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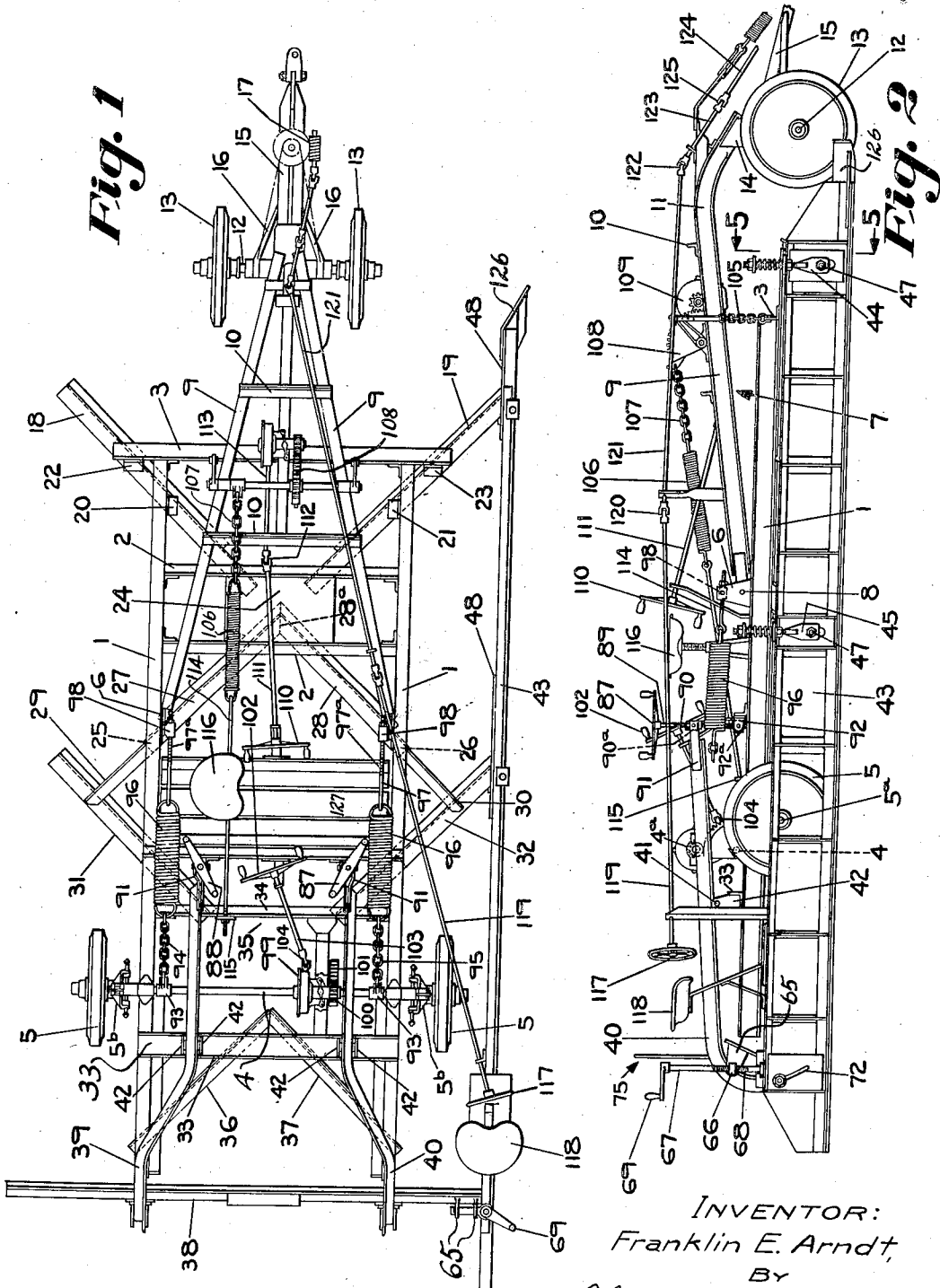
F. E. ARNDT

2,160,193

ROAD BUILDING MACHINE

Filed June 9, 1933

2 Sheets-Sheet 1



INVENTOR:
Franklin E. Arndt,
BY

Chas. M. Nissen,

ATTY.

