

Sept. 4, 1951

E. B. SNEAD
ROAD GRADING MACHINE

2,566,641

Filed July 19, 1945

4 Sheets-Sheet 1

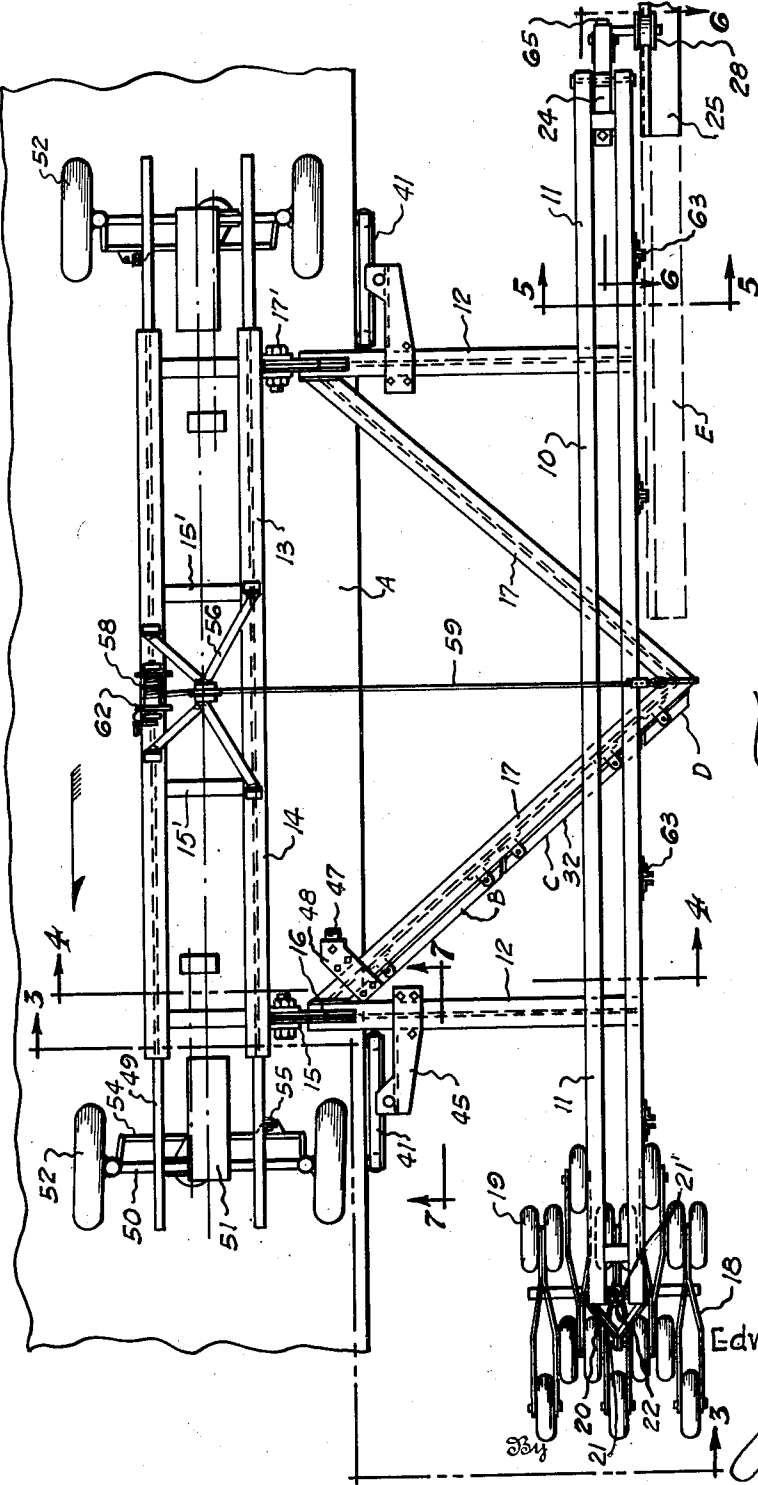


Fig. 1.

