be maintained at a high level it is preferably provided with side, or end, plates as 20 and 21. In order to stiffen the moldboard, normally, it is flanged at 22 so as to form, in effect, an angle section at its upper margin. These features are present in the conventional bulldozer moldboards as made by various manufacturers.

Our invention consists essentially in providing the toothed assembly, designated generally by the reference character 24, which consists of a plurality of scarifier arms 25 preferably formed of steel and which are made of such a weight and section as to be able to handle, without deformation, the full force that the bulldozer can exert upon them when arm resistance is encountered. These arms 26 have a point or tooth portion 28, a lower arm portion 29, and each arm is bent as at 30 and is provided with an upper arm portion 32 that is normally substantially straight. The arm is secured to accommodate the pivot bolt 34—there being preferably one such bolt for each of the teeth.

To serve as an anchor for pivot bolt 34 we provide, preferably, the two pivot support members 36 and 37 which may be secured to the moldboard in any desired manner; they may be welded thereto if desired, but we find it most convenient to secure them as by bolts 38 so that the whole assembly can be attached to, or detached from, a moldboard in the field.

At the lowest point where the arms rest against the trailing bar 18 of the moldboard, we provide a tie member 39. This should be, preferably, a steel bar of considerable weight so that it will be adequately strong to distribute the strain from any one arm to those adjacent so that the entire assembly of arms is mutually supported. This member is secured to the arm by the angle brackets 40 and 41 which may be welded to the arms and welded to the tie bar 39. Each end of the tie bar is bent in a right-angle, directed rearwardly, so that the two lug portions 42 and 43 thus formed extend rearwardly to engage the end plates 20 and 21, respectively, and also engage the opposite ends of the cutter bar 18, so that the toothed assembly, which is hinged supported well up on the moldboard, cannot be deflected sideways due to side strain that occurs when the bulldozer is in operation and greater resistance is met on one side than on the other, or when the bulldozer tends to turn. Inasmuch as bar 39 should be of substantial weight, the lugs 42 and 43 are capable of resisting any side thrust on the arms that the bulldozer itself is capable of placing on the assembly.

When it is desired not to use the toothed assembly we have provided means for easily securing it in its raised position. A most convenient means of accomplishing this is to provide chains as 45 having an elongated link, 46 that may be slipped over the end of the two outside teeth and then led down through bayonet slots 47 in the lugs 48 that are, in turn, fixedly secured to the moldboard proper as by being welded thereto. With a reasonable length of chain extending down through opening 47 it is but a moment's operation to pull the chain through the opening and then allow the reduced bayonet portion of the slot to engage a link of the chain and hold it in a secure manner.

For use on small bulldozers it will be apparent particularly if only a limited number of teeth are employed, as we have illustrated in our drawings, that it is relatively easy for one or two men to raise the toothed assembly as desired and to lower the same. However, when used with the larger equipment or where conditions indicate that a greater number of teeth should be employed, we find it most convenient to employ an auxiliary raising means. The simplest that we have, as yet, been able to devise, is to provide a
2,262,415 steel cable, or chain, 50 having an elongated link at 51 and a hook at 52. With this arrangement it will be apparent, it is believed, particularly from a study of Figure 1, that hook 52 may be looped over one of the traction lugs on belt 12, passed over the angled portion 52 of the moldboard and down to the link 51 which may be engaged over one arm. The operator may then, by backing up slightly with his tractor tread belts, raise the toothed assembly. When it is in its upper position, the locking chain assembly 45 may be used to secure it in its raised position. To put the arms back in service, the strain can be taken by cable 58 in the same manner so that chains 48 can be released from the bayonet slot and then, by moving the machine forward, the operator can lower the toothed assembly easily to the ground.

Our present arrangement permits auxiliary teeth, for use in land clearing, to be easily attached. These auxiliary teeth 56 are similar to the scarifier arms 26 having the same pivot bolt 24 and the pivot. In Figure 3 they are mounted on the moldboard in the same manner as by bolts 38. There are, preferably, angles similar to 40 and 41 welded to the auxiliary arm which when the teeth line on the tie bar 38 can be temporarily fastened to the tie bar by suitable securing means. Any one of the auxiliary arms can be used as a single arm should the hinged assembly be detached. The auxiliary arm may be fastened between the angle 38 and 37 on the moldboard with one of the same bolts that are used to hold the hinged assembly. This permits the angles that are welded to the auxiliary arm to lie on the cutting bar of the bulldozer where it can be securely fastened by bolts or latches. This is often helpful in emergency where a small corner or area of hardpan is encountered.