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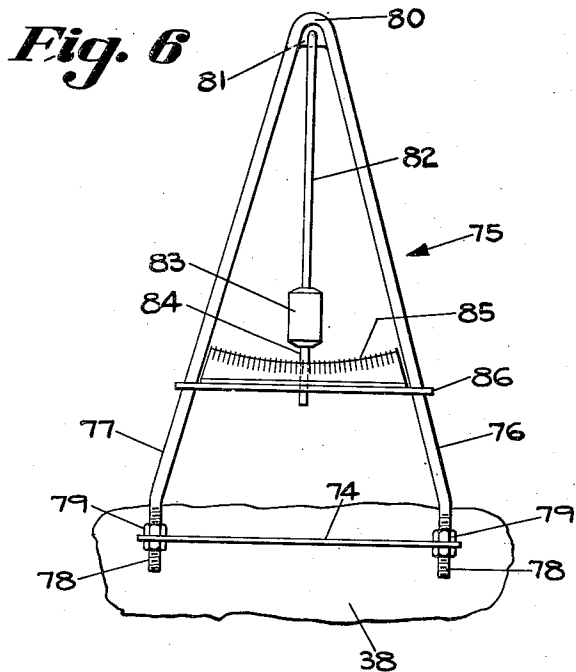
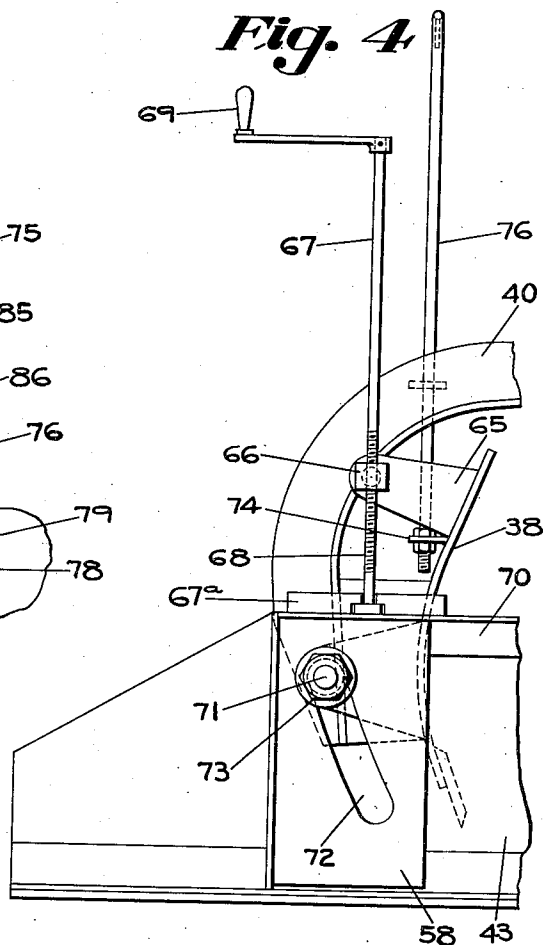
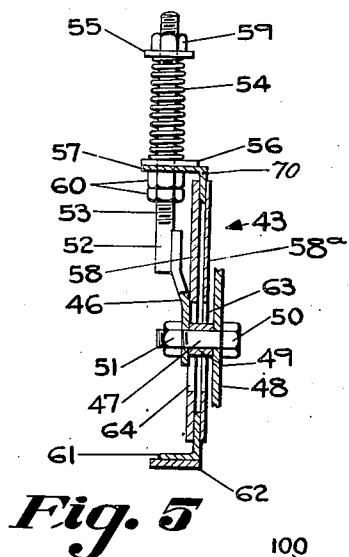
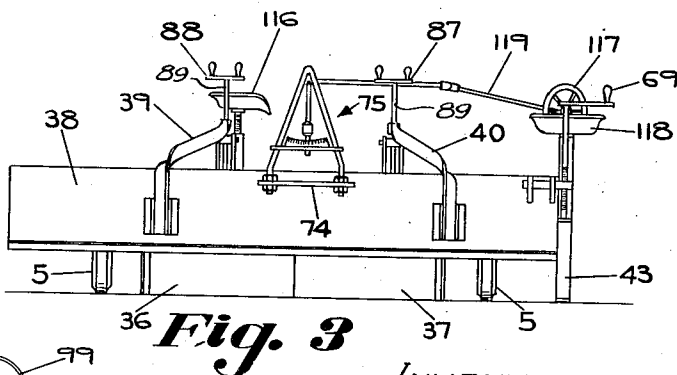
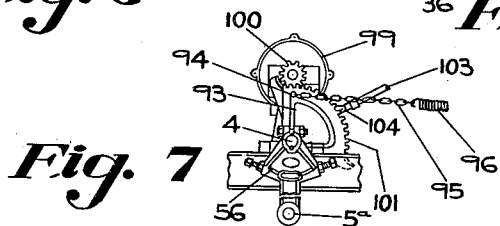
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ROAD BUILDING MACHINE