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4 Sheets-Sheet 2

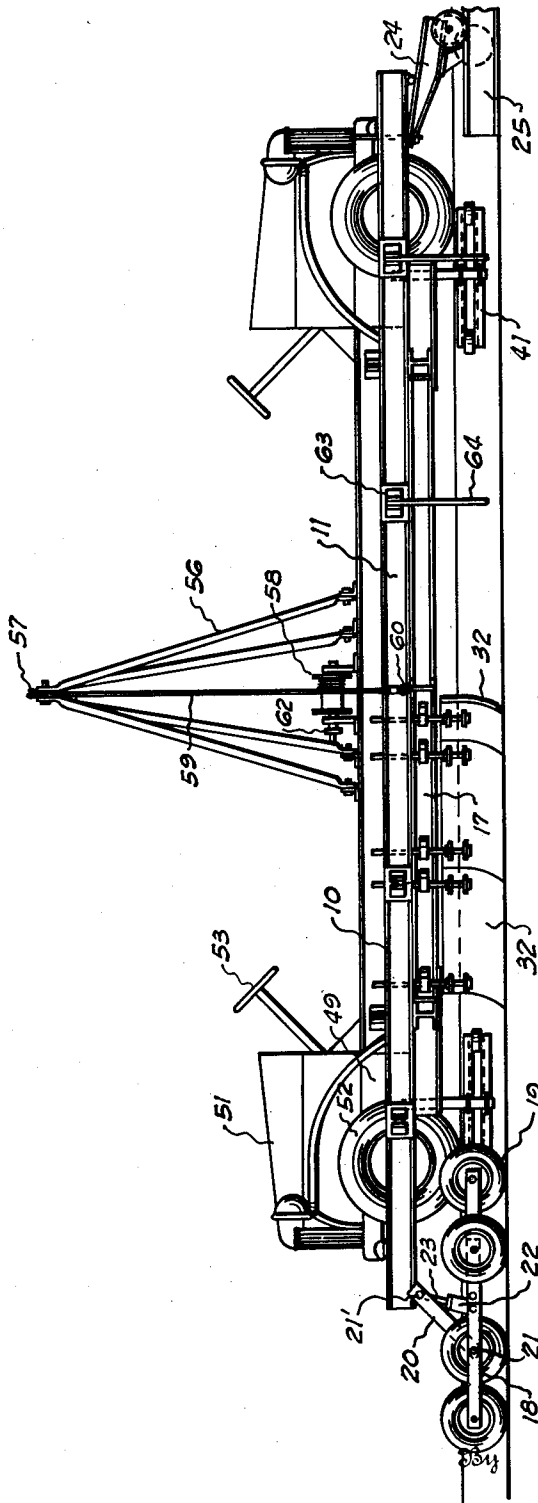


Fig. 2.

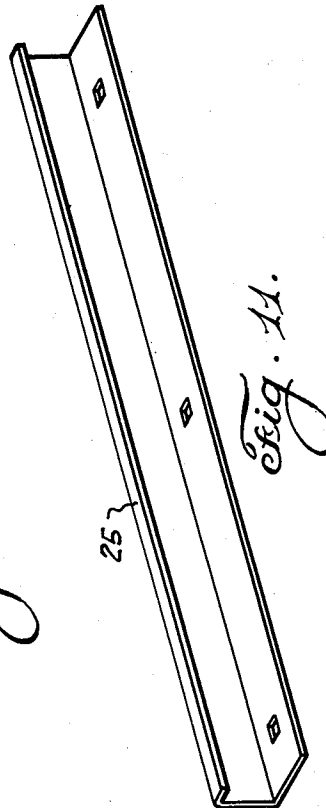


Fig. 11.

