Dec. 31, 1929. J. H. GUNNISON 1,741,933

GRADER AND SCARIFIER

Filed March 3, 1927 2 Sheets-Sheet 1

Fig. 1.

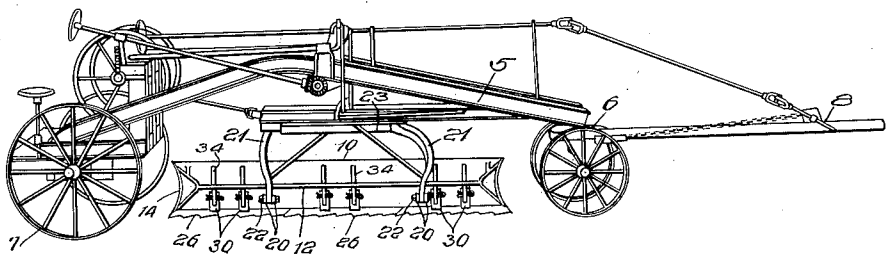
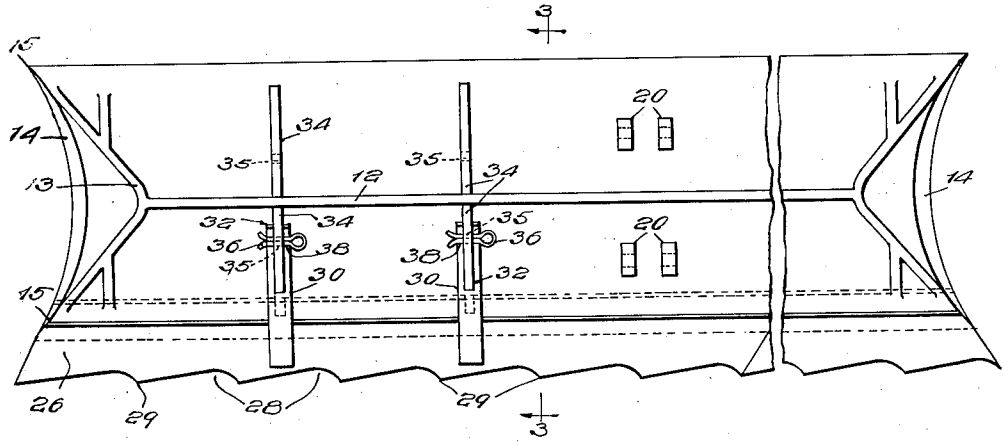


Fig. 2.



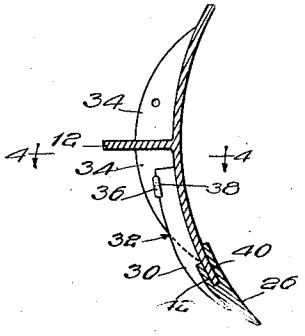


Fig. 3.

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Fig. 4.

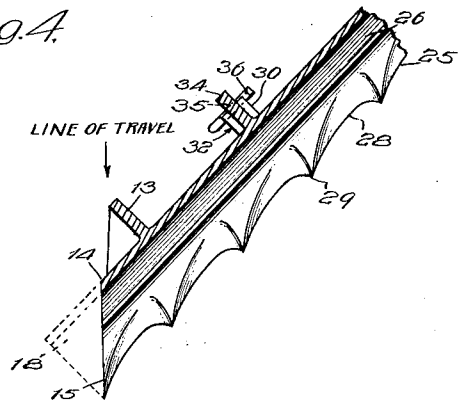


Fig. 5.

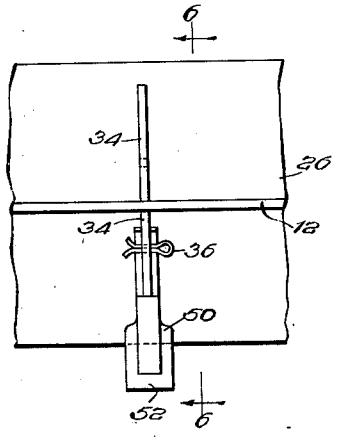


Fig. 6.

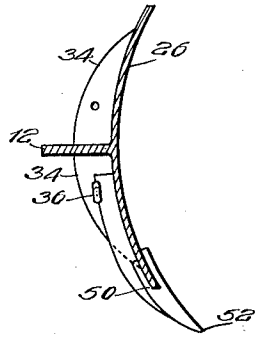
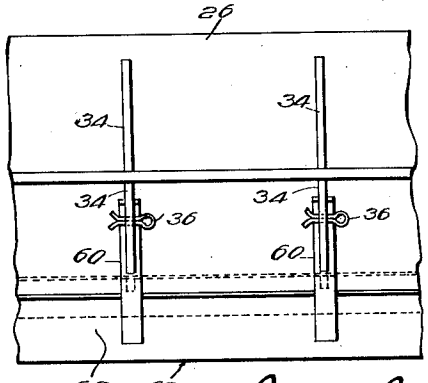


Fig. 7



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Patented Dec. 31, 1929

1,741,933

UNITED STATES PATENT OFFICE

JOHN H. GUNNISON, OF MADISON, WISCONSIN

GRADER AND SCARIFIER

Application filed March 3, 1927. Serial No. 172,250.