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2 Sheets-Sheet 2



INVENTOR:
Franklin E. Arndt
By
Chas. M. Nisnew,
ATT'Y.

UNITED STATES PATENT OFFICE

2,160,193

ROAD BUILDING MACHINE

Franklin E. Arndt, Galion, Ohio, assignor to The
Galion Iron Works and Manufacturing Com-
pany, a corporation of Ohio

Application June 9, 1933, Serial No. 675,079

34 Claims. (Cl. 37—150)

The improved road building machine of the present invention presents certain decided improvements over the prior art as applied to the type of road machines commonly referred to as road graders and maintainers, which act upon road aggregates such as gravel, stone or earth to level the same preparatory to rolling, and which are especially adapted for repair work, cutting off high places in the roads and filling holes and depressions, leaving a smooth and accurately graded road.

Operations of this character are greatly facilitated by increasing to the maximum the convenience of the necessary manipulations to the operators, and the ready determination of the proper working of the machine in performing the required steps in a satisfactory manner.

The improved machine of the present invention comprises, in general, a portably mounted frame adapted to be readily coupled to any power unit, upon which frame there being mounted a plurality of cutting blades disposed to act upon the road aggregates in such a manner that these aggregates will be passed back and forth across the width of the cut a plurality of times in a single trip of the machine, the material being, finally, evenly feathered out by the rear blade.

The invention further provides a construction of machine wherein the blades may be lifted, by improved equalizing spring type lifts controlled by a single control wheel, this wheel being in easy and convenient access to the operator of the power unit, giving the operator easy and positive control of the pressure on the blades at all times. This wheel is adjustable both in height and in distance from the power unit, and it affords an easy means for adjusting the blades to the proper depth to cut with the proper pressure, this pressure being variable gradually between zero and approximately four thousand pounds.

Additional features of the present improved construction reside in the provision of an automatic edger, designed to overcome choppy road waves and to give a perfectly straight edge to the road; the inclusion of a strike-off blade, adjustable for the crown of the road and which is provided with an indicator for showing variations of the machine on either side of the desired level.

There may be mentioned also the fact that in the present improved machine a greater clearance of the blades from the road is obtainable, thus giving a higher degree of safety during transportation of the vehicle than is obtainable in constructions prior to the present one.