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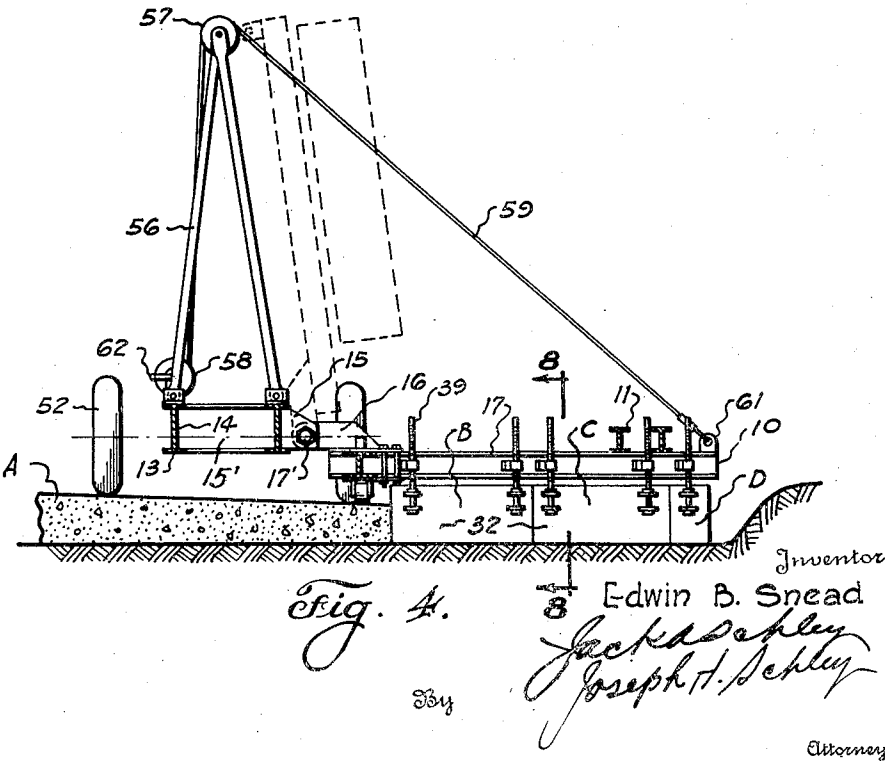
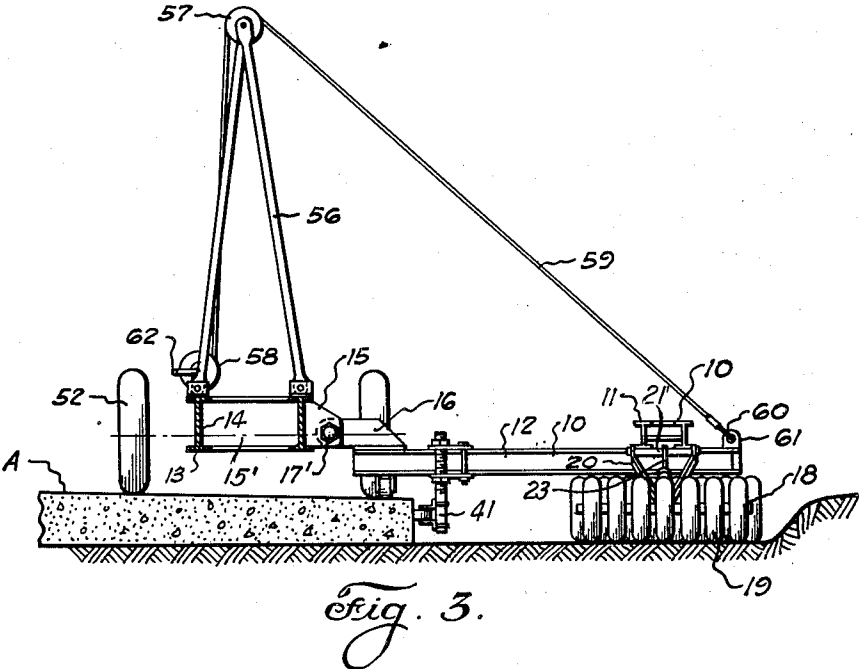
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4 Sheets-Sheet 3



UNITED STATES PATENT OFFICE

2,566,641

ROAD GRADING MACHINE

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Application July 19, 1945, Serial No. 605,859

9 Claims. (Cl. 37-108)

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This invention relates to new and useful improvements in a road grading machine.

One object of the invention is to provide an improved apparatus particularly adapted for use in building roads of the type having a concrete or other type of pavement wherein form rails or sections are employed.

