

April 2, 1935.

F. M. HARGRAVE

1,996,676

GRADER PLANER

Filed May 12, 1934

2 Sheets-Sheet 1

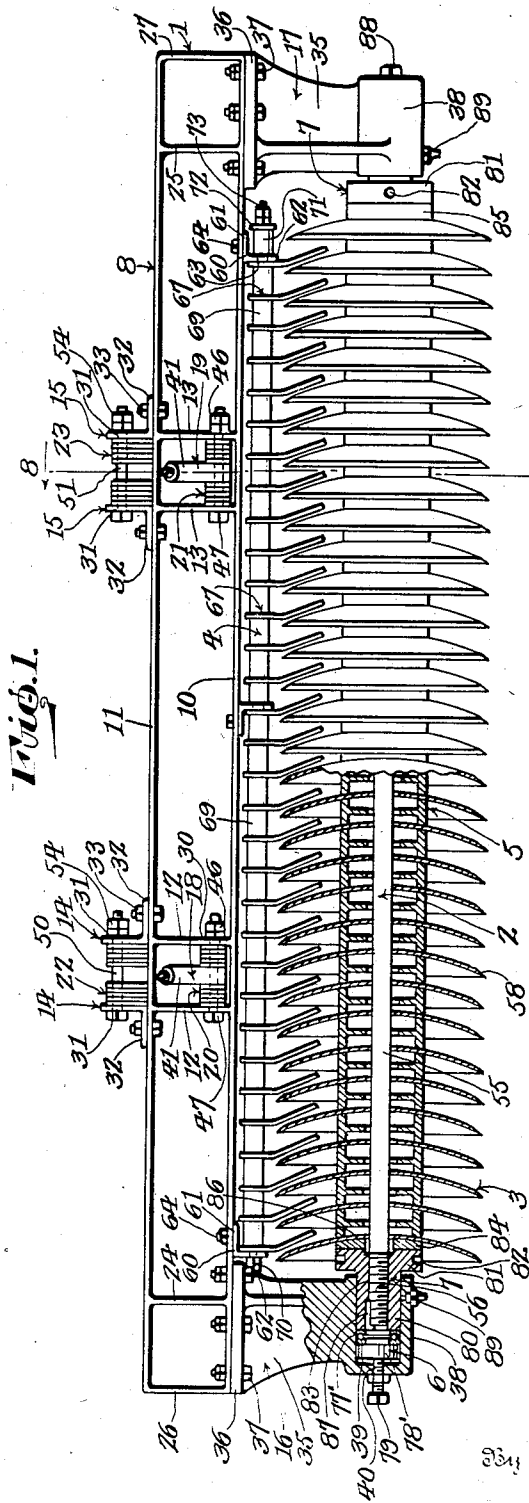


Fig. 5.



Fig. 6.

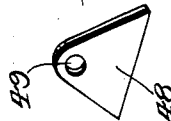


Fig. 4.

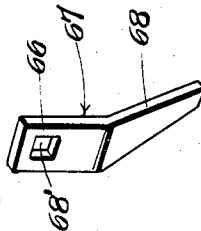


Fig. 3.

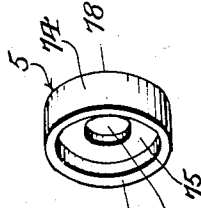
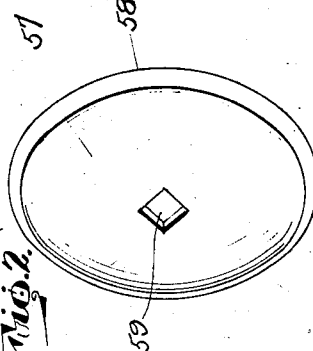


Fig. 2.



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2 Sheets-Sheet 2

Fig. 7.