The improved construction will be more readily

understood by reference to the accompanying drawings, in which:

Fig. 1 represents a plan view of a machine embracing the improved features of the present invention;

Fig. 2 is a side elevation of such machine;

Fig. 3 is a rear end view of the machine showing the mounting of a level indicating device employed for designating to an operator variations of the machine from the required level;

Fig. 4 is a fragmentary side elevation of the rear of the machine showing details of adjusting mechanism for an edger blade attached to the machine;

Fig. 5 is a sectional view on the line 5—5 of Fig. 2, looking in the direction of the arrows;

Fig. 6 is a fragmentary view of the level indicating device shown in Fig. 3, and illustrating the details of the mounting of the device; and

Fig. 7 is a view illustrating a form of lifting mechanism employed for lifting the road operating devices for transportation of the machine.

Referring more particularly to the drawings, it will be seen that the machine embraces a main frame comprising side channel bars 1 braced in proper spaced relation by transversely extending channel or angle bars 2, and joined together at the front end by angle bar 3, the ends of which extend beyond the side bars 1 of the main frame on each side of the machine.

Mounted on the side bars 1 is the rear shaft 4, upon which are mounted the adjusting devices, to be later described, for adjusting the rear wheels 5, which wheels are mounted on axles 5a carried in casting 5b. The wheels 5 are adjustably mounted relative to the frame of the machine for purposes which will be explained in detail hereinafter.

Suitably secured to the side bars 1 of the main frame of the machine are upstanding brackets 6, to which brackets is pivotally secured at 8 an auxiliary frame 7 comprising forwardly converging side channels each interconnected by the spacing and reinforcing angle bars 10. It will be seen from the drawings that the pivot points 8 are intermediate the front end of the machine and the rear wheels 5, and that the side bars 9 of the auxiliary frame 7 are inclined upwardly relative to the main frame of the machine and then bent downwardly as indicated at 11 in an arcuate manner to give additional strength. At the forward end of the auxiliary frame 7, at the point of convergence of the side members 9, is mounted the axle 12 carrying the front steering wheels 13. The axle 12 is interconnected with the

auxiliary frame for pivotal movement relative thereto by means of a bracket 14, and is also connected to the machine draw bar 15 by diagonal braces 16. These diagonal braces 16 are rods which transmit steering movement to the front axle 12 from the steering worm and worm gear mechanism 17 mounted on the draw bar 15, to the front axle 12.

It will be seen that the main frame 1 carries certain road working mechanism illustrated as comprising a plurality of blades disposed relative to each other and relative to the frame so as to effect an efficient mixing action upon road aggregates as the machine operates along the roadway.

Referring more particularly to these blades, it will be seen that a pair of such blades indicated at 18 and 19 is mounted adjacent the front end of the main frame of the machine, and is carried by the main frame, being secured thereto by being riveted or welded to angle brackets 20 and 21 welded or otherwise secured to the side bars 1 of the main frame, and also to angle brackets 22 and 23 secured to the overhanging ends of the front end bar 3. The blades 18 and 19 are disposed at an angle of approximately 45 degrees to the machine, and, as the machine operates upon the roadway, these blades gather the aggregates between them and deflect such aggregates toward the opening 24 between the inner ends of these blades.

Rigidly mounted on the side bars 1 of the main frame through means of brackets 25 and 26 are the blades 27 and 28 meeting at 28a just rearwardly of the opening 24, thus forming a V-shaped spreader, the point or apex of which is located substantially within the aforesaid opening 24. This V-shaped spreader acts upon the aggregates gathered between the blades 18 and 19 to spread these aggregates toward the sides of the machine. It will thus be seen that the aggregates are further mixed and spread by the action of these cooperating blades 27 and 28 forming the V-shaped spreader.