A particular object of the invention is to provide an improved apparatus, whereby a previously cut or dug excavation may be finished to the desired grade and contour and at the same time the forms set with a minimum of labor and a great saving in time.

An important object of the invention is to provide improved apparatus particularly adapted for use in widening paved roads wherein a new strip of pavement is laid contiguous to an old pavement.

Another object of the invention is to provide an apparatus of the character described which includes an elongate mobile grading frame adapted to be moved along the edge of a pavement and which is suitably supported, so as to carry a cutting blade for grading the excavation and disposing the excavated material to the outside thereof, whereby the form sections or rails may be set up immediately behind the cutting blade as the grading proceeds.

Still another object of the invention is to provide an apparatus of the character described including a vehicle or mobile support adapted to track on the old pavement and carry a grading frame overhanging the excavation, arranged with a cutting blade for bringing the excavation to the desired grade and contour and alinement gages travelling on the edge of the old pavement for keeping the frame in line.

One of the features of the invention is the provision of a grading frame having mobile supporting means and a grading blade together with a supporting roller or wheel adapted to travel on the usual form rails and spaced from the blade so as to permit the placing of an advance rail therebetween when said wheel is resting upon the forward end of a previously placed form rail.

A further object of the invention is to provide an apparatus of the character described including a vehicle or mobile support adapted to track on the old pavement and supporting a grading frame overhanging the excavation, arranged to be swung to an upright position when not in use, to enable the tractor to travel along the road without interfering with other vehicles or obstructions.

Still another object of the invention is to pro-

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vide an apparatus having a grading frame provided with portable supporting means and alinement gages, adapted to roll along the edge of the pavement, in combination with a propelling unit to which the grading frame is attached, which unit is provided with wheels arranged to be adjusted at an angle divergent from the edge of the pavement, whereby the grading frame is held in alinement with the edge of the pavement while being moved therealong.

A still further object of the invention is to provide a grading frame having a scraper, a mobile support at one end and a mobile support at the opposite end thereof, having means whereby the frame and the scraper carried thereby may be vertically adjusted to control the depth of the cut made by the scraper.

An important feature of the invention is to provide an apparatus of the character described wherein one end of the grading frame is carried upon the usual form rail, thus assuring in combination with the alinement gages, the desired grading and contour as well as holding the operation to a uniform width contiguous to the edge of the pavement.

A construction designed to carry out the invention will be hereinafter described, together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings, wherein an example of the invention is shown, and wherein:

Fig. 1 is a plan view of a machine constructed in accordance with the invention,

Fig. 2 is a side elevation of the same,

Fig. 3 is a transverse sectional view taken on the line 3-3 of Fig. 1,

Fig. 4 is a similar view taken on the line 4-4 of Fig. 1,

Fig. 5 is an enlarged transverse sectional view taken on the line 5-5 of Fig. 1,

Fig. 6 is an enlarged longitudinal sectional view taken on the line 6-6 of Fig. 1,

Fig. 7 is an enlarged longitudinal sectional view taken on the line 7-7 of Fig. 1,

Fig. 8 is an enlarged transverse sectional view taken on the line 8-8 of Fig. 4,

Fig. 9 is an elevation of the rear end of the grading frame showing the auxiliary supporting wheel, and

Fig. 10 is a contracted plan view of another form of vehicle adapted to be pulled by a tractor.

Fig. 11 is a perspective view of a form rail used in pavement construction.

In the drawings, the numeral 10 designates an elongate grading frame which is formed of a pair of spaced I-beams 11 supported on the ends of bolsters 12. The grading frame is hinged to a vehicle or propelling frame 13, which is preferably made long and narrow, so as to space the bolsters 12 a substantial distance apart, and give to the frame 10 the desired elongation. The frame 13 is preferably made with I-beams 14 extending along each side and connected by transverse members 15 suitably secured thereto, as by welding.

Near each end of the vehicle frame, one of the beams 14 has a pair of spaced ears 15 secured to its web. Hangers 16, welded to the upper sides of the bolsters 12 at their inner ends, engage between the ears and are pivoted on bolts 17, whereby the frame 10 may be swung up and down and also may be swung to an upright position when it is desired to transport the machine from place to place. A triangular scraper hanger 17 has its inner end secured to the inner ends of the bolsters, and its apex or outer end projecting beyond the beams 11. This hanger may be made of I-beams, and secured to the underside of the frame 10 so as to lie substantially flush with the bolsters. The hanger being triangular and being disposed between the bolsters, will give rigidity to the frame 10.

