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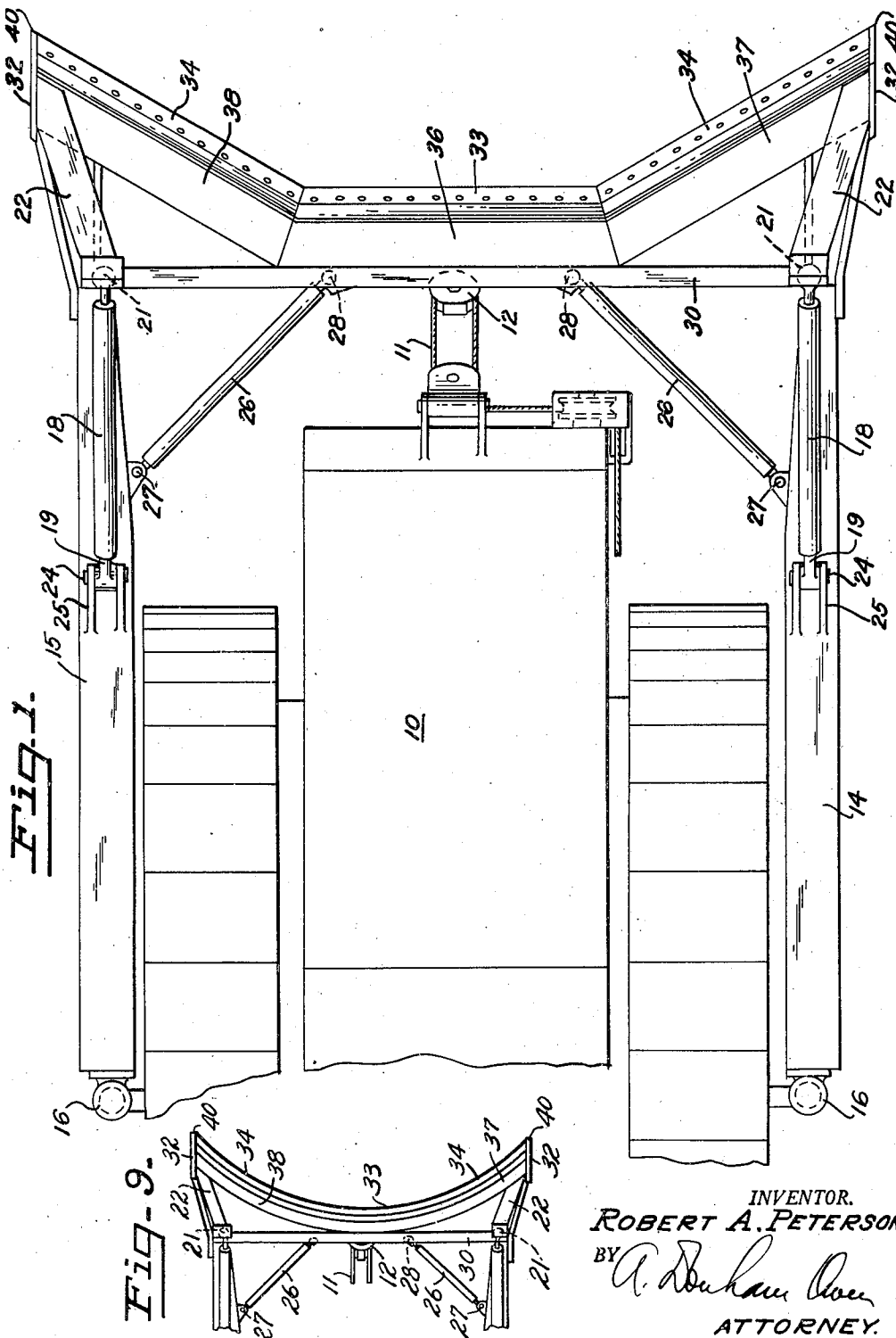
R. A. PETERSON

2,485,407

BULLDOZER

Filed April 8, 1947

4 Sheets-Sheet 1



INVENTOR.
ROBERT A. PETERSON
BY *A. Durham*
ATTORNEY.