The blades 27 and 28 extend approximately to the sides 1 of the main frame. The angle bars 29 and 30 connect the side bars 1 to the outer extremity of the blades 31 and 32 which are rigidly supported in suitable manner by the frame bars 1. These blades 31 and 32 are disposed at an angle of approximately 45 degrees relative to the frame, and deflect the aggregates spread by the blades 27 and 28 so that the aggregates will be again brought inwardly toward the axis of the machine and concentrated in the opening 35 between the inner ends of the blades 31 and 32. It will therefore be seen that there is further agitation and mixing of these aggregates, and that they are now concentrated beneath the longitudinal axis of the machine.

Disposed rearwardly of this opening 35 is a second V-shaped distributor comprising the blades 36 and 37 also rigidly mounted on the side bars 1 of the machine frame, so that the aggregates will be spread outwardly toward the sides of the machine and be ready to be leveled by the rear transverse strike-off blade 38, which is mounted on bars 39 and 40, which bars are individually liftable relative to the machine frame so that the depth of spread, as determined by the strike-off blade 38, may be predeterminedly adjusted in accordance with the requirements of the desired operation. The bars 39 and 40 carrying the strike-off blade 38 are pivoted as indicated at 41 to the brackets 42 mounted on the channel brace 33, and the ad-

justment of the strike-off blade is effected by adjusting the angularity of the bars 39 and 40 by mechanism which will be hereinafter described in more detail.

Adjustably mounted on supporting brackets 43 carried on the outer ends of the blades 19, 32 and 33, and extending longitudinally of the frame of the machine, is an edger blade 43, which is adjustable in a manner hereinafter set forth. These supporting brackets are indicated at 44 and 45, and include a plate 46 mounted on a bolt 47 which extends through a plate 48 welded or otherwise secured rigidly to the end of the blades 19 or 32. The plate 46 is held in spaced relation with respect to plate 48 by means of a pipe spacer 49 and bolt head 50 and nut 51. A diagonal deflector 126 at the extreme front end of the edger blade 43 is adapted to clear a smooth path for itself.

The plate 46 is welded or otherwise rigidly secured to a rod 52 which is threaded as indicated at 53, and which forms a support for the coil spring 54 which bears against collars 55 and 56 mounted on the rod 52. The rod 52 passes through the leg of the angle iron member 57 which is secured in position to and between the vertical plates 53 and 53a, as shown in Fig. 5. The desired compression of the spring 54 is secured by means of nuts 59 and 60 which are received on the threads 53 of the rod 52. The degree of compression of the spring 54 is thereby responsive to the adjustment of the nuts 59 and 60. Between the lower edge of the edger blade 43 and the stiffening plate 53 there is positioned a second angle iron member 61 provided on its underside with a traction shoe 62 which is adapted to provide a wearing surface for the edger blade assembly. Angle members 51 and 57 may be welded or otherwise secured to and between the plate 53a and the stiffening plate 53. The spring 54 provides a resilient mounting for the edger blade assembly, since the plate 53a and the plate 56 are slotted as at 63 and 64 respectively, therefore enabling a play to be obtained between these members and the spacer 49 so as to permit of a yielding between the edger blade assembly and the spacer in the event that the traction shoe 62 should encounter an obstruction. The spring 54 maintains the traction shoe and edger blade in the proper position at all times. The edger blade 43 preserves a straight edge along the roadway as the machine progresses, and also acts as a vertical guide for enabling the remaining blades to act upon the irregularities in the road surface enabling these blades to level off choppy road waves thus giving a smooth and even surface to the road.

When the adjustments by means of the double levers 102 and 110 are such as to enable the edger blade 43 to be supported by means of the upper horizontal member 57 on the nuts 60 (Fig. 5) with the lower traction shoe 62 above the road surface, the nut 73 may be released whereupon adjustment in elevation and inclination of the transverse strike-off blade 38 may be made by means of the double levers 27 and 36 while the pin 71 is free to slide along the slot 72. It should be particularly noted, as shown in Fig. 4, that the pin 71 is carried on a bracket secured to the strike-off blade 38 and consequently the pin 71 partakes of the movements of the strike-off blade 38.