For supporting the forward end of the frame 10, a multiple wheel carriage or truck 18 is provided. This carriage is equipped with a plurality of wheels 19, which are offset longitudinally and transversely of the frame, and may have rubber tires or flat rims so as to distribute the load over a comparatively broad area, and thus prevent digging into the soft ground. The wheels are also disposed in rows transversely of the beams 11. The carriage supports the forward end of the frame by means of a yoke 20 suitably pivoted at its lower end in the carriage as is best shown in Fig. 1, and at its upper end on a transverse rocker 21 suitably journaled under the forward ends of the I-beams 11. A hydraulic cylinder 22 has its lower end suitably pivoted on a transverse shaft 21 in the carriage 18 and is provided with a plunger 23 having its upper end pivoted to the rocker 21. Any suitable means may be provided for supplying fluid to the cylinder and for operating the same, whereby the forward end of the frame 10 may be vertically adjusted.

For supporting the rear end of the frame 10, I provide a dolly 24, adapted to track upon the ordinary angular form rail 25. The dolly includes an elongate support 26 pivoted intermediate its ends to the underside of the beams 11, as is best shown in Figs. 5 and 6. The support 26 has a laterally projecting axle 27 welded to its underside at its rear end for supporting a flange roller 28, which rides upon the form rail 25. These form rails are in common use, and are placed along the outer side of the excavation so as to form the outer edge of the new pavement. For pivoting the member 26, a shaft 29 is journaled in bearing boxes 30 welded to the undersides of the beams 11, and passing through a box 31 welded on top of said support.

A scraper blade 32 is carried on the forward side of the hanger 17, and it is obvious that the frame 10 must be vertically adjusted so that the blade will cut to the proper depth. The forward end of the frame is adjusted by means of the hydraulic cylinder 22, as has been previously described. For adjusting the rear end of the frame, an eye bolt 33 pivoted at its lower end between ears 34 carried on the forward end of the sup-

port 24, extends upwardly through brackets 35 carried by a transverse brace 36 secured between the beams 11. The bolt is adjusted up and down by means of nuts 37 mounted thereon, and bearing upon the upper bracket 35. By this means, the dolly is rocked upon the shaft 29 and the rear end of the grading frame is thus adjusted vertically.

The distance between the edge of the old pavement A and the form rail 25 controls the width of the new strip of pavement. This strip may vary in width, and thus the scraper blade 32 must be made in sections, so that while it may pass between the edge of the pavement A and the form rail, it will cut the entire surface of the ground therebetween, in order to establish the proper grade and contour. As is shown in Figs. 2 and 4, the blade 32 is formed in three sections B, C and D, which are of different lengths or widths. The manner of supporting the sections is optional, and will be described only in a general way. The sections B, C and D are provided with lugs 38 (Fig. 8). Upright bars 39 have their lower ends journaled in these lugs, as is best shown in Fig. 8. Each bar is screw-threaded and engaged in a bearing block 40 secured to the web of the hanger 17. By rotating the bars 39 of a section, the latter may be raised and lowered. Only one supporting means has been shown for the section D, however it could be formed with a plurality of supporting members, and it is to be understood that the supporting members for the blade sections may be of any suitable construction. The sections are interchangeable so as to be assembled in blades of various lengths. Although only one scraping blade has been illustrated the machine may be provided with two scraping blades. The two scraping blades may be arranged to correspond with the triangular form of hanger 17 so that the machine will be capable of scraping in either of two directions.

It is pointed out that the cutting edges of the blade 32 may be adjusted to give various contours to the cut, but it is not considered necessary to illustrate such contours. It will be observed that the outer section D is comparatively narrow. Ordinarily, this section will not be used. It sometimes occurs that the contractor has form rails 25 which are higher than the thickness of the new strip of pavement, which he is called upon to lay. As an illustration, his form rails may be 9 inches high, while his pavement is only to be 3 inches in thickness. In such cases, the section D is adjusted lower than the other sections, so as to dig a trench in which the form rails 25 may be laid so that their upper surfaces will be at the proper elevation. With the section D omitted, the sections B and C will cut the entire grade between the edge of the pavement A and the form rail 25.