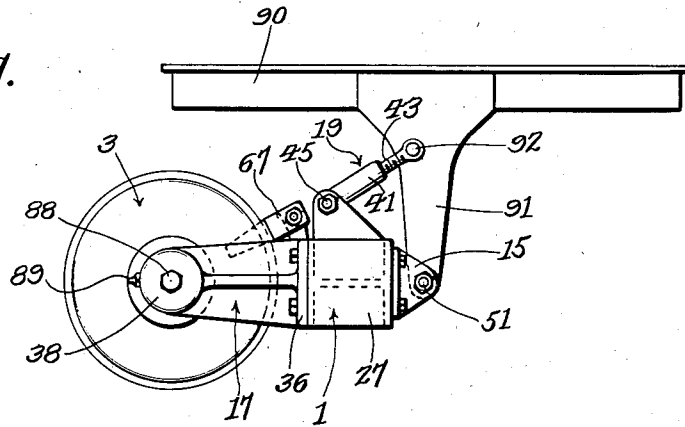
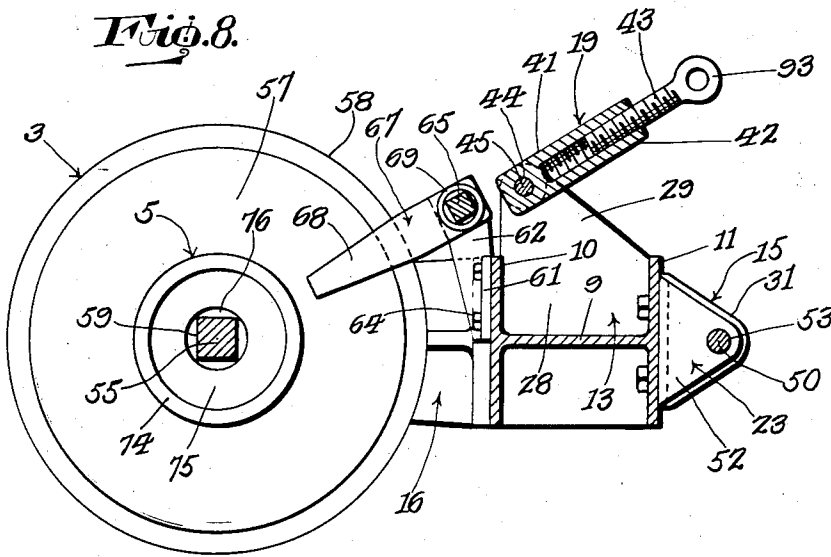


Fig. 8.



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UNITED STATES PATENT OFFICE

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GRADER-PLANER

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Application May 12, 1934, Serial No. 725,401

18 Claims. (Cl. 55—30)

This invention relates to a grader-planer for use in connection with pavements of sheet asphalt, asphalt or tar macadam, asphaltic concrete, bitulithic, surface treated dirt roads and streets, or any other type of bituminous pavements.

The objects of the invention are to provide, in a manner as hereinafter set forth a grader-planer for completely smoothing the types of pavements as aforesaid without extra and expensive equipment and at a minimum cost; for scarifying of low cost roads and oiled dirt roads and streets; for cutting up large chunks after a surface has been torn up by a scarifier; for cutting oil balls in oil mixed gravel work; for mixing re-tread work or oil gravel or oil sand mixed work; for drying gravel and stone before application of bitumen; for mixing or turning over oil or tar and gravel when following a distributor; for smoothing previously treated or untreated surfaces before the next treatment thereof; for furnishing a low cost original purchase machine which may be attached to any grader or motor patrol as an attachment thereby utilizing available equipment; for planing and smoothing all types of bituminous pavements including low cost re-tread roads, oil mixed gravel and sand roads and oil treated dirt roads without additional expensive equipment and at a minimum operating expense; for maintaining corrugated gravel roads; for cutting sod on grassy road shoulders; for diskings earth fills in grading work; for diskings and smoothing a sub-grade ahead of pavers; for diskings long swales out of a gravel or dirt road; and to attain these ends by a strong, durable, adjustable, low cost grader-planer for low cost construction and maintenance and which may be coupled to any form of grader or motor patrol as an attachment.

To the above ends essentially, and to others which may hereinafter appear, the invention consists of such parts, and in such combination of parts which fall within the scope of the invention as claimed.

In the drawings:

Figure 1 is a top plan-view partly in section of the grader planer,

Figure 2 is a perspective view of the form of cutting disc,

Figure 3 is a perspective view of the form of separator for the cutting discs,

Figure 4 is a perspective view of the form of disc cleaning member,

Figure 5 is a perspective view of the form of spacer for the cleaning members,

Figure 6 is a perspective view of the form of stiffener employed for a bolt or pin,

Figure 7 is an elevation of the grader planer looking towards one end thereof and coupled to an adjusting element therefor,

Figure 8 is a section on line 8—8, Figure 1.

The grader-planer includes a combined supporting and coupling structure 1, a rotatable shaft 2 supported from the latter, a series of spaced cutting discs 3 mounted on and bodily moving with shaft 2, a stationary cleaner device 4 for the discs 3, a series of separators 5 mounted on the shaft 2 for the discs 3, an adjustable thrust bearing 6 for the shaft 2, and a pair of adjustable combined disc binders or tighteners and shaft bearing elements 7.

The structure 1, which is in the form of a horizontally disposed yoke open at its rear, includes a non-rotatable beam 8 of H-shaped contour in cross section formed of a horizontally disposed flat web 9, a pair of vertical parallel flanges 10, 11, two spaced upstanding apertured webs 12, 13, two spaced pairs of spaced oppositely disposed angle irons 14, 15, a pair of spaced parallel horizontally disposed hangers 16, 17, a pair of adjustable coupling devices 18, 19, a pair of spaced sets of combined stiffeners and spacers 20, 21, a pair of spaced sets of combined stiffeners and spacers 22, 23, a pair of upstanding spaced parallel webs 24, 25 and a pair of upstanding end closure webs 26, 27.