The vertical screw-threaded rod 68 is preferably mounted as shown in Fig. 4. Spaced brackets 65, as shown in Fig. 1, are mounted on the

transverse strike-off blade 38 in position to pivotally support the nut 66 to receive the screw-threaded portion 68 of the vertical rod 67. Vertical movement of the rod 67 in the nut 66 is obtained by turning the crank handle 69 which is secured to the upper end of the rod 67.

The lower end of the rod 67 is pivotally connected, as shown in Fig. 4, by means of recessed block 67a, to the top angle 70 of the edger blade 43, so that upon turning the rod 67 the rear end of the edger blade 43 may be lifted or lowered relatively to the strike-off blade 38, provided the nut 73 is released. When the rod 67 is turned to force the edger blade 43 down, the pin 71 remains stationary relative to the strike-off blade 38, and therefore this pin 71 will act as an abutment against the upper end of the slot 72 to limit the downward movement of the edger blade 43 relatively to the strike-off blade 38.

When the traction shoe 62 at the bottom of the edger blade 43 engages the road surface and the levers 102 and 110 are operated to lower the spreading blades toward the road surface, that side of the drag frame 1 adjacent to the edger blade 43 may be resiliently supported by means of the springs 54 on the top of the edger. This can readily be understood by reference to Figs. 1 and 5 since the plates 48 are rigidly mounted at the outer ends of the blades 19 and 32 and the plates 48 carry the brackets 44 and 45 shown in Fig. 2 and in detail in Fig. 5. When the rigid spreader unit comprising the drag frame 1 and the diagonal blades rigidly connected thereto, is thus resiliently supported spaced above the road surface but on the top of the edger blade 43, it will become easy for the operator sitting on the seat 118 to rotate the crank 69 to vary the elevation of the adjacent side of the frame 1, provided the nut 73 has been previously released. That is to say, particularly during crowning operations, adjustments may be made by the operator from the seat 118 to vary the transverse inclinations of the drag frame 1 for crowning purposes, by turning the handle 69 alone without manipulation of the nuts 60 provided adjustments have been previously made to resiliently support the blades 19 and 32 through the plates 48 on the springs 54.

It is of course apparent that the machine is intended to operate so as to give a road surface of a desired level or crown, especially in a transverse direction. It is important that the operator knows at all times whether the machine is operating at this predetermined level or crown so that the road surface will have the proper transverse slope for the crown. A convenient level and crown indicator is therefore provided, which is mounted on the strike-off blade 38 in such a manner that it will be readily and conveniently visible to the operator at all times and will indicate to such operator the exact transverse inclination at which the machine is operating at any given time. The mechanism illustrated in Figs. 3 and 6 is a very useful provision for this purpose. The rear strike-off blade 38 is provided with a horizontally extending bar 74 which receives a frame 75, the arms 76 and 77 of which are passed through the bar 74, and have the end thereof threaded as indicated at 78 for the reception of nuts 79 for securing the frame in place. The arms or sides 76 and 77 of this frame converge upwardly, and may be formed from a single piece of rod material by bending the same midway of its length at an arcuate angle, as indicated at 80, this angle being braced as indicated at 81. Freely suspended

from the brace 81 is a pendulum rod 82 carrying a weight 83 and a pointer 84 which is associated with a graduated scale 85 mounted on a transversely extending brace member 86. The rod 82 and weight 83 act as a plumb-bob pendulum, obviously remaining continuously perpendicular to the surface of the road by virtue of the free connection between rod 82 and brace 81. Therefore, when the machine is operating with its transverse axis horizontal to the surface of the road, the pointer 84 will be positioned automatically at the center of the scale 85, and graduations on the scale 85 will immediately indicate to the operator such variations from this level as may be existent at any given time; or if the blade 38 is operating at any predetermined slope for crowning purposes, variations therefrom will become at once apparent to the operator in a similar manner, and suitable adjustments may be made accordingly to restore the desired crowning position of the machine.