An important feature of the invention is the means for keeping the grading frame in proper alignment, and this is accomplished by alignment gages 41, which are best shown in Figs. 1, 3 and 7, and which projects forwardly and rearwardly from the bolsters 12. Each gage is formed of an elongate head 42 carrying rollers 43 at each end, which roll on the edge of the pavement A. The head is suspended by an upright screw-threaded bar 44 suitably secured to the medial portion of the head and carried in a clamp 45 fastened on the bolster 12. Nuts 46, mounted on a bar 44, engage the upper and lower sides of the clamps, as is best shown in Fig. 7, whereby the

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gage head may be vertically adjusted to properly engage the edge of the pavement A. In order to take the load off of the pivot bolts 17', by which the frame 10 is hinged to the vehicle frame 13, a caster roller 47 is carried by a bracket 48 secured at the inner, front end of the hanger 17 and rolls on the pavement A.

At its forward and rearward ends, the vehicle 13 is provided with chassis members 49, which are indicated generally and which are suitably secured to the beams 14. Each chassis is suitably supported by an axle 50, and carries a power plant 51 of the front wheel drive type, so that the wheels 52 may be driven as well as steered. As is best shown in Fig. 2, each power unit is provided with a steering wheel 53, and the wheels are provided with rubber tires for rolling on the pavement A. The wheels are provided with steering linkage 54, as is shown in Fig. 1, and each linkage is provided with a suitable lock 55 connected with the chassis 49, whereby said linkage may be locked against movement.

It will be observed that the wheels 52 are shown in Fig. 1 at an angle slightly divergent from the longitudinal edge of the pavement A, and this angle has been slightly exaggerated in the drawings for the purposes of illustration. After the wheels are adjusted to this angle, the locks 55 are operated to hold said wheels in the adjusted position. The purpose of this is to create a side draft to the forward movement of the machine whereby the alinement gages 41 are held in engagement with the edge of the pavement A for the purpose of keeping the machine in alinement. Since the surface of the excavation which is being graded is uneven, there will be areas where the blade 32 will cut deeper than at other areas, thus involving heavy cuts and light cuts. The angling of the vehicle wheels 52 is highly important where the cut is light.

For raising and lowering the grading frame 10, a tripod 56 is mounted at the center of the vehicle frame 13 on the beams 14, and has a sheave 57 journaled at its top. A small drum 58 is mounted on the inner I-beam 14, at the base of the tripod, and has a cable 59 wound thereon, which passes upwardly and over the sheave 57. This cable is provided with a hook 60 at its outer end, which engages in an eye 61 (Fig. 3) at the outer end of the hanger 17. The drum is provided with a winding handle and ratchet 62. By revolving the drum to wind the cable, the frame 10 may be swung to an upright position. Since the bolts 17' are inwardly of the wheels 52 and the top of the tripod is offset laterally from said bolts, it is obvious that when the frame 10 is in its upright position, only a portion will overhang said wheels, thus permitting the machine to pass over bridges and avoid road obstructions.

While the invention is primarily for use in widening a pavement which has been previously laid, it is not to be so limited, and may be used wherever found practical. While the apparatus has been illustrated with a single grader frame extending from one side of the vehicle, it would be feasible to duplicate the structure on the other side of the vehicle. Since the caster roller 47, at the inner end of the bolster 12, rolls on the pavement A and supports the inner side of the frame 10, it would be possible to detach the frame 10 from the vehicle and pull it with a tractor or other self-propelled unit traveling on the pavement. Either the vehicle or the caster rollers constitute a mobile support for the grader frame.

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In using the apparatus herein set forth, it is first necessary to provide an excavation contiguous to the edge of the pavement before the apparatus can be used. This excavation may be dug or cut in any suitable manner and with any suitable machine. In making the excavation, the grade is left about 1 inch higher than the grade at which the excavation is to be finished. After the excavation has been dug, it is customary to set upright form sections or rails, such as the form rail 25, which are placed at the outer line of the strip of any pavement which is to be laid.