The opposed faces of the flanges 10, 11 centrally thereof are integral with the sides of web 9. The latter and the flanges are of the same length. Preferably the width of web 9 will be greater than the height of the flanges and is so shown. The webs 12, 13 are of like form and apertured in proximity to flange 10. The pair of webs 12 are arranged in parallel spaced relation and disposed between the transverse median and one end of beam 8. The pair of webs 13 are arranged in parallel spaced relation and disposed between the transverse median and the other end of beam 8. Each of the webs 12, 13 (Figure 8) is formed of a rectangular lower portion 28 and an upper portion 29 in the form of a right angle triangle. The top edge of portion 29 extends at an upward inclination from flange 10 to flange 11. The lower portion 28 is arranged between and integral with the flanges 10, 11, as well as being integral with the upper face of web 9. The portion 29 is positioned above the flanges 10, 11 and is formed in proximity to its upper corner with an opening 30. The openings 30 in the webs 12 and 13 align with each other. The two pairs of angle irons 14, 15 are positioned against and extend forwardly from the forward face of flange 11. The pair of irons

14 are arranged between the transverse median and one end and the pair of irons 15 between the transverse median and the other end of the beam 8. The angle irons 14, 15 are of like form and each includes a leg 31 arranged in alignment with a web 12 or 13 and a leg 32 which detachably connected to flange 11 by holdfast means 33. The legs 31 of each pair of irons are arranged in parallel spaced relation, of triangular contour and formed at their outer ends with openings 34. The legs 32 of each pair of irons are square. The angle irons 14, 15 are spaced from the top and bottom edges of flange 11. The legs 32 of each pair of angle irons extend in opposite directions with respect to each other and at right angles to the inner ends of the legs 31 of the pair. The hangers 16, 17 are of like construction but oppositely disposed with respect to each other and each includes an arm 35 flanged at its inner end, as at 36, for the passage of holdfast means 37 to detachably secure the arm 35 to the outer face at the flange 10 at an end of the latter. The arm 35 is disposed at right angles to flange 10. The outer end of arm 35 is formed with a cylindrical enlargement 38 provided with a circular socket 39 opening at the inner side of the arm. The enlargement 38 at its outer end is provided with an opening 40 communicating with the inner end of socket 39. The wall of opening 40 is threaded. The adjustable coupling devices 18, 19 are of like construction and the description of one will apply to the other. Each coupling device is formed of a pivotally mounted section 41 provided with a lengthwise extending socket 42 having a threaded wall and an adjustable section 43 in the form of an eye-bolt having threaded engagement with the wall of socket 42. The latter opens at the outer end of section 41. The inner end of section 41, adjacent the base of socket 42 is provided with an opening 44 for the passage of a headed pivot bolt 45. The bolt 45 of device 18 extends through the openings of the webs 12. The bolt 45 of device 19 extends through the openings of the webs 13. Holdfast means 46 is mounted on the non-headed end of a bolt 45 and abuts the outer face of a web 12 or 13. The head 47 of a bolt 45 abuts the outer face of a web 12 or 13. The section 41 is mounted on a bolt 45 at the center thereof and is maintained in such position by a set of combined spacers and stiffeners 20 or 21 and each of the latter consists of a triangular shaped body 48 (Figure 6) formed with an opening 49 for the passage of the shank of a bolt 45. The combined spacers and stiffeners of a set 20 or 21 are arranged between the section 41 of a coupling device and abut the inner faces of the pair of webs 12 or the pair of webs 13. The spacers and stiffeners of a set may be adjusted so as to maintain the section 41 of a coupling device at different positions on bolt 45. Mounted in the aligning openings 34 of the legs 31 of the pair of irons 14 is a headed bolt 50 for the lower end of a hanger to be referred to. Mounted in the aligning openings 34 of the legs of the pair of irons 15 is a headed bolt 51 for the lower end of a hanger to be referred to. The combined spacers and stiffeners 22 are mounted on the bolt 50 and abut the flange 11. The combined spacers and stiffeners 23 are mounted on the bolt 51 and abut the flange 11. The combined spacers and stiffeners 22 are positioned between the hanger mounted on bolt 50 and the inner faces of the legs 31 of the pair of irons 14. The combined spacers and stiffeners 23 are positioned between the hanger mounted on bolt 51 and the inner faces of the legs