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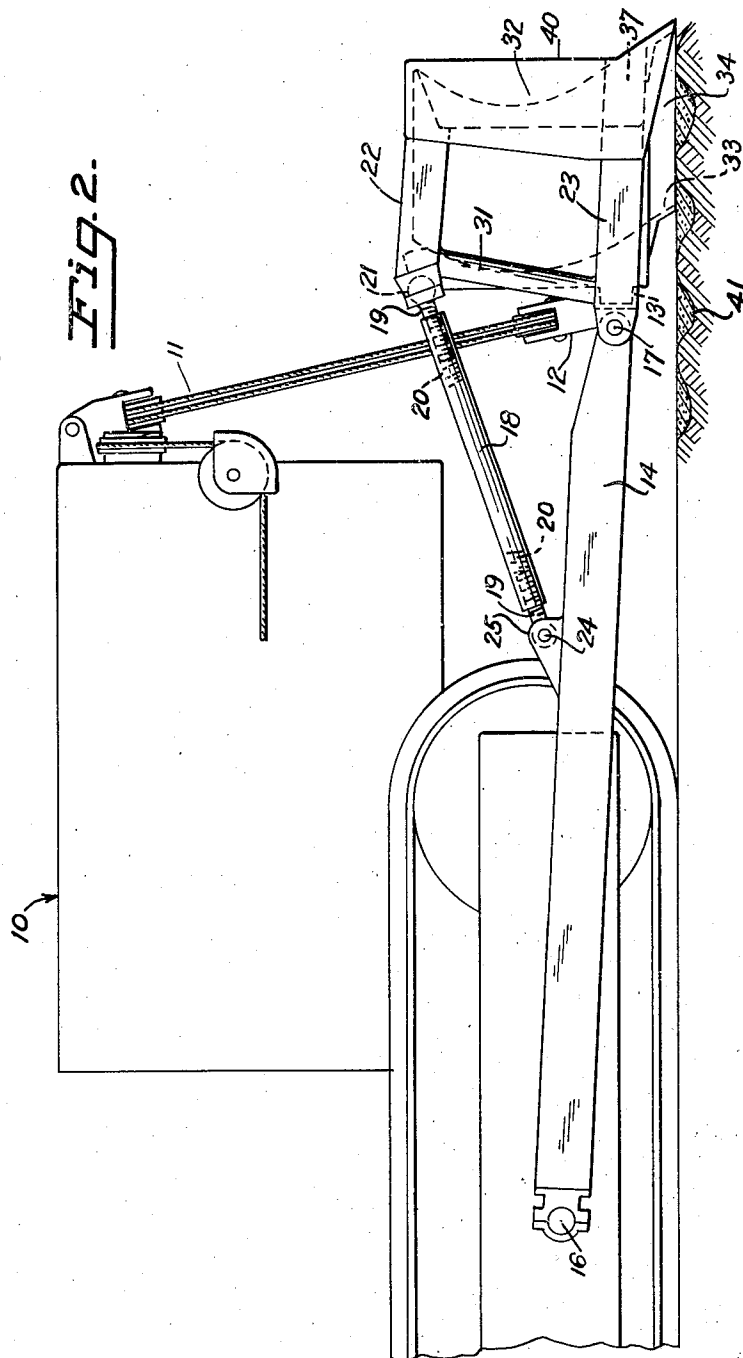
R. A. PETERSON

2,485,407

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4 Sheets-Sheet 2



INVENTOR.
ROBERT A. PETERSON
BY *William Allen*
ATTORNEY.

Oct. 18, 1949.