This invention relates to graders and scarifiers and its object is the provision of a generally improved and simplified grader blade and scarifier that may be operated together and with which the material may be finely broken up and graded without building up ahead and clogging the machine and without separate scarifying and grading operations.

The combined scarifying and grading action can be accomplished with the present invention without increasing the power of the machine, which has in the prior art arrangements usually been insufficient to produce these combined actions.

I further provide for eliminating the necessity of a separate mounting on the frame of the machine for the scarifier means by mounting this means directly on the grader blade, and I provide improved means for attaching the scarifier means to the blade. I also provide an improved shape of scarifier and I provide a detachable grading edge for the grader and for removably attaching the same to the grader blade in accordance with the attachment of the scarifier means.

By providing detachable grader edges these may be separately tempered or brought to the desired hardness without impairing the tensile strength of the remainder of the blade and at the same time these edges may be renewed and maintained in proper condition at all times and are interchangeable with the scarifying means.

The invention is illustrated in the accompanying drawings, in which:

Fig. 1 is a more or less diagrammatic perspective view of a grading machine showing an embodiment of the present invention in connection therewith;

Fig. 2 is an enlarged back view of the grader blade and scarifier in elevation and partially broken away;

Fig. 3 is a vertical section taken on the line 3—3 of Fig. 2;

Fig. 4 is a fragmentary section taken on the line 4—4 of Fig. 3 and showing the scarifier teeth formed at an angle and directed with the line of travel;

Fig. 5 is a fragmentary back view of the grader blade showing another form of scarifier mounted thereon;

Fig. 6 is a vertical section taken on the line 6—6 of Fig. 5 and

Fig. 7 is a fragmentary back view similar to Fig. 4 showing a detachable edge mounted on the edge of the blade in accordance with the present invention.

Referring to the drawings the particular grading machine shown comprises the arched frame 5 having the front wheels 6, rear wheels 7, and engine or draft tongue 8.

The particular machine, per se, forms no part of the present invention and the mounting of the grader blade may be varied to accommodate it to any desired machine, the particular showing herein being illustrative of a particular embodiment of the invention.

It will also be understood, as this description proceeds, that the tooth formation of the scarifier may be varied with different uses and different materials. For example, in working with asphalt or bituminous pavements the teeth of the scarifier may be closer together than with ice or harder road materials.

The blade 10 is preferably of arched cross section and it is preferably cast of a material having suitable wear and abrasion resisting qualities and the requisite strength. Various steel alloys or the metal-manganese may be employed, for example, although this, of course, may vary as desired. The blade 10 might even be formed of plate rolled stock with the necessary fins or flanges, which will appear as this description proceeds, riveted or bolted to the blade.

In use the concave front of the blade 10 is presented to and moves against the material. The convex back of the blade 10 has a longitudinal median reinforcing rib or fin 12, the opposite ends of which terminate in fins 13 which conform somewhat generally with the ends of the blade. It will be noted that the ends 14 of the blade are cut out or incurved at 14, so that when the blade is set perpendicular and at an angle of say 45 degrees to the line travel, it is possible to cut a perpendicular furrow. The incurving of the ends at 14, prevents the rearwardly bulged portion of

the blade between the top and bottom from extending laterally from the pointed edges 15 when the blade is set perpendicular and at an angle of say 45 degrees to the line of travel. This feature is a valuable one in grading up to side abutments. For example, in subgrading for the laying of a concrete highway this feature permits grading out for forms or up close to the side forms where they have already been set to grade. The sides of the furrow may thus be made perpendicular to the horizontal surface in spite of the rearward bulging or arched form of the blade. In use the points 15 lead slightly but the rearwardly disposed central median part of the blade is disposed in substantially the same vertical plane as the points when the blade is set at the proper angle. The lateral offset at the central part, which would be produced by the arched form of the blade, as shown in dotted lines at 18 in Fig. 4, is removed by the incurving of the ends at 14.

The blade 10 itself is reversible, that is, its upper edge may be disposed at the bottom or vice versa and this blade may be complete with hardened cutting edges or hardened detachable cutting edges may be employed as will be hereinafter described.