31 of the pair of irons 15. Each combined spacer and stiffener 22 or 23 is in the form of a triangular shaped body 52 (Figure 8) formed with an opening 53 for the passage of a bolt 50 or 51. Preferably the stiffeners 22 or 23 will be of thicker stock than the stiffeners 20 or 21. The combined stiffeners and spacers 20 and 21 prevent the sections 41 of the coupling devices shifting lengthwise of the bolts 45. The combined stiffeners and spacers 22 and 23 prevent the shifting of the hangers, which are mounted on the bolts 50, 51 lengthwise of the latter. Holdfast means 54 for the bolts 50, 51 are carried thereby and which abut the legs of one of the angle irons of each part. The webs 24, 25 are arranged in proximity to the ends of beam 8 and are interposed between the flanges 10, 11, as well as being integral with the latter and the upper face of web 9. The webs 24, 25 are disposed transversely of web 9 and flush with the top edges of flanges 10, 11. The webs 26, 27 are at the ends of beam 8, of the same height as flanges 10, 11 and are integral with the ends of web 9 and the ends of flanges 10, 11.

The shaft 2 is of a length to extend from within the hanger 16 to and within hanger 17 and is formed of an intermediate portion 55 of any suitable contour, other than circular and is shown square. The shaft 2 is formed with a pair of end portions 56 of circular cross section. Only one end portion 56 is shown. The end portions are peripherally threaded throughout.

The number of cutting discs 3 may be as desired and are of like form. Each disc 3 consists of a circular body part 57 of concavo-convex cross section formed with an endless cutting edge 58 and an axially arranged opening 59 corresponding in contour to that of the intermediate portion 55 of shaft 2. The discs 53 are mounted in spaced relation upon shaft 2 between the end portions 56 of the latter and bodily move with the shaft.

The stationary cleaner device 4 for the discs 3 consists of a pair of spaced parallel angle-shaped brackets 60, each formed of a horizontal leg 61 and an upstanding and rearwardly inclined leg 62 extended above leg 61 and provided in proximity to its upper end with an opening 63. The lower end of leg 62 is integral with one side of leg 61. The latter is anchored to the outer face of flange 10 adjacent one end of said flange by the hold-fast means 64. The leg 62 extends above and inclines rearwardly from flange 10. Extending through the openings 63 in the legs 62 is a squared non-rotatable rod 65 upon which is mounted the rectangular inner stretches 66 of a series of spaced cleaner members 67. These latter also include tapered outer stretches 68 which are inclined laterally with respect to the outer ends of stretches 66 to be disposed in opposed closed relation to the upper portions of the convex faces of the discs 3. The cleaner members 67 extend rearwardly and downwardly at an inclination with respect to rod 65. The stretches 66 are formed with openings 68 corresponding in contour to and for the passage of rod 65, whereby the members 67 are held stationary on said rod. The members 67 are maintained in spaced relation relative to each other upon rod 65 by tubular spacing sleeves 69 interposed between the stretches 66. The stretches 66 of the outer cleaner members 69 are arranged in abutting relation with the inner faces of legs 62 of the brackets 60. One end of the rod 65 is provided with means, as at 70 to abut the outer face of a leg 62 of one of the brackets 60. The

rod 65 extends beyond the outer face of the leg 62 of the other of the brackets 60 and carries a tubular sleeve 71 which at one end abuts the outer face of said leg. Mounted on rod 65 and abutting the other end of sleeve 71 is an abutment disc 72, which is engaged by the combined clamping and adjusting nuts 73, threadedly engaging with that end of rod 65 carrying the sleeve 71. This arrangement secures the rod 65 to the brackets and maintains the sleeves 69 in binding engagement with the cleaner members 67.

Each of the separators 5 consists of an annular body part 74 having arranged therein adjacent the ends thereof a web 75 formed with an axial opening 76 of a diameter to clear the intermediate portion 55 of shaft 2. The web 75 is circular and integral with the inner face of body part 74. The end edge 77 of body part 74 is concaved and the end edge 78 of said body part 74 is convex. The separators 5 are mounted upon and adjacent the ends of the intermediate portion 55 of shaft 2. One of the outer separators 5 of the series abuts the convex face of one of the outer discs 3, and the other outer separator 5 of the series abuts the concave face of the other outer disc 3. Each of the separators 5, other than the outer ones of the series of separators abuts the concave face of one disc and the convex face of an adjacent disc.

The adjustable thrust bearing 6 for the shaft 2 is arranged in the socket 39 of the hanger 16 and it consists of a bearing element 77, a shiftable disc 78 abutting element 77 and an adjusting screw 79 for the disc 78. The screw 79 has threaded engagement with the wall of opening 44 in the enlargement 38 of hanger 16.