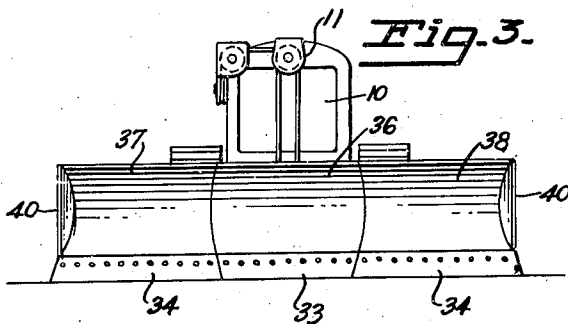
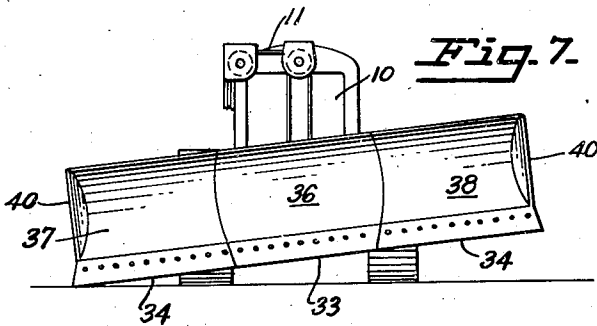
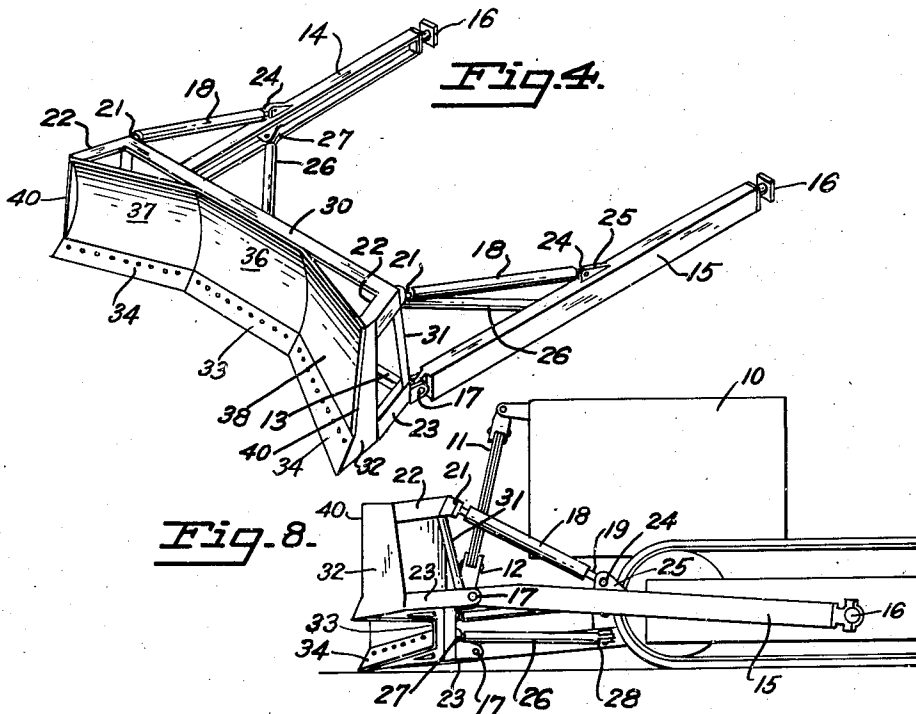
R. A. PETERSON

2,485,407

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4 Sheets-Sheet 3



INVENTOR.
ROBERT A. PETERSON
BY *A. Duhaime Owen*
ATTORNEY.

Oct. 18, 1949.

R. A. PETERSON

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BULLDOZER

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4 Sheets-Sheet 4

Fig. 5.