The apparatus is driven along the pavement A and stopped at the point where the grader frame 10 is to be used. One form rail 25 is set up and the grader frame positioned so that the flanged roller 28 rests upon the forward or advance end of the rail, as is indicated in full lines in Fig. 1. If the grader frame is carried by a vehicle, as shown in Figs. 1 to 4, inclusive, it is lowered so that the wheel 28 will rest upon the rail 25. It will, of course, be necessary to position the vehicle so that the roller 28 will rest on top of the rail 25 and the frame 10 will extend substantially parallel to the edge of the pavement A.

After the roller has been lowered onto the rail 25, the rear end of the frame is adjusted by manipulating the eye-bolt 33 and the hydraulic cylinder 22 is operated to adjust the carriage 18. The purpose in making these adjustments is to dispose the lower edge of the cutter blade at the desired inclination and depth. It is obvious that the provision of vertical adjustments at the front and rear ends of the grader frame, together with the adjustment of the blade 32, enables the operator to set the cutting edge of the blade 32 to the exact grade and contour at which he desires to finish the excavation. After the frame has been positioned, the alinement gages 41 are adjusted so that the rollers 43 will bear against the vertical edge of the pavement A and keep the grader frame in line.

In beginning the operation, the next form section or rail 25 is placed in position as indicated in dotted lines at E in Fig. 1. It will be observed that sufficient length is given to the frame 10 to permit the rail E to be set between the apex of the cutters 32 and the forward end of the previously set rail. To aid in aligning the rails, cleats 63 are spaced along the outer beam 11 and upright gage bars 64 have their upper ends inserted in these cleats with their lower ends terminating above the grade. The relative lateral spacing between the gage bars and the roller 28 is such that when the added rail E is placed against the bars 64, it will be positioned in proper alinement with the previously set rail. This arrangement avoids the necessity of measuring and manually aligning the rails. It would, of course, be possible to first adjust the alinement gages 41 and then move the vehicle along the road so that when the rollers 43 engage the edge of the pavement, the wheel 28 would be in position to engage on top of the rail 25. In actual practice, it would be preferable to first adjust the frame 10, and then complete the adjustment by setting the cutter blade. After the adjustments have been made, and the frame 10 is in position, the vehicle wheels 52 are swung to the proper angle and the locks 55 then applied.

The vehicle is now driven forwardly, whereby the ground is cut to the proper grade and contour. It will be noted that the scraper 32 projects beyond the beams 11 so as to extend the

grade laterally and outwardly sufficiently to receive and support the next form rail at the proper elevation; also, the angular disposition of the cutting blade 32 will move the dirt toward the outer side of the cut and thus dispose it outwardly thereof, which leaves the cut clean and facilitates the placing of the form rails. When the apparatus has progressed to the point where the roller 28 reaches the forward or advance end of the rail 25, an additional rail is placed in position and the operation is continued. The apparatus may be efficiently operated with a driver and three laborers, which is one-third the number of men usually employed. It has been found in actual operation that the work may be done in one-half the time usually required by the methods now in common use.

In case the apparatus should move so far forwardly as to carry the roller 28 off the front end of the rail 25, an auxiliary caster wheel 65 is fastened to the rear end of the inner beam 11, so as to hang just above the grade and act to support the rear end of the frame, as will be obvious.

It is pointed out that the frames 10 and 13, being of considerable length, and comparatively narrow, will absorb twists and ordinary vertical displacements of individual wheels without seriously affecting the cut of the scraper blade. The apparatus permits the finishing of an excavation to an exact grade and contour, with a minimum amount of labor and with a desirable accuracy.