The elements 7 are mounted in and extend inwardly from the sockets 39. The elements 7 are of like construction, but oppositely disposed with respect to each other. Each element 7 consists of a tubular member 80, formed at one inner end with a laterally extending annular flange 81 provided with sockets 82 in its edge. The bore 83 of member 80 is threaded for engagement with the threads on an end portion 56 of the shaft 2.

Positioned upon the intermediate portion 55 of the shaft 2 is a pair of spaced slidable abutment members 84, 85, the former having a convex inner face and the latter a concave outer face. Each of the abutment members is formed with an axial opening 86 of a diameter to clear the intermediate portion 55 of shaft 2. The inner face of member 84 abuts the concave face of one outer disc 3 and the inner face of member 85 abuts the convex face of the other outer disc 3. The members 84, 85 have their other faces abut elements 7.

The elements 7 after adjustment are keyed, as at 87, to the end portions 56 of the shaft 2 to prevent the revolving thereof upon the latter. The sockets 82 in the flanges 81 are provided to selectively receive a tool or other instrument (not shown) for the purpose of adjusting said elements 7 lengthwise of shaft 2 for the purpose of binding the discs, separators and members 84, 85 together upon shaft 2. The opening 40 in the enlargement 38 of hanger 17 is closed by a plug 88. The enlargements 38 have oil lubricant supply fittings 89 opening into the sockets 39.

It is well known that motor patrols or traction devices which carry adjustable moldboards, graders or other road working devices are provided with what are termed horizontally disposed rings adjustable by revolving them in a horizontal path for the purpose of adjusting the moldboard, graders, etc., to position them at different angles

while road making. The ring or annulus has depending therefrom a pair of hangers which are coupled to the moldboard, grader, etc., to provide traction for and the bodily adjusting of the moldboard, grader by the ring. The construction and arrangement of the grader-planer in accordance with this invention enables it to be quickly installed with a motor patrol or traction device on the removal of the moldboard or planer. With reference to Figure 7 the ring or annulus referred to is shown and indicated at 90. Depending from the ring 90 is a pair of hangers 91, only one of which is shown. The hangers 91 have openings near their upper ends and openings at their lower end. The hangers 91 when used in connection with this invention extend between angle irons of the two pairs of angle irons 14, 15. The bolts 50, 51 extend through the openings in the lower ends of the hangers 91, and by this arrangement when ring 90 is revolved, the grader-planer, in accordance with this invention will be adjusted at an angle. The combined spacers and stiffeners 22, 23 act as abutments for the lower ends of the hangers 91 in either path of movement of the ring 89. The grader-planer, in accordance with this invention is also adjustably connected to the hangers 91 by holdfast means 92 extending through the eyes 93 of bolts 43 of the coupling devices 18, 19 and the upper openings in hangers 91. The coupling devices 18, 19 also provide for adjusting the discs 3 whereby they may be sunk into the surface the desired depth depending upon the type of surfaces being worked.

Among the advantages attained by a grader-planer in accordance with this invention are that it costs at least 50% less than any other machine capable of doing the same work; may be mounted on any grader or motor patrol in approximately thirty minutes by removing the mold board and fastening the disc-planer in the same hangers; no trailer type planer to haul around; no lost motion; no extra machine to pull the planer, unless mounted on a pull type grader; no extra man needed to operate the machine as the grader or patrol operator does the work; no tires or trailer parts to wear out; the discs may be swung in any direction to operate at any pitch, the same as a patrol or grader blade, as experience will tell just what angle to swing the disks for the best results for class of work to be done; as great a cutting pressure can be placed on the disks as on a grader blade, or approximately 9,000 pounds if a large patrol is used; and the discs may be sunk into the surface from a fraction of an inch to six inches, depending upon type or surface being worked.

What I claim is:—

1. A grader planer comprising a shaft, a series of spaced concavo-convex discs mounted upon and bodily movable with the shaft, one-piece separators interposed between said discs and each having concave and convex ends abutting a pair of opposed discs, each of said separators being formed with an internal axially apertured web adjacent its ends for the passage of said shaft, a pair of abutment members mounted upon the shaft and one having a concave face for abutting the convex face of one of the outer discs of said series and the other having a convex face for abutting the concave face of the other outer disc of the series, a pair of adjustable combined disc binders and bearing elements for the shaft adjustably engaging with the ends of the latter and bearing against the other faces of said members,

means coacting with said elements and shaft to prevent the revolving of the former upon the latter when said elements are in adjusted position, and a combined supporting and coupling structure, said elements being revolubly mounted in said structure.