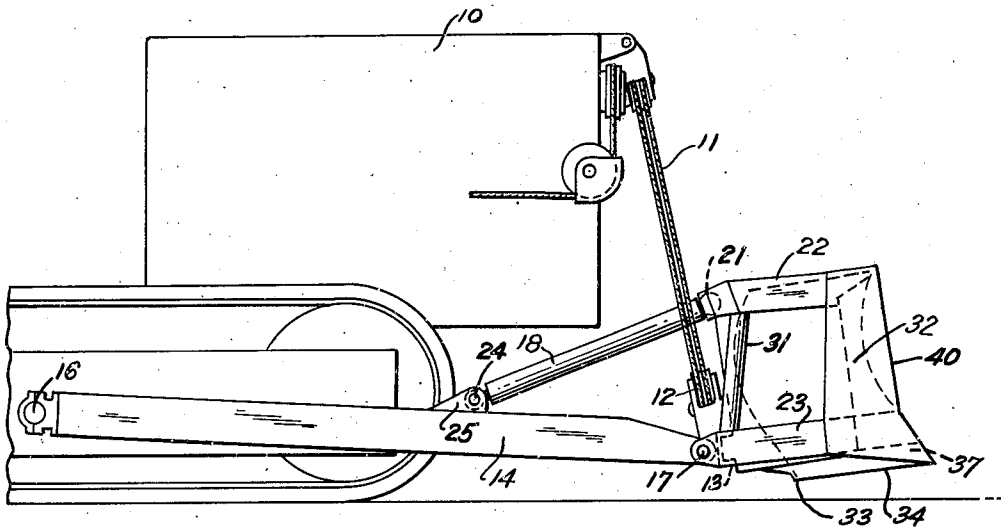
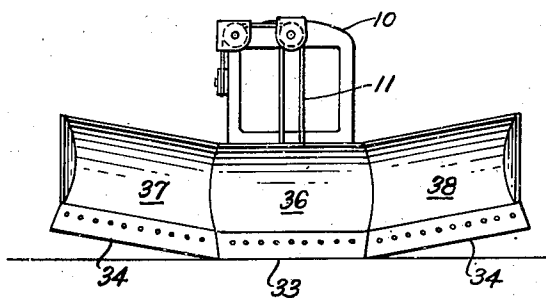


Fig. 6.



INVENTOR.
ROBERT A. PETERSON
BY *A. Duhan Allen*
ATTORNEY

UNITED STATES PATENT OFFICE

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BULLDOZER

Robert A. Peterson, San Leandro, Calif.

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6 Claims. (Cl. 37-144)

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This invention relates to improvements in earth-moving implements of the type known generally as "bulldozers."

A bulldozer is a blade mounted in front of a tractor, preferably of the continuous-tread type. When impelled by the tractor it can do many things which call for moving earth, such as leveling ground, digging holes, building roads on the level or carving them in the sides of hills.

Up to the present, two general types of bulldozers have been developed. One is the straight bulldozer in which the blade is mounted perpendicular to the path of movement of the tractor and is used mostly for moving earth and for levelling or scraping. The other is the angle bulldozer in which the blade is set at an inclined angle to the path of movement of the tractor and is used mostly for digging into banks of earth and for moving the earth over the low side of a cut in road building. Each of these types of bulldozers is limited to certain kinds of work, and most jobs call for the use at some time of both types. This has meant that either an extra blade must be carried along in a truck to replace the other type of blade, or a form of mounting must be provided so that the blade can be swung to either side from its straight position and used for both purposes. Carrying an extra blade means transportation problems and operator's time in changing from one to the other. Using a single blade mounted to function in one position as a straight bulldozer and in an inclined position as an angledozer leads to an inefficient operation.

An angle bulldozer cannot become an efficient straight bulldozer merely by having its blade placed straight. In the first place, the blade of an angle bulldozer must be longer than that of a straight bulldozer because it should extend at an angle for the full width of the tractor. If such a long blade is moved into a straight-across position it is much too wide for the tractor to push when digging. A corollary is that if a straight bulldozer of proper width were set at an angle to use it as an angle bulldozer, the earth will be spilled in the path of the tractor track or wheels because as an angle bulldozer the blade is too short. Another fault of the conventional adjustable angle bulldozer arises from the fact that the digging corner of the blade is so far out in front of the tractor itself that 15 to 20 percent of the power is lost. Also, the blade must be suspended from a supporting frame light enough not to be too great a weight or drag on the front of the tractor. If it is made light it will not be sturdy enough to stand the maximum power the

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tractor is capable of exerting at the cutting edge. Thus efficiency has had to be sacrificed with all the prior art devices and a makeshift operation has resulted.