Suitable draft ears or mounting lugs 20 are cast or otherwise provided on the back of the blade 10, one pair at each end of the top and bottom of the blade, for example. These draft ears 20 may be spaced and arranged to accommodate any draft beam arrangement, thereby adapting the blade for universal use. In the particular machine shown the draft beams are indicated at 21 being curved down and around the blade and engaging at their lower ends between the lower two pairs draft ears 20 and secured therebetween as by means of suitable bolts 22, or the like.

The beams 21 are attached to and depend from the turn table 23, and suitable instrumentalities may be provided for adjusting the position and angle of the grader blade all as well understood in the art. The present invention is, of course, equally as applicable to machines in which the source of power is provided directly upon the grading machine itself.

The scarifier or cutting edges 25 are preferably made up in sections. As illustrative of the relative dimensions of a commercially practicable embodiment of the invention these sections may be two feet long, so that three of them are required along one edge of the six foot blade, four along one edge of the eight foot blade, five along one edge of the ten foot blade and six along the edge of a twelve foot blade. The scarifier or detachable cutting edges are thereby universal in application to blades of different sizes which standardizes the construction and makes for cheaper production.

It will be understood that any desired cutting edge or tooth may be fashioned to meet the requirements of any particular use. A serrated edge, finer than the one shown, might be used to cut unevenness from bituminous surfaces where it is inadvisable to tear up the whole depths of the surface.

In the embodiment of Figs. 1 to 4 the edges of each section 26 are serrated to form a plurality of teeth to each section. These serrations may be cast in the section 26 or otherwise formed therein and their formation preferably provides the indentations 28 tapering to the points 29 between them, the cutting edges around the teeth and identations being preferably continuously sharp. The tapered points 29 are obliquely disposed with respect to the width and length of the blade 10 preferably at such an angle that these points 29 are directed with or toward the line of travel of the blade when the blade is set at a 45 degree angle to that line, as shown in Fig. 4.

For detachably securing the edges 25 to the blade 10, each section 26 is provided with a pair of projecting lugs 30, which fit against and conform to the back of the blade 10. The inner ends of the lugs 30 are bifurcated at 32 to receive or straddle vertical mounting fins or flanges 34, cast or otherwise formed on the back side of the blade 10. The edge sections 26 are held in place on the edge of the blade by cotter keys or fastening devices 36 which pass through cored openings 35 in the flanges 34 and engage in the notches 38 in the outer edges of the lugs 30.

The inner longitudinal edges of the edge sections 26 are grooved at 40 to receive and fit over the adjacent edge 42 of the blade 10. It will be noted that in use the slip-on sections 26 are continuously pressed against the blade 10 and need no fastening other than to hold the section from slipping off when not in use. The cotter keys or other securing means 36 carry no load or stress other than the weight of the section.

It will also be noted that it is but a few minutes' work to apply or remove the slip-on sections 26 to the lower edge of the blade 10 and that the sections 26 when not in use may be hooked or slipped over the upper or top edge of the blade, being thus in readiness for use immediately, and thereby obviating the necessity of having a box or container in which to carry the sections with the machine when not in use.

The blade and suitable slip-on sections may be used to break and remove ice from a highway or street, as well as for cutting and removing chatter bumps formed by traffic on gravel or other roads. The invention may even be employed in grading ice, and in cutting and grading earth roads the teeth are slipped on when the earth is found too hard or stony to be cut with the blade alone. The invention may be used to remove unevenness

or waves from asphalt or tar surfaced roads or streets and it may be used to level an earth section or grade, fine toothed slip-on sections being used to cut the packed high spots to bring them down to an even grade. This is especially hard to do with the ordinary grader blade regardless of how heavy it is made because of the tendency of the blade to ride up and over the high spots and dig deeper where the earth is not so densely packed.

The scarifier teeth may be formed separately as shown at 50 in Figs. 5 and 6, these being slipped upon the blade and secured similar to the slipping on and attachment of the sections 26 of the previous embodiment. In this case the separate teeth 50 are separately secured to the blade and they may have separate relatively sharp cutting edges 52 of any desired configuration.

In the embodiment of the invention shown in Fig. 7 the detachable sections 58 are grooved to receive the edge of the blade as in the embodiments of Figs. 1 to 6 and their detachable attachment at 60 is similar to the attachments of the previous embodiments. In this case, however, instead of the serrated tooth forming scarifier edges the edges 62 are in the form of relatively straight grader or scraper edges 62. The detachability of the edges 58 permits heat treating and water solution quenching of these edges to bring them to the desired strength, rigidity and hardness without similarly treating the entire blade. This is a distinct advantage in the manufacture of blades of this sort and permits securing the desired condition of the edge of the blade and maintaining the same without impairing the tensile strength or condition of the rest of the blade or entirely replacing the same in the event it is desired to renew the grader or scraper edge only. In this case the hardened cutting edges or scraping or grading edges are embodied in the removable or detachable sections 58, but it is to be understood that the scarifying means previously described may be employed with a grader blade having integral hardened grading or scraping edges for grading or scraping use with the scarifier means.