2. A grader planer comprising a shaft, a series of spaced concavo-convex discs mounted upon and bodily movable with the shaft, one-piece separators interposed between said discs and each having concave and convex ends abutting a pair of opposed discs, each of said separators being formed with an internal axially apertured web adjacent its ends for the passage of said shaft, a pair of abutment members mounted upon the shaft and one having a concave face for abutting the convex face of one of the outer discs of said series and the other having a convex face for abutting the concave face of the other outer disc of the series, a pair of adjustable combined disc binders and bearing elements for the shaft adjustably engaging with the ends of the latter and bearing against the other faces of said members, means coacting with said elements and shaft to prevent the revolving of the former upon the latter when said elements are in adjusted position, and a combined supporting and coupling structure, said elements being revolubly mounted in said structure, and said structure provided with means having provisions for coupling it to a traction and adjusting means therefor.

3. A grader planer comprising a shaft, a series of spaced concavo-convex discs mounted upon and bodily movable with the shaft, one-piece separators interposed between said discs and each having concave and convex ends abutting a pair of opposed discs, each of said separators being formed with an internal axially apertured web adjacent its ends for the passage of said shaft, a pair of abutment members mounted upon the shaft and one having a concave face for abutting the convex face of one of the outer discs of said series and the other having a convex face for abutting the concave face of the other outer disc of the series, a pair of adjustable combined disc binders and bearing elements for the shaft adjustably engaging with the ends of the latter and bearing against the other faces of said members, means coacting with said elements and shaft to prevent the revolving of the former upon the latter when said elements are in adjusted position, a combined supporting and coupling structure, said elements being revolubly mounted in said structure, and said structure provided with means having provisions for coupling it to a traction and adjusting means therefor, and a thrust bearing for one end of said shaft and one end of that element carried by said end of said shaft, said thrust bearing being adjustable and positioned within said structure in abutting relation to the said end of the said element.

4. A grader planer comprising a shaft, a series of spaced concavo-convex discs mounted upon and bodily movable with the shaft, one-piece separators interposed between said discs and each having concave and convex ends abutting a pair of opposed discs, each of said separators being formed with an internal axially apertured web adjacent its ends for the passage of said shaft, a pair of abutment members mounted upon the shaft and one having a concave face for abutting the convex face of one of the outer discs of said series and the other having a convex face for abutting the concave face of the other outer disc of the series, a pair of adjustable combined disc

binders and bearing elements for the shaft adjustably engaging with the ends of the latter and bearing against the other faces of said members, means coacting with said elements and shaft to prevent the revolving of the former upon the latter when said elements are in adjusted position, a combined supporting and coupling structure of yoke shape contour having its arms disposed horizontally, said arms constituting hangers, said hangers being formed with sockets, and said elements having a portion of their length revolubly mounted in said sockets.

5. A grader planer comprising a shaft, a series of spaced concavo-convex discs mounted upon and bodily movable with the shaft, one-piece separators interposed between said discs and each having concave and convex ends abutting a pair of opposed discs, each of said separators being formed with an internal axially apertured web adjacent its ends for the passage of said shaft, a pair of abutment members mounted upon the shaft and one having a concave face for abutting the convex face of one of the outer discs of said series and the other having a convex face for abutting the concave face of the other outer disc of the series, a pair of adjustable combined disc binders and bearing elements for the shaft adjustably engaging with the ends of the latter and bearing against the other faces of said members, means coacting with said elements and shaft to prevent the revolving of the former upon the latter when said elements are in adjusted position, a combined supporting and coupling structure of yoke shape contour having its arms disposed horizontally, said arms constituting hangers, said hangers being formed with sockets, said elements having a portion of their length revolubly mounted in said sockets, and said structure provided with means having provisions for coupling it to a traction and adjusting means therefor.

6. A grader planer comprising a shaft, a series of spaced concavo-convex discs mounted upon and bodily movable with the shaft, one-piece separators interposed between said discs and each having concave and convex ends abutting a pair of opposed discs, each of said separators being formed with an internal axially apertured web adjacent its ends for the passage of said shaft, a pair of abutment members mounted upon the shaft and one having a concave face for abutting the convex face of one of the outer discs of said series and the other having a convex face for abutting the concave face of the other outer disc of the series, a pair of adjustable combined disc binders and bearing elements for the shaft adjustably engaging with the ends of the latter and bearing against the other faces of said members, means coacting with said elements and shaft to prevent the revolving of the former upon the latter when said elements are in adjusted position, a combined supporting and coupling structure of yoke shape contour having its arms disposed horizontally, said arms constituting hangers, said hangers being formed with sockets, said elements having a portion of their length revolubly mounted in said sockets, said structure provided with means having provisions for coupling it to a traction and adjusting means therefor, and an adjustable thrust bearing mounted in one of said sockets and abutting that element extending thereto.