One important object of the present invention is to provide a new kind of bulldozer which can operate at full efficiency in performing all the principal functions of the straight and the angle type bulldozer, and which, in addition, can perform new functions not achieved heretofore.

Another important problem related to the use of earth-moving machines and solved by this invention is that heretofore the power of the tractor has been sufficient to carry far more earth than the bulldozer blade could keep in front of it. An ordinary bulldozer blade possesses a small earth-carrying capacity, and after this capacity is reached, the earth is lost around the edges of the blade. Vertical end plates to retain the earth are not satisfactory except in about ten percent of the cases, and the usual experience is that the operator soon cuts them off and abandons them. An angle bulldozer has even less carrying capacity because the earth sloughs off the trailing corner of the blade. Due to the fact that the blade in previous angle bulldozers had to be made so that either edge could be used for excavation by changing the position of the blade, it was not possible heretofore to provide an angle bulldozer with any flange to hold the dirt in. The low capacity of the prior art bulldozer blade required many additional trips to carry a load of dirt as compared with the number of trips necessary to carry the same load with my improved device. Therefore an important object of my invention is to get increased carrying capacity into a bulldozer so that earth which has been cut from a bank or scraped up from a surface can be carried any desired distance without losing it out of the bowl, and so that it can be dumped over a bank without losing it out the bowl as the tractor is swung to the side.

Another important object of this invention is to provide a bulldozer which without any changes or adjustments can dig from either edge or can scrape or level, functions which heretofore have been accomplished only with partial efficiency and then only by changes and adjustments which usually have required two men to stop what they were doing and spend time changing blades or adjusting the blade. Thus by my invention I provide a bulldozer which combines in one blade ready for instant use as an angledozer blade section to cut into a right or a left bank and having a vertical blade at the outer edge of each

angle blade section for making a simultaneous, substantially vertical cut in the bank.

Another important object of my invention is to provide a bulldozer in which the center set-back portion of the blade can be lowered into cutting position where a powerful scraping or digging action is required in front of the tractor. With present-day bulldozers it is impossible to scrape generally horizontally with a short central portion of the blade. Either the whole blade must be used or one or the other corners may be lowered to dig. By my invention I provide a bulldozer in which the effective cutting width of the blade can be reduced without substituting another shorter blade or in any way reducing the carrying capacity of the implement.

Another object of my invention is to improve the levelling characteristics of a bulldozer by providing side blade sections extending at an angle to the central generally transverse blade section so that when pushing earth along a surface having transverse gullies the angularly extending side sections will support the whole blade and prevent it from dropping into the gullies as the earth fills them in.

Other objects of my invention are to provide a bulldozer with a blade which can be tipped forward and back, tilted from side to side, and raised or lowered at its corners; to provide a bulldozer in which the power is always near the blade and is applied directly to the portion which is cutting or scraping; and to provide a more generally efficient and versatile bulldozer.

Other objects and advantages of this invention will become apparent from the following description, which is given in accordance with U. S. Revised Statutes, section 4888 as a detailed description of a specific embodiment of the invention, but which is not intended to limit the scope of the appended claims.

In the drawings:

Fig. 1 is a plan view of a bulldozer embodying my invention, the tractor being only generally indicated, since any appropriate type of tractor may be used;

Fig. 2 is a side view in elevation of the bulldozer shown in Fig. 1;

Fig. 3 is a view in front elevation of the same;

Fig. 4 is a view in perspective of the improved device attached to one form of mounting means;

Fig. 5 is a side view in elevation similar to Fig. 2, showing the blade tilted back so that the center portion alone is used to dig or to scrape;

Fig. 6 is a front view similar to Fig. 3, showing the blade tilted back to the digging position shown in Fig. 5;

Fig. 7 is a front view similar to Fig. 3 except that the blade is tilted sideways;

Fig. 8 is a side view of the blade and its mounting means when in the position shown in Fig. 7; and

Fig. 9 is a plan view of an alternative form of arcuate blade.