While the apparatus has been illustrated with motor units 51 mounted on the vehicle frame 14 and the wheels equipped with drives from the engines, it may be desirable to pull the frame by a tractor or other propelling means. In Fig. 10, I have illustrated a form suitable for this purpose and only the front and rear portions of the frame are shown. Instead of the engine drives, the axles 50 and wheels 52 would be equipped with ordinary steering linkage 70 and draw bars 71 are attached to the ends of the frame. The forward draw bar may be suitably connected to a tractor so that the frame may be pulled along the pavement and the wheels secured by the locks 55, if desired. It would also be possible to equip the frame with a power driving unit at one end and a draw bar at the other end so that the apparatus may be used in either manner.

The foregoing description of the invention is explanatory thereof and various changes in the size, shape and materials, as well as in the details of the illustrated construction may be made, within the scope of the appended claims, without departing from the spirit of the invention.

What I claim and desire to secure by Letters Patent is:

1. A road apparatus including, a grading frame, a portable carriage adjustably supporting one end of the frame, a dolly adjustably supporting the opposite end of the frame, alinement gages carried by the frame for engaging the edge of a pavement, a scraper blade suspended from the medial portion of the frame, a vehicle adapted to travel along a finished pavement and to which the frame is attached, and means for locking the wheels of the vehicle at an angle to its direction of travel to cause the alinement gages to maintain the frame in line.

2. A road grading machine including, an elongate grading frame adapted to travel longitudinally outboard of a finished pavement and having an inner side and an outer side, spaced rolling guides at the inner side of the frame disposed horizontally for engaging the edge of a pave-

ment, a rigid blade hanger carried by the frame between the rolling guides, a blade carried by the hanger transversely of the frame, a wheeled support for the frame in advance of the blade hanger, a rolling support in rear of the hanger adapted to roll on a form rail, the outer end of the blade being spaced a greater distance from the rear support than the length of a form rail section, and a rolling support connected to the inner side of the frame adapted to roll on a pavement.

3. A road grading machine as set forth in claim 2, with a dolly at the rear end of the frame.

4. A road grading machine including, a frame comprising an elongate outer member along its outer side and medial spaced transverse members directed inwardly from the outer member, a triangular blade hanger between the transverse members having its outer open portion rigidly secured to the outer frame member and its inner ends rigidly carried by the inner ends of the transverse members, a blade suspended by the hanger, a portable support attached to the inner ends of the transverse members at the inner side of the frame, a wheeled support at the front end of the outer frame member movable in the direction of the longitudinal axis of the outer frame member, and a rear wheeled support at the rear end of said outer frame member.

5. A road grading machine as set forth in claim 4, with horizontal rolling edge gages carried at the inner ends of the transverse frame member.

6. A road grading machine as set forth in claim 4, with a dolly at the rear end of the outer frame member.

7. A road grading machine including, a frame comprising an elongate outer member along its outer side and medial spaced transverse members directed inwardly from the outer member, a triangular blade hanger between the transverse members having its outer open portion rigidly secured to the outer frame member and its inner ends rigidly carried by the inner ends of the transverse members, a blade suspended by the hanger, a portable support attached to the inner ends of the transverse members at the inner side of the frame, a multiple wheel truck supporting the front end of the outer frame member movable in the direction of the longitudinal axis of the outer frame member, and a rear wheeled support at the rear end of said outer frame member.

8. A road grading machine including, a frame comprising an elongate outer member along its outer side and medial spaced transverse members directed inwardly from the outer member, a triangular blade hanger between the transverse members having its outer open portion rigidly secured to the outer frame member and its inner ends rigidly carried by the inner ends of the transverse members, a blade suspended by the hanger, the transverse frame members having means at their inner ends for hinging the frame to the side of a portable support, brackets carried by the transverse members adjacent the inner ends thereof, horizontal rolling edge gages carried by said brackets, and wheeled supports at the front and rear ends of the outer member of the frame.

9. A road grading machine including, a frame comprising an elongate outer member along its outer side and medial spaced transverse members directed inwardly from the outer member, a triangular blade hanger between the transverse members having its outer open portion rigidly

secured to the outer frame member and its inner ends rigidly carried by the inner ends of the transverse members, a blade suspended by the hanger, a portable support attached to the inner ends of the transverse members at the inner side of the frame, a truck supporting the front end of the outer frame member having rigidly alined transverse rows of wheels, and a wheeled support supporting the rear end of the outer frame member.

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