7. A grader planer comprising a shaft, a series of spaced concavo-convex discs mounted upon and bodily movable with the shaft, one-piece separators interposed between said discs and each

having concave and convex ends abutting a pair of opposed discs, each of said separators being formed with an internal axially apertured web adjacent its ends for the passage of said shaft, a pair of abutment members mounted upon the shaft and one having a concave face for abutting the convex face of one of the outer discs of said series and the other having a convex face for abutting the concave face of the other outer disc of the series, a pair of adjustable combined disc binders and bearing elements for the shaft adjustably engaging with the ends of the latter and bearing against the other faces of said members, means coacting with said elements and shaft to prevent the revolving of the former upon the latter when said elements are in adjusted position, and a combined supporting and coupling structure, said elements being revolvably mounted in said structure and having laterally disposed annular flanges at their outer ends.

8. A grader planer comprising a shaft, a series of spaced concavo-convex discs mounted upon and bodily movable with the shaft, one-piece separators interposed between said discs and each having concave and convex ends abutting a pair of opposed discs, each of said separators being formed with an internal axially apertured web adjacent its ends for the passage of said shaft, a pair of abutment members mounted upon the shaft and one having a concave face for abutting the convex face of one of the outer discs of said series and the other having a convex face for abutting the concave face of the other outer disc of the series, a pair of adjustable combined disc binders and bearing elements for the shaft adjustably engaging with the ends of the latter and bearing against the other faces of said members, means coacting with said elements and shaft to prevent the revolving of the former upon the latter when said elements are in adjusted position, a combined supporting and coupling structure of yoke shape contour having its arms disposed horizontally, said arms constituting hangers, said hangers being formed with sockets, and said elements having a portion of their length revolvably mounted in said sockets and being formed at their outer ends with laterally disposed annular flanges.

9. A grader planer comprising a shaft, a series of spaced concavo-convex discs mounted upon and bodily movable with the shaft, one-piece separators interposed between said discs and each having concave and convex ends abutting a pair of opposed discs, each of said separators being formed with an internal axially apertured web adjacent its ends for the passage of said shaft, a pair of abutment members mounted upon the shaft and one having a concave face for abutting the convex face of one of the outer discs of said series and the other having a convex face for abutting the concave face of the other outer disc of the series, a pair of adjustable combined disc binders and bearing elements for the shaft adjustably engaging with the ends of the latter and bearing against the other faces of said members, means coacting with said elements and shaft to prevent the revolving of the former upon the latter when said elements are in adjusted position, a combined supporting and coupling structure, said elements being revolvably mounted in said structure, and said structure being provided with spaced adjustable coupling devices for connecting it to a traction means therefor and with spaced means for connecting it to an adjusting means therefor.

10. A grader planer comprising a shaft, a series of spaced concavo-convex discs mounted upon and bodily movable with the shaft, one-piece separators interposed between said discs and each having concave and convex ends abutting a pair of opposed discs, each of said separators being formed with an internal axially apertured web adjacent its ends for the passage of said shaft, a pair of abutment members mounted upon the shaft and one having a concave face for abutting the convex face of one of the outer discs of said series and the other having a convex face for abutting the concave face of the other outer disc of the series, a pair of adjustable combined disc binders and bearing elements for the shaft adjustably engaging with the ends of the latter and bearing against the other faces of said members, means coacting with said elements and shaft to prevent the revolving of the former upon the latter when said elements are in adjusted position, and a combined supporting and coupling structure, said elements being revolvably mounted in said structure, said structure being provided with spaced adjustable coupling devices for connecting it to a traction means therefor and with spaced means for connecting it to an adjusting means therefor, said coupling devices being positioned at the top of said structure, and said spaced means being arranged at the front of said structure.

11. A grader planer comprising a shaft, a series of spaced concavo-convex discs mounted upon and bodily movable with the shaft, one-piece separators interposed between said discs and each having concave and convex ends abutting a pair of opposed discs, each of said separators being formed with an internal axially apertured web adjacent its ends for the passage of said shaft, a pair of abutment members mounted upon the shaft and one having a concave face for abutting the convex face of one of the outer discs of said series and the other having a convex face for abutting the concave face of the other outer disc of the series, a pair of adjustable combined disc binders and bearing elements for the shaft adjustably engaging with the ends of the latter and bearing against the other faces of said members, means coacting with said elements and shaft to prevent the revolving of the former upon the latter when said elements are in adjusted position, a combined supporting and coupling structure, said elements being revolvably mounted in said structure, said structure provided with pivots for coupling it to a traction and to an adjusting means therefor, and combined spacers and stiffeners mounted on said pivots for and between which is adapted to be disposed the said traction and the said adjusting means is extended.

12. In a grader planer, a horizontally disposed supporting structure common to a plurality of bodily revoluble cutting discs and to a plurality of stationary cleaner members for said discs, said structure having spaced means at its front for coupling it to an adjusting means therefor forming an element of a traction device, spaced adjustable couplers extending forwardly from said structure for connecting it to said adjusting means, means for pivotally connecting said couplings to the top of said structure, and combined stiffeners and spacers for and connected to said spaced means and for and connected to the means for pivotally connecting said couplings to the top of said structure.