Broadly speaking, these drawings show an earth-moving implement adapted to be mounted on and propelled in front of a power-driven vehicle 10, comprising a cutting blade having a central set-back section 33 generally extending partially across the front of said vehicle, and side sections 34 extending forwardly and at an angle to said central section 33 (see Fig. 1), all of said sections lying in substantially the same plane (see Fig. 7); a concave body portion 36, 37, and 38 extending upwardly from said blade sections (see Fig. 2), an upwardly and forwardly extend-

ing cutting blade section 40 mounted adjacent the outer end of each of said angular blade sections 34 (see Fig. 4), arms 14, 15, 18, etc. for mounting said implement on said vehicle, and lifting means 11 for raising and lowering said implement. The arms 18 may be shortened to tilt the cutting blade about an axis generally parallel with the driving axle of the tractor 10 so that the central section 33 of the cutting blade is lowered in relation to the outer extremities of the side cutting sections 34 (see Figs. 5 and 6).

Referring more specifically to the illustrative device in the drawings, the tractor 10 is a conventional, continuous track type of tractor, such as provides the impelling means for any of the bulldozers now in use. A pulley system 11 is mounted on the front of the tractor 10 and supports the block 12 which is pivotally fixed to the bulldozer frame member 13. The rigid support arms 14 and 15 are each fastened to the driving frame of the tractor 10 by a ball and socket joint 16 which permits movement up and down and also permits a limited relative sidewise movement when in the position shown in Fig. 8. The opposite end of each of the arms 14 and 15 is connected to the bulldozer frame at the joint 17. The bulldozer is supported and adjusted relative to the arms 14 and 15 by the spacer members 18, which are rotatable and engage the exteriorly threaded rods 19 with their interior threads 20. The upper threaded rods 19 are connected with ball-and-socket type joints 21 near the top corners of the bulldozer side frame members 22 and the lower threaded rods 19 are pivoted at 24 to a bracket 25 secured on each of the arms 14 and 15. Cross braces 26 hold the bulldozer frame in lateral alignment with the tractor. These braces are pivoted at 27 to the arms 14 and 15 and have ball and socket joints 28 where they connect to the bulldozer frame cross member 13.

The bulldozer frame should be sufficiently strong to support the cutting blade properly at all points. The one illustrated here is composed of the lower horizontal cross-member 13, a similar upper member 30, vertical corner posts 31, and side frame members 22 and 23 which are tied together at the front by the heavy vertical cutting plate 32. There may be as many additional supporting braces as a designer may choose but those shown here have proven adequate in use.

The bulldozer blade consists preferably of three blade portions: a center set back portion 33, and two sloping side portions 34 and 34, which extend at an angle out from and forward of the center portion 33. Concave body portions 36, 37, and 38 extend upwardly from these blade portions. Although any dimensions may be used, I have found that a very efficient blade is made by having each of these three cutting blade portions about four feet long and the concave portion about three feet high. A good angle for the forwardly extending side blade sections 34 in relation to the central blade section 33 is about 30 degrees, as shown in Fig. 1. When viewed as in Figs. 2, 3 or 7 all of the cutting blade edges 33 and 34 lie in substantially the same plane. Mounted adjacent the outer end of each of the side sections 34 is the forwardly and upwardly extending cutting plate 32, having a cutting edge 40 which can be used for cutting vertically into the sides of hills.

Another form of blade which can accomplish many of the features of this invention is one essentially like the above where each section 36, 37, and 38 is curved instead of being straight.