A study of our drawings, it is believed, will illustrate the construction and the general manner of using our equipment. In Figures 6, 7, and 8 we have shown three different positions for our toothed assembly. In Figure 6 we show the teeth as raised, and held in the raised position, with the moldboard picking up a load of dirt. In this operation the teeth are not used and, when in their raised position they in no way interfere with the normal functioning of the bulldozer. When, however, hardpan, stone or rooted ground is encountered, the teeth are lowered and operated as illustrated in Figure 7 wherein the teeth extending well below the cutting bar 10 bite into the ground at 54 and loosen the same so that the bulldozer may be effectively employed.

In Figure 8 we show what is known as “floating” dirt that has been otherwise collected, over which the moldboard is placed and the whole machine moved to the rear and the dirt thus spread out evenly. In this operation it will be noted that the teeth rise out of the dirt and again in no way interfere with the operation.

The foregoing description and the accompanying drawings are believed to clearly disclose a preferred embodiment of our invention but it will be understood that this disclosure is merely illustrative and that such changes in the invention may be made as are fairly within the scope and spirit of the following claims.

We claim:

1. A toothed assembly for earth-moving blades comprising a plurality of scarifier arms having scarifier teeth at their outer extremities, a plurality of pivot support members on the face of an earth-moving blade, said arms being pivotally attached to said pivot support members, a tie-bar secured to said arms and co-operative with the lower edge of the earth-moving blade, a rearwardly bent lug on each end of said tie-bar co-operative with the ends of the earth-moving blade to resist transverse movement of the toothed assembly with relation to said blade.

2. A toothed assembly for earth-moving blades comprising a plurality of scarifier arms having scarifier teeth at their outer extremities, a plurality of pivot support members on the face of an earth-moving blade, said arms being pivotally attached to said pivot support members, a tie-bar secured to said arms and co-operative with the lower edge of the earth-moving blade, a rearwardly bent lug on each end of said toothed assembly co-operative with the ends of the earth-moving blade to resist transverse movement of the toothed assembly with relation to said blade.

3. A toothed assembly for earth-moving blades comprising a plurality of scarifier arms having scarifier teeth at their outer extremities, a plurality of pivot support members on the face of an earth-moving blade, said arms being pivotally attached to said pivot support members, a tie-bar secured to said arms and co-operative with the lower edge of the earth-moving blade, means on each end of the toothed assembly co-operative with the ends of the earth-moving blade to resist transverse movement of the toothed assembly with relation to said blade.

4. A scarifier device for earth-moving blades comprising a tie-bar co-operative with the lower edge of an earth-moving blade, a plurality of scarifier arms each having a scarifier tooth at its outer extremity, said arms being secured to said tie-bar spaced apart from each other, means for pivotally securing scarifier teeth to the earth-moving blade so that the lower tooth extremity of each scarifier arm extends below the lower edge of the earth-moving blade, and means for resisting transverse movement of said scarifier device with relation to said earth-moving blades.

5. A toothed assembly for earth-moving blades comprising a plurality of scarifier arms having scarifier teeth at their outer extremities, a tie-bar securing said arms together in spaced-apart relationship to each other and co-operative with the lower edge of the earth-moving blade, means on said toothed assembly co-operative with the earth-moving blade to resist transverse movement of the toothed assembly with relation to said blade, said assembly being pivotally attached in its upper portion to an upper portion of the earth-moving blade.

6. A scarifier device for earth-moving blades comprising a tie-bar co-operative with the lower edge of an earth-moving blade, a plurality of scarifier arms each having a scarifier tooth at its outer extremity, said arms being secured to said tie-bar spaced apart from each other, means for pivotally securing scarifier device to the earth-moving blade, and means for resisting transverse movement of said scarifier device with relation to said earth-moving blades.

CLAUDE E. WILLIAMS.
ELMER J. HOY.