When the operator is on the seat 118 he has within his reach the handle 69 which he can turn, after the nut 73 has been loosened to cause the lower end of the rod 67, which is swiveled to the top of the runner 70 at 67a (Fig. 4), to lift or lower the rear end of the straight edge 43 while the nut 66 is held stationary by the gearing connected to the front end of the lever 40. This gearing comprising the screw-threaded rod 90 and nuts 90a and 92a (Fig. 2) serves to move the blade 38 to the position shown in Fig. 4. Then the nut 73 may be retightened and the nuts 59 and 60 shown in Figs. 2 and 5 may be adjusted so as to secure the proper position of the runner relative to the frame 1. When the operator is on the seat 116 he has within his reach the double levers 102 and 110 by means of which he can operate the elevating mechanism for the forward end of the frame 1 and the elevating mechanism for the rear portion of the frame. Both of these elevating mechanisms tend to lift or lower both sides of the frame equally but inasmuch as the lowering of that side of the frame 1 adjacent to the runner 43 is limited by the latter, the scraping and spreading blades remote from the runner will be lowered to crowning positions, and since the plumb-bob mechanism shown in Fig. 6 is mounted on the rear transverse strike-off blade 38, the operator on the seat 116 has within his direct observation a degree indicator comprising the graduated scale 85. The operator on the seat 116 has also within his reach the double arm lever 88 by means of which he can operate the mechanism for changing the elevation of that end of the strike-off blade 38 remote from the runner 43. The adjustments made by the operator from the seat 116 are for the purpose of placing the machine in condition for crowning purposes, and while making such adjustments the operator has under his vision the plumb-bob mechanism which always indicates the position of the transverse mold-board whether adjusted as to inclination by means of the double arm lever 88 independently of the frame 1 or together with the frame 1 when the latter is adjusted while the runner 43 rests on the roadway. Inasmuch as the forward end of the frame may be adjusted in elevation independently of the rear end, and vice versa, the forward blades may be in scraping position and the rear blades in spreading position, and all of those blades remote from the runner 43 may be in crowning positions, and the degree of crowning may be determined by the plumb-bob

mechanism which is always under the direct observation of the operator wherever he may be on or near the machine.

Such adjusting instrumentalities embrace hand wheels 87 and 88, the shafts 89 of which are threaded at 90 to receive a nut 90a held at adjusted elevation, and engaging the upper side of a block pivoted in a yoke 91 rigidly secured to each of the bars 39 and 40 carrying the strike-off blade 38. Shafts 89 are suitably threaded in a nut 92a pivotally held in brackets 92 on the frame side members 1, and when each hand wheel is turned, obviously the inclination of the bars 39 and 40 will be independently adjusted, the bars turning upon their respective pivot points 41. It will therefore be seen that either end of the strike-off blade 38 may be adjusted independently of the other end, and the blade 38 pitched transversely at any predetermined angular adjustment relative to the frame.

It will be obvious that some means must be provided necessarily for lifting the various spreader blades out of contact with the road surface, when it is desired to transport the machine from place to place. Lifting instrumentalities of the type illustrated in Fig. 7 may be provided for this purpose. The adjustment is accomplished by lifting the main frame of the machine vertically relative to the roadway, and this is accomplished by adjustably mounting the rear axles of the machine as has been indicated before. For this purpose, the shaft 4 has secured to it a segmental lever arm 93, on which is mounted a connection 94 for receiving a chain 95 attached to one end of a heavy tension spring 96, the other end of which spring is connected by means of the rod 97 threaded at 97a for receiving a nut 98, to the top of the bracket 6. The shaft 4 is normally locked in position by a self-locking worm and worm gear in a housing 99, which worm gear operates, upon release thereof, a gear 100, the teeth of which mesh with the teeth of a segmental rack 101. Upon release of the self-locking worm gearing mechanism by proper manipulation of a hand