See Fig. 9. Such a blade has good digging and earth-carrying characteristics and is intended to come within the scope of the claims appended hereto. Except for the fact that more welding would be involved the sections 33 and 34 could be divided up into more sections and still accomplish the results of my invention. An important feature of this invention is the fact that the cutting blade slopes inwardly at each outer edge and that these inwardly sloping sections are joined by a straight or gently curved central set back blade section.

The blade as shown in the drawings includes two angularly set sections 34 which are set to cut in the manner of an angledozzer. If the two blades 37 and 38 came together at an angle like a 'V', many of the objections already noted about angle bulldozers would apply, with the additional objection that not very much of a bowl would be formed for carrying dirt. The set back center portion 36 extending partway across the front of the tractor 10 gives depth to the dirt-carrying bowl and also renders it possible to place the cutting blades very close to the tractor, so that the power is applied to the ends of the blades 36 and 37 through arms 14 and 15 which are practically no longer than those in use on ordinary straight bulldozers and can be just as sturdy. In other words, the cutting is done by a blade which is close in to the tractor, is ready to use for angle dozing or straight cutting; and is not one pivoted as in the prior art at the end of a frame set far enough out in front of the tractor so that there is clearance for the operator to tilt it to either side when using it as an angledozzer for digging on opposite banks.

Among other things, what my invention has done is to put carrying capacity into a bulldozer plus providing an angledozzer on either side ready for immediate use without any adjustment by the operator.

Figs. 5 and 6 illustrate how with my device it is possible to cut down the digging width to substantially that of the middle blade section 33 plus a small bit of the angularly set adjacent blade sections 34. This is done by shortening the arms 18 which tilt the implement about an axis generally parallel with the driving axle of the tractor 10. In other words, it raises the outer ends of the blade sections 34 in relation to the blade section 33. In Figs. 5 and 6 the blade is in this tilted position ready to be pushed forward by the tractor. The depth of cut can be regulated by the cable 11. As the tractor moves forward the dirt will roll up in front of the concave section 36 and spread sidewise into the sections 37 and 38. The digging will be confined mostly to the earth below the blade section 33.

Fig. 2 illustrates another advantage of this construction where the forwardly extending side blade sections 34 serve as runners or supports for the center blade section 33 and prevent the blade from dropping into transverse ruts 41 in the road. The result is that the earth in the bowl will fall into these ruts and soon the surface will be smooth and packed.

The adjustment shown in Figs. 7 and 8 is useful where a road is being cut in a side hill and the blade should be set at an angle relative to the transverse axis of the tractor 10. By raising the blade vertically (by means of the pulley 11) and by shortening one of the adjusting members 18 relatively to the other, the natural adjustment of equilibrium will tilt the blade to one side as shown in Figs. 7 and 8. There the

blade portion 37 is considerably lower than the blade portion 38, and the entire blade may be as high above the ground as is desired, limited only by the height of the pulley system 11.

The great versatility of the invention renders it capable of use in many ways in construction work which heretofore have either been impossible or have required several different types of machines.

I claim:

1. An earth cutting and moving implement adapted to be mounted on and propelled in front of a power-driven vehicle, comprising a cutting blade lying substantially in one plane and being of generally arcuate shape when viewed in plan with the outer side portions of the blade pointing ahead of the central portion of the blade as mounted on said vehicle; side arms secured to said vehicle along its side and extending forward; transverse pivotal connecting means securing said cutting blade to the forward ends of said side arms; support arms transversely pivoted to said cutting blade at points spaced apart from where said side arms are connected to said blade, and pivoted to the forward ends of said side arms aft of where the blade is connected thereto; and means for changing the length of said support arms in relation to that portion of said side arms which lies between their forward ends and where said support arms are secured to it; whereby said arcuate cutting blade may be rotated about said transverse pivotal connecting means to bring the central portion of said blade into a lower cutting position than its outer side portions thereby reducing the effective cutting width of said blade.