It will be apparent that by mounting the scarifier means directly upon the grader blade additional supports upon the machine for this scarifier means are eliminated and the beams 21 which carry the blade 10 also thereby carry the scarifier means. Where the invention is employed in connection with ice the shape of the scarifier teeth shown in the embodiment of Figs. 1 to 4 with the raised or thicker formations at the center of the teeth and the tapering off to the indentations 28 will shave the ice off in relatively fine slivers so that it will be practically displaced and will not build up ahead of the blade and clog the machine.

The particular sectioning of the scarifier or edge sections may, of course, be varied and the entire scarifier or blade edge may be made in one piece over the entire length of the blade.

Except where otherwise defined, in the appended claims where I refer to edge member I intend same to cover a straight edge member for forming a detachable grader edge as well as a scarifier edge member for forming scarifier teeth along the edge of the blade.

I claim:

1. In combination, a grader blade having a ground engaging edge adapted for direct grading and scraping cooperation with the ground, a scarifier and means for detachably securing the scarifier to the grader blade with the scarifier projecting from the ground engaging edge of the blade for scarifying cooperation with the ground, said scarifier being removable for grading and scraping cooperation of the ground engaging edge of the blade with the ground independently of any scarifying cooperation therewith.

2. In combination, a grader blade having a ground engaging edge adapted for direct grading and scraping cooperation with the ground, a scarifier, means for detachably securing the scarifier to the grader blade with the scarifier projecting from the ground engaging edge of the blade for scarifying cooperation with the ground, said scarifier being removable for grading and scraping cooperation of the ground engaging edge of the blade with the ground independently of any scarifying cooperation therewith, and means for supporting said scarifier on said blade out of position for cooperation with the ground when the ground engaging edge of the grader blade is in use.

3. In combination, a grader blade having a lower ground engaging edge and an upper edge, and a scarifier adapted to be mounted selectively upon said lower ground engaging edge for scarifying cooperation with the ground and upon said upper edge for grading and scraping cooperation of the ground engaging edge of the grader blade with the ground.

4. In combination, a grader blade having a lower ground engaging edge and an upper edge, a scarifier adapted to be mounted selectively upon said lower ground engaging edge for scarifying cooperation with the ground and upon said upper edge for grading and scraping cooperation of the ground engaging edge of the grader blade with the ground, and means for detachably securing the scarifier to the grader blade for scarifying use along the ground engaging edge thereof.

5. In combination, a grader blade having a lower ground engaging edge and an upper edge, a scarifier grooved to receive selectively the lower or upper edge of said blade for

scarifying use on the lower edge of the blade and for support out of scarifying position upon the upper edge of the blade, and means for detachably securing the scarifier to the grader blade.

6. In combination, a grader blade having a lower ground engaging edge and an upper edge, a scarifier grooved to receive selectively the lower or upper edge of said blade for scarifying use on the lower edge of the blade and for support out of scarifying position upon the upper edge of the blade, and means detachably securing the scarifier to the grader blade, said means including a flange on the back of the blade, a fastening device removably engaged with said flange, and a lug on the scarifier fitting the back of the blade and extending between the back of the blade and said fastening device.

7. In combination, a grader blade having a lower ground engaging edge and an upper edge, a scarifier grooved to receive selectively the lower or upper edge of said blade for scarifying use on the lower edge of the blade and for support out of scarifying position upon the upper edge of the blade, and means for detachably securing the scarifier to the grader blade, said means including a flange on the back of the blade, a fastening device removably engaged with said flange, and a lug on the scarifier fitting the back of the blade and extending between the back of the blade and said fastening device, said lug being notched to interlock with said stop.

8. In combination, a grader blade having a relatively thin edge, a flange on the back of said blade, an edge member grooved to receive the edge of the blade, a fastening device removably engaged with said flange, and a lug on the edge member fitting between the back of the blade and extending between the back of the blade and said fastening device.

9. In combination, a grader blade having a relatively thin edge and a vertical flange on the back of the blade, an edge member grooved to receive the edge of the blade and having a vertical lug grooved to straddle said flange, and a pin detachably secured in said flange and confining the sides of the grooved lug between the back of the blade and said pin.

In witness whereof, I hereunto subscribe my name this 26th day of February, 1927.

JOHN H. GUNNISON.