13. In a grader planer a horizontally disposed supporting structure common to a set of bodily

- revoluble cutting discs and a set of stationary cleaner members and having spaced means at its front for coupling it to an adjusting means therefor forming an element of a traction device, spaced adjustable coupling devices extending forwardly from said structure for connecting it to said adjusting means, and means for pivotally connecting the rear ends of said devices with the top of said structure.
14. In a grader-planer, a mobile horizontally disposed yoke shaped structure open at its rear, a horizontally disposed revoluble shaft having its end terminal portions extending into the rear ends of the sides of said structure, a series of spaced cutting discs carried by and bodily movable with said shaft, a pair of spaced endwise aligning adjustable tubular shaft bearing and disc tightener elements threadedly engaging with and encompassing said end terminal portions of the shaft, said elements being revolubly mounted in and extending from the inner faces of the sides of said structure at the rear end of the latter, vertical hanger means, means for connecting the lower end of said hanger means to said structure, and adjusting means for said structure connected to the top of the front of the latter and to the upper portion of said hanger means.
15. In a grader-planer, a mobile horizontally disposed yoke shaped structure open at its rear, a horizontally disposed revoluble shaft having its end terminal portions extending into the rear ends of the sides of said structure, a series of spaced cutting discs carried by and bodily movable with said shaft, a pair of spaced endwise aligning adjustable tubular shaft bearing and disc tightener elements threadedly engaging with and encompassing said end terminal portions of the shaft, said elements being revolubly mounted in and extending from the inner faces of the sides of said structure at the rear end of the latter, vertical hanger means, means extending forwardly from the front of said structure and extending through and straddling the lower end of said hanger means for connecting the latter to said structure, and adjusting means for said structure connected to the top of the forward end of the latter and to the upper portion of said hanger means.
16. In a grader-planer, a mobile horizontally disposed yoke shaped structure open at its rear, a horizontally disposed revoluble shaft having its end terminal portions extending into the rear ends of the sides of said structure, a series of spaced cutting discs carried by and bodily movable with said shaft, a pair of spaced endwise aligning adjustable tubular shaft bearing and disc tightener elements threadedly engaging with and encompassing said end terminal portions of the shaft, said elements being revolubly mounted in and extending from the inner faces of the sides of said structure at the rear end of the latter, vertical hanger means, a horizontally disposed revoluble annulus connected to the upper end of said hanger means, spaced means arranged at the front of said structure and extending through and straddling said hanger means for connecting the lower end of the latter to said front, rearwardly extending and downwardly inclined spaced adjusting means for said structure connected at the upper end to the upper portion of the hanger means, and spaced means upon the top of the front end of said structure extending through and straddling the lower end of said adjusting means for connecting the latter to the front end of the structure.
17. In a grader-planer, a mobile horizontally disposed yoke open at its rear, closed at its front and extended laterally in opposite directions with respect to said structure, a shaft positioned within and having its end terminal portions extending into the sides of the yoke, a series of cutting discs mounted on the shaft, separators interposed between the discs, a pair of spaced endwise aligning adjustable tubular bearing and tightener elements encompassing and threadedly engaging with the end terminal portions of said shaft, said elements being revolubly mounted in and projecting from the inner faces of the sides of said yoke, abutments interposed between said elements and the outer of the discs of said series, said elements providing, when adjusted in a direction towards said abutments, the binding of the discs, separators and abutments on the shaft whereby the latter said discs, separators, abutments and elements will bodily revolve together relative to the yoke, spaced means extended forwardly from the front of the yoke for connecting to the latter the lower end of said hanger means, adjusting means for the yoke extending rearwardly from the upper portion of said hanger means, and spaced means upon the top of the forward end of the yoke for connecting to the latter the said adjusting means.
18. In a grader-planer, a planer structure including a horizontally disposed yoke and a series of revoluble cutting discs, said yoke open at its rear end and closed at its front end, a horizontally revoluble mobile structure including hanger means, a pair of spaced supporting means extending forwardly from the front of the yoke, said hanger means extending into said supporting means, bolts connected to said supporting means and extending through the lower ends of said hanger means, stiffeners within said supporting means, mounted on said bolts and arranged at opposite sides of the lower end of the hanger means, rearwardly extending and downwardly inclined adjusting means for the yoke connected at the upper end thereof to the upper portion of the hanger means, bolt elements arranged at the top of the front end of said yoke, supports for the bolt elements, the lower end of said adjusting means extending into said supports, said bolt elements extending through the lower end of said adjusting means, and stiffeners within said supports and mounted on the bolt elements at opposite sides of the lower end of the adjusting means.