2. An earth cutting and moving implement adapted to be mounted on and propelled in front of a power-driven vehicle, comprising a cutting blade lying substantially in one plane and being of generally arcuate shape when viewed in plan with the outer side portions of the blade pointing ahead of the central portion of the blade as mounted on said vehicle and having an upwardly and forwardly extending cutting blade section mounted adjacent the outer end of each of said outer side portions of the blade; side arms secured to said vehicle along its side and extending forward; transverse pivotal connecting means securing said cutting blade to the forward ends of said side arms; support arms transversely pivoted to said cutting blade at points spaced apart from where said side arms are connected to said blade, and pivoted adjacent said side arms aft of where the blade is connected thereto; and means for changing the length of said support arms in relation to that portion of said side arms which lies between their forward ends and where said support arms terminate; whereby said arcuate cutting blade may be rotated about said transverse pivotal connecting means to bring the central portion of said blade into a lower cutting position than its outer side portions.

3. An earth-moving implement adapted to be mounted on and propelled in front of a power-driven vehicle, comprising a cutting and carrying blade having a central cutting section extending partway across the front of said vehicle, and a side cutting section for each side with the cutting edge lying in substantially the same plane as the cutting edge of the central section, each side section being connected to said central section at its inner end and extending forwardly and outwardly from said central section to provide at each side of said implement a cutting edge generally angular in relation to the fore and aft

axis of said vehicle; arms for mounting said implement on said vehicle; transverse pivotal connections between said arms and said blade; and bracing means for supporting said blade in fixed relation with respect to said arms; said bracing means including means for adjusting said blade about an axis generally parallel with the driving axle of said vehicle whereby the central cutting section of said cutting blade may be lowered or raised in relation to the outer extremities of said side cutting sections.

4. A materials moving implement adapted to be mounted on a power-driven vehicle and propelled by the same, comprising a cutting, pushing and carrying blade having a central section extending part-way across said vehicle, and a side section for each side with the cutting edges lying in substantially the same plane as the cutting edge of the central section, each side section being connected to said central section at its inner end and extending forwardly and outwardly from said central section to provide at each side of said implement a cutting edge generally angular in relation to the fore and aft axis of said vehicle; means for mounting said implement on said vehicle; transverse pivotal connections between said means and said blade; and bracing means for supporting said blade in predetermined relation with respect to said mounting means; said bracing means including means for adjusting said blade about an axis generally parallel with the driving axle of said vehicle whereby the central cutting section of said blade may be lowered or raised in relation to the outer extremities of said side cutting sections.

5. A materials moving implement adapted to be mounted on a power-driven vehicle and propelled by the same, comprising a cutting blade lying substantially in one plane and being of generally arcuate shape when viewed in plan with the outer side portions of the blade pointing ahead of the central portion of the blade as mounted on said vehicle; side arms secured to said vehicle along its side; transverse pivotal connecting means securing said cutting blade to the ends of said side arms; bracing means transversely pivoted to said cutting blade at points

spaced apart from where said side arms are connected to said blade, and pivoted to said side arms to form a brace; and means for changing the length of said bracing means whereby said arcuate cutting blade may be rotated about said transverse pivotal connecting means to bring the central portion of said blade into a lower or higher cutting position than its outer side portions.

6. An earth cutting and moving implement adapted to be mounted on and propelled in front of a power-driven vehicle, comprising a cutting blade lying substantially in one plane and being of generally arcuate shape when viewed in plan with the outer side portions of the blade pointing ahead of the central portion of the blade as mounted on said vehicle; a side arm secured to said vehicle along each side; transverse pivotal connecting means securing said cutting blade to the ends of said side arms; a bracing means on each side of said vehicle transversely pivoted to said cutting blade at points spaced vertically apart from where said side arms are connected to said blade for supporting said blade in predetermined relation with respect to said arms; and means for changing the length of one or both of said bracing means in relation to the length of said side arms; whereby said arcuate cutting blade may be rotated about said transverse pivotal connecting means as well as about an axis extending on the fore and aft line of said vehicle to bring the central portion of said blade into a lower or higher cutting position than its outer side portions or to lower one corner into a lower cutting position than the other corner.

ROBERT A. PETERSON.

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