This invention relates to implement blade-equipped machines such as bulldozers, angle-dozer snowplows and the like.

Particularly the invention relates to implement blade-equipped tractors, wherein push beams for the blade are adaptably mounted on the tractor to tilt or cock the blade relative to the tractor axle and wherein a winch-operated cable on the tractor is trained around sheaves that are so arranged as to guide the cable for exerting a direct pull to raise and lower the blade relative to the tractor.

The invention will be hereinafter specifically described as embodied in an angle-dozer, but it should be understood that the principles of this invention are generally applicable to other types of material-handling apparatus, and especially implement blade-equipped tractors.

It is frequently desirable to tilt or cock the blade of an angle-dozer relative to the axle of the tractor, so that a transversely inclined scraping edge is presented to the surface being acted upon. This inclined edge is highly desirable in grading roads for crowning the road, in starting a trail in a hillside, and in other surfacing operations.

The present invention provides an angle-dozer blade frame mounting for carrying the angle-dozer blade in any one of a large number of tilted or cocked positions, thereby providing a very fine tilting adjustment for the blade.

The tilting blade mounting of this invention is small and compact, but it provides for a wide range of tilting or cocking of the blade, at least twelve inches of tilting being preferable. The blade frame, in accordance with this invention, is adaptably carried by push beam brackets which are pivotally mounted on the tractor about an axis in line with the oscillating points for the tractor track frames, so that no strain is imparted to the blade frame when the tractor track frames are oscillated relative to each other.

The blade frame is raised and lowered relative to the tractor by a winch-actuated cable. A twin windeer drum winch is mounted on the rear end of the tractor. The cable passes through a tube overlying the tractor supported at its rear end by the upright frame and supported at its front end by a saddle or frame mounted on the front end of the tractor body. The saddle or frame carries a sheave receiving the cable from the tube. The blade frame has a cross beam in front of the tractor carrying a universal joint midway between the push beams of the frame. A rigid sheave carrying bar has one end thereof support by a universal joint and the other end thereof rotatably carrying a sheave for receiving the cable. The end of the cable is anchored to the front saddle or frame. A leaf spring is provided for urging the bar into upright position so that the sheave on the bar will not become fouled when the cable is slack. The bar carries the sheave at a level above the top of the blade, so that this sheave can be brought into contact with the saddle-carried sheave when the blade is in maximum elevated position. The universal joint permits the bar-carried sheave to swing so that the sheave thereon will always be in direct alignment with the saddle-carried sheave.

It is, then, an object of this invention to provide a cable-actuated angle-dozer, bulldozer or the like, which is adaptable to angle-dozer blade-equipped tractor with a tilting blade carrying frame for cocking the blade, and a cable sheave arrangement that always guides the cable for exerting a direct pull on the blade frame.

Specifically this invention relates to push beam brackets for bulldozers and the like which adaptably support push beams to cock or tilt the bulldozer blade throughout a wide range without presenting a cumbersome assembly.

Another specific object of the invention is to provide a tilting blade mounting for scraper blade-equipped tractors wherein stub shaft brackets are secured to the axle brackets of a tractor and pivotally support push beam brackets having an upstanding arcurately grooved push beam receiving portions to adjustably carry push beams. A still further object of the invention is to provide a tilting frame mounting for tractor-carried blade frames which swings the frame about a central axis for cocking the blade in any one of a large number of closely spaced positions to provide a very fine adjustment for the blade.

Other and further objects of the invention will be apparent to those skilled in the art from the following detailed description of the annexed sheets of drawings which, by way of a preferred example, illustrate one embodiment of the invention.

On the drawings:

Figure 1 is a side elevational view, with a part broken away and shown in vertical cross section, of a cable-actuated angle-dozer according to this invention.

Figure 2 is a rear end elevational view of the angle-dozer shown in Figure 1.

Figure 3 is a front end elevational view of the angle-dozer shown in Figure 1, with part of the blade broken away to show underlying parts.
Figure 4 is a fragmentary, somewhat diagrammatic, rear end elevational view of the tilting blade mounting illustrating the blade in horizontal or uncocked position, and the self-aligning sheave in vertical position.

Figure 5 is a view similar to Figure 4, but illustrating the blade in cocked position, and showing how the self-aligning sheave remains in vertical position.

Figure 6 is a vertical cross-sectional view, with parts in rear end elevation, taken along the line VI—VI of Figure 3.

Figure 7 is a fragmentary rear elevational view taken substantially along the line VII—VII of Figure 6.

Figure 8 is a fragmentary side elevational view, with a part broken away and shown in vertical cross section, of the tilting mounting for the blade frame.

Figure 9 is a vertical cross-sectional view, with parts in rear end elevation, taken along the line IX—IX of Figure 8.

Figure 10 is a vertical cross-sectional view taken along the line X—X of Figure 8.

As shown on the drawings:

In Figures 1 to 3 inclusive the reference numeral 10 designates generally a tractor having a main body portion 11, a tractor track frame 12 on each side of the body 11, and track laying belts 13 trained between driven rear sprockets 14 and front idler wheels 15. Each sprocket 14 is rotatably mounted on a dead axle 16 which, as best shown in Figure 9, is surrounded by an axle bracket 17 to which the track frame 12 is bolted. The track frames 12 thereby oscillate about the dead axle 16.

A twin drum winch 18 is mounted on the rear end of the tractor body 11 and has winder drums 18a and 18b thereon in side by side relation. Handles 19 operate clutches and brakes for selectively driving and braking the winder drums 18a and 18b. Sheaves 19a and 19b are rotatably mounted in side by side relationship above the drums 18a and 18b respectively for selectively receiving a cable C from one of the drums.

A U-shaped blade-carrying frame 20 is provided for the angled up blade B. This frame 20 has side push beam arms 20a and a cross arm 20b, as best shown in Figures 1 and 6. The side arms 20a straddle the tracks 13 and the cross arm 20b extends across the front of the tractor body 11.

The blade B is pivotally mounted midway between its ends on a vertical pin 21 which, as shown in Figure 6, is carried by a bracket 22 on the cross arm 20b. The blade B can thus be swung about a vertical axis into selected angle-doe and bulldozer positions.

The ends of the blade B are pivotally connected on vertical pivot pins 23 to struts 24 which are adjustable on the side push beam arms 20a along the lengths of these arms by means of anchor pins 25. The struts hold the blade B in adjusted position on its center pivot 21.

The axle brackets 17 of the tractor, as shown in Figure 9, have stub shaft brackets 26 bolted thereon by means of bolts 27. Each stub shaft bracket 26 has a stub shaft portion 26a projecting outwardly from the tractor in line with the dead axle 16. Push beam brackets 28 engage a cylindrical bearing portion 28b pivotally mounted on each stub shaft 26a, together with an arcuate upstanding flange portion 28b struck from a radius R centered on the axle mid-point O of the tractor axles 18, as best shown in Figs. 4 and 5. The upstanding arcuate flange 28b has an arcuate groove 29 therein struck from a radius centered on the same center O. This arcuate groove 29 has arcuate open ends, but is closed at the inner end thereof by an abutment wall 30 as best shown in Figure 8. Webs 28c reinforce the abutment wall 30 and are connected to the cylindrical portion 28a of the bracket 28. The upstanding arcuate portion 28b, as best shown in Figures 1 and 8, has a plurality of holes 31 therethrough spaced along the length thereof and intersecting the groove 29. The holes 31 are preferably arranged in groups near the top and bottom ends of the flange 28b. As shown, a pair of closely spaced holes 31 is provided adjacent the bottom end of the flange, while a second pair of holes 31 is provided adjacent the top end of the flange, for a purpose to be more fully hereinafter described.

The push beam arms 26a have upstanding arcuate flanges 32 integrally affixed to the rear ends thereof. These flanges 32 are struck from the same radius as the groove 29 and are adapted to project into the groove to be fully bottomed on the abutment wall 30 as best shown in Figure 8. The flanges 32 are longer than the flanges 28b of the push beam brackets 28, but the open ends of the groove 29 permit the ends of the flanges to project from the grooves. The flanges 32 have holes 33 in closely spaced relation from the top to the bottom ends thereof. Two holes 33 of the flange 32 are adapted to be aligned with at least one hole of each pair of holes 31. Locking pins 34 project through the aligned holes 31 and 33 for adjusting the carrying the flanges 32 in the groove 29 of the bracket 28. These pins are conveniently secured in position by means of links 35 bolted on the outer faces of the flanges 28b by means of bolts 36. The links 35 have recessed free ends 35a extending into the grooves 34c provided on the pins 34. The bolts 36 can be removed to permit the links 35 to be withdrawn from the grooves 34c, and the pins 34 can then be readily pulled out of the holes for readjustment of the frame 20.

The blade 20, with holes 31 at its top and bottom ends of the flange 28b make possible a further shifting of the flanges 32 to increase the range of adjustment since, in extreme lowered positions, the flanges 32 may be below the top holes 31 to have their top holes 33 aligned with the bottom hole of the top pair of holes 31. Conversely, the flange 32, in extreme raised position, can have its bottom hole 33 aligned with the top hole 31 of the bottom pair of holes.

The frame 20, as illustrated in Figures 4 and 5, is tilted throughout a relatively wide range by selectively securing the flanges 32 of the push beams in the brackets 28. This tilting of the frame 20 in carrying the struts and pivot pin 21 therewith, of course, tilts the blade B throughout the same range. Since the tractor track frames oscillate about the dead axle 16, and since the push beam brackets are pivoted coaxially with this dead axle, the blade B is not subjected to any warping strains during independent oscillation of the tractor track frames, as when the tracks 13 move over uneven ground.

At the same time, however, the frame 20 can be carried in the selected cocked or tilted position, and will remain in this position relative to the dead axle 16. Thus the frame 20 is adjustable cocked or tilted relative to the axis of the dead axle of the tractor but, when so adjusted, the
frame remains in the same angular relation relative to the dead axle and will carry the blade in response to the positions assumed by the dead axle in operation of the tractor.

The abutment wall 36 rigidly backs up all push loads on the frame 39 and the pins 34 only serve to lock the push beam flanges in adjusted relation relative to the push beam brackets.

The bracket 32 on the cross beam 20b of the frame 39 carries a universal joint 37 composed of upstanding ears 37a on the bracket 32, a first pin 37b pivoted in the ears 37a and pivotally carrying a joint member 37c which is pivoted by a second pin 37d to ears 37e on the lower end of a bar 38. The ears 37e thus tilt in all directions relative to the frame 39, but is held against rotation relative to the frame.

A sheave frame 39 is secured on the upper end of the bar 38 and a pair of sheaves 40 is rotatably mounted in the frame 39 in side by side relation as shown in Figures 5, 6, and 7.

As shown in Figures 6 and 7, a leaf spring 41 is pivotally mounted for limited sidewise swinging movement on the cross beam 20b. The leaf spring 41 has a bottom end portion held against the vertical wall of the beam 20b by means of a bracket 42 bolted on the beam by means of bolts 43 and carrying a pivot pin 44 which projects through the spring and beam. The pin 44 is welded to the bracket 42. The bracket 42 has an offset portion 42a receiving the spring 41 therein and accommodating limited swinging movement of the spring.

The upper end of the spring 41 is embraced by a strap 45 secured on the bar 38 and having inner rocking faces 45a to accommodate rocking movements of the leaf spring 41 relative to the bar 38. The leaf spring 41 is slidable through the strap 45 and has a flange 41a on the free end thereof to prevent withdrawal of the spring from the strap.

As illustrated in Figure 6, the spring 41 urges the bar 38 into upright position toward the blade 30, and permits rearward swinging of the bar as shown by dotted lines. As shown in Figure 7, the pivotal mounting of the spring and the arcuate rocking faces 45a of the strap 45 permits the frame beam 20b to tilt without tilting the bar 38.

The bar 38 carries the sheaves 40 above the top of the blade 30 for a purpose to be hereinafter described. The top of the sheave frame 39 has an abutment block 46 secured thereon for a purpose to be more fully hereinafter described.

As best shown in Figures 1 and 3, the sides of the body 11 have brackets 46 secured thereon near the front end of the body. These brackets carry pins 47. A U-shaped frame or saddle 50 has side arms 50a straddling the tractor body, and a cross arm 50b overlying the tractor body. The bottom ends of the arms 50a have flanges 51 secured thereon extending into the brackets 46 and pivotally carried by the pins 47. Brasses such as 52 are pivotally secured to brackets such as 53 on the side arms 52 and are anchored on the body 11 rearwardly from the brackets 46 to hold the saddle frame 50 in upright forwardly inclined position.

A sheave block or frame 54 is fixedly carried by the cross arm 50b of the saddle frame 50 and projects forwardly of the tractor body as best shown in Figure 1. This sheave frame 54 rotatably supports a pair of sheaves 55 in side by side relation as shown in Figure 3. An abutment block 54a is provided at the bottom of the frame 54 for opposing the block 39a of the frame 39.

The cable C has the free end thereof anchored to a clamp 60 on the side of the sheave frame 39. The cable is trained from this anchor 60 around the first sheave 39 in the frame 39, thence around the second sheave 40 in the frame 39, and thence around the second sheave 50 in the frame 54.

A tube 61 is pivoted at 62 to the cross beam 20b of the saddle frame 50 immediately behind the sheave frame 39 for receiving the cable from the second sheave 40. The rear end of the tube 61 is pivoted at 63 to a frame 64 which is pivoted at 61 to the winch 10. This frame 64 includes a pair of depending legs 65a which straddle the upper portion of the winch 10 to receive the pivots 61. A reversible sub-frame 62 mounted on the frame 64 provides a universal mounting for an inclined sheave 68 permitting the cable C to be directed out of the rear end of the tube 61 to either sheave 39 or 40 of the winch assembly, depending upon whether the winder drum 18a or 18b of the winch is being used. This reversible universal mounting is desirable to permit changing from one winder drum to the other in the event of failure of operation of a drum.

The sheave arrangement is such that either the winder drum 18a or 18b will have a direct, unobstructed pull on the cable C which passes freely through the tube 61 and around the sheaves 39 and 40 to have a direct pull on the frame beam 20b. The bar 38 carrying the sheave frame 39 can tilt on its universal joint support so that the sheaves 40 will always be aligned with the sheaves 39 and the cable running between these sheaves 39 and 55 and 55 cannot become fouled. The abutment blocks 39a and 54a likewise will always be aligned and, in the event the blade is raised to its maximum height, no damage will be done to the sheaves because the abutment blocks will be the first members to come together.

The sheaves 40 will not get fouled behind the blade 30 because the bar 38 carries these sheaves at a level above the top of the blade. Then when the cable is slack, the spring 41 will hold the bar 38 in upright position to prevent fouling of the cable runs. The spring, however, will flex to permit fore and aft movement of the sheave frame 39 such as occurs during raising and lowering of the frame 20.

From the above descriptions it will be understood that this invention provides a cable-actuated scraper blade assembly on a tractor or the like wherein the blade can be cocked relative to the tractor without straining any of the parts and wherein the cable is so guided as to have a direct pull on the blade.

I claim as my invention:
1. In combination with a tractor having a body, a dead axle, axle brackets, and track frames secured to said brackets, a stub shaft bracket secured to said axle brackets and having the stub shaft portions thereof coaxial with the dead axle, push beam brackets each having a bearing portion pivoted on the stub shaft and an upstanding arcuately grooved portion with locking pin holes at spaced intervals along the length thereof, their rear ends having upstanding arcuate flanges along the length thereof, a blade extending across the front of the tractor carried by said push beams, and locking pins extending through mating holes of the flanges and push beam brackets for securing the push beams in selected positions in the brackets to carry the blade in
desired parallel or tilted relation relative to the dead axle of the tractor.

2. In combination with a tractor having a dead axle, axle brackets pivoted on the dead axle, track frames secured on said brackets, a stub shaft bracket secured to each axle bracket and having the stub shaft portion thereof coaxial with the dead axle, push beam brackets each having a bearing portion pivoted on the stub shaft and an upstanding push beam receiving portion, push beams having ends mating with said upstanding receiving portions of the relative levels of the ends, a blade carried by said push beams, and means securing the ends of said push beams in selected relation to said upstanding receiving portion of the push beam brackets for carrying the blade in desired parallel or cocked relation relative to the dead axle.

3. In combination with a tractor having a dead axle and track frames oscillated about said dead axle, push beam brackets secured on said tractor having stub shafts coaxial with said dead axle, a rigid frame having push beams straddling said track frames, upstanding end flanges on said push beams constructed and arranged to mate with said brackets at variable relative levels of the flanges without warping the rigid frame, a blade carried across the front of the tractor by said frame, and means selectively connecting said push beams with said brackets to carry the blade in desired inclined or parallel relation to the dead axle.

4. A tilting blade mounting for scraper blade-equipped machines which comprises brackets adapted to be fixedly connected to the machine, said brackets being extendable outwardly therefrom, push beam brackets pivoted on said stub shafts, and upstanding arcuate push beam receiving portions on said push beam brackets for carrying the ends of the push beams in selected positions and laterally tilting a blade carried by the push beams, said arcuate push beam receiving portions being struck from radii centered on a tilting axis for the blade to mate with the push beam ends in all selected positions.

5. A tilting blade mounting for scraper equipped tractors and the like machines which comprises brackets pivotable to said tractor having stub shafts projecting outwardly therefrom, push beam brackets pivoted on said stub shafts having arcuate upstanding push beam receiving grooves, scraper carrying push beams having arcuate upstanding rear end portions adjustably mounted in said receiving grooves of said push beam brackets to carry the scraper in desired tilted positions, and said arcuate grooves and said bracket being struck from radii centered on the tilting axis of the tractor to accommodate the various desired tilted positions of the scraper.

6. A tilting blade mounting for an angledozer carried by a tractor having a dead axle which comprises a pair of brackets secured to opposite sides of the tractor and each having a stub shaft projecting laterally from the tractor in coaxial alignment with the dead axle, push beam brackets pivotable on the stub shafts having upstanding mounting portions, an angledozer frame having side push beams straddling the tractor and detachably secured to the mounting portions of the push beam brackets, an angledozer blade, a vertical connecting said blade to said brackets and means including mating arcuate members struck from radii centered on an axis of tilt for adjustably shifting the push beams relative to the push beam brackets for tilting the angledozer frame and the vertical pivot for the angledozer blade relative to the dead axle of the tractor for selectively inclining the blade to present an inclined cutting edge.

7. A mounting for tractor carried implement blades which comprises a bracket having a portion adapted to be fixedly attached to a tractor and a stub shaft projecting outwardly therefrom, a push beam bracket pivoted on said stub shaft and having an upstanding arcuateely grooved portion, an arcuate push beam flange adapted to be seated in the groove of said bracket portion, said bracket portion and arcuate flange having a plurality of holes therethrough adapted to be selectively aligned, locking pins seatable in said holes, said pins having grooves therein adjacent the outer ends thereof, links having recesses receiving the grooved portions of said locking pins, and bolts connecting said links to said push beam bracket for securing the locking pins in position.

8. A tilting blade mounting for tractors and the like machines which comprises a stub shaft bracket pivotable to a tractor or the like, a push beam bracket pivotable on the stub shaft and having an elongated grooved portion with a plurality of locking pin holes along the length thereof, a push beam flange seatable in the groove of said grooved portion against the bottom of the groove and having a plurality of locking pin holes along the length thereof, and locking pins selectively seatable in aligned holes of said push beam bracket and flange for carrying the flange at selected levels relative to the push beam bracket.

9. In combination with a tractor, a pair of stub shaft brackets secured to the tractor and having stub shafts projecting laterally from the tractor, a push beam bracket pivoted on the stub shafts, an implement blade frame having side push beams straddling the tractor, flanges on said push beams selectively attachable to said push beam brackets, said flanges and said push beam brackets having interfitting arcuate portions struck from radii centered on the longitudinal central axis of the tractor, and means selectively attaching said flanges and push beam brackets to tilt the frame for carrying the implement blade to present an inclined scraping edge.

10. A tilting blade mounting for tractor carried implement blades which comprises a stub shaft bracket fixedly attachable to a tractor in co-linear alignment with the dead axle shaft of the tractor, a push beam bracket pivotable on the stub shaft dead axle having an upstanding arcuate grooved portion struck from a radius centered on the longitudinal axis of the tractor, a push beam having an arcuate flange projecting into a groove of said push beam bracket to be bottomed against the bottom of said groove, said flange having a plurality of closely spaced holes therethrough, said arcuate grooved portion of the push beam bracket having at least one hole adapted to be selectively aligned with the holes in said push beam flange, and a locking pin insertable through the alignment of said push beam brackets and said flange for securing the push beam to the push beam bracket.

11. A tilting blade mounting for scraper blade-equipped machines which comprises brackets adapted to be fixedly connected to the machine having a blade with said tractor, said blade having a plurality of holes therethrough, push beam brackets pivoted on said stub shafts, and a plurality of arcuate push beam receiving portions on said push beam brackets for
carrying the push beams in a plurality of selected tilted positions in either direction.

12. In combination with a tractor, a blade frame having side arms and arcuate means struck from radii centered on a common tilting axis for attaching the side arms to the tractor in selected positions to tilt the frame in either direction in a plurality of selected tilted positions.

13. In combination with a vehicle having a U-shaped blade-carrying frame pivoted thereon with the sides of the frame straddling the vehicle and the connecting portion of the frame extending across an end of the vehicle, means for adjustably mounting the ends of the sides of the frame on the vehicle for laterally tilting the frame relative to the vehicle, a universal joint mounted on the frame at the central portion of the connecting portion thereof, a bar extending upwardly from said universal joint to a level above the top of the frame, and a cable operatively connected to the upper end of said bar and attached to said vehicle for raising and lowering the frame about the pivots whereby said cable will always have a direct pull on said bar irrespective of the tilted position of the frame.

HARRY H. WASHBOND.

REFERENCES CITED

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

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,061,929</td>
<td>LeTourneau</td>
<td>June 1, 1937</td>
</tr>
<tr>
<td>2,084,690</td>
<td>Knapp</td>
<td>June 22, 1937</td>
</tr>
<tr>
<td>2,089,485</td>
<td>Knapp</td>
<td>Aug. 10, 1937</td>
</tr>
<tr>
<td>2,136,551</td>
<td>Knapp</td>
<td>Nov. 15, 1938</td>
</tr>
<tr>
<td>2,159,348</td>
<td>Austin</td>
<td>May 23, 1939</td>
</tr>
<tr>
<td>2,169,606</td>
<td>Hutchins et al.</td>
<td>Aug. 15, 1939</td>
</tr>
<tr>
<td>2,178,280</td>
<td>Hutchins et al.</td>
<td>Oct. 31, 1939</td>
</tr>
<tr>
<td>2,182,412</td>
<td>Stewart</td>
<td>Dec. 5, 1939</td>
</tr>
<tr>
<td>2,215,025</td>
<td>Austin</td>
<td>Sept. 17, 1940</td>
</tr>
<tr>
<td>2,256,982</td>
<td>Lawler</td>
<td>Sept. 23, 1941</td>
</tr>
<tr>
<td>2,275,390</td>
<td>Lawler</td>
<td>Mar. 3, 1943</td>
</tr>
<tr>
<td>2,304,075</td>
<td>Davidson et al.</td>
<td>Dec. 8, 1943</td>
</tr>
<tr>
<td>2,335,851</td>
<td>Fox et al.</td>
<td>Dec. 7, 1943</td>
</tr>
<tr>
<td>2,344,417</td>
<td>Schmidt et al.</td>
<td>Mar. 14, 1944</td>
</tr>
<tr>
<td>2,347,290</td>
<td>Schaeffer</td>
<td>Apr. 25, 1944</td>
</tr>
<tr>
<td>2,365,677</td>
<td>Burns</td>
<td>Dec. 26, 1944</td>
</tr>
<tr>
<td>2,408,268</td>
<td>Peterson et al.</td>
<td>Sept. 24, 1946</td>
</tr>
<tr>
<td>2,451,348</td>
<td>Miller</td>
<td>Oct. 12, 1948</td>
</tr>
</tbody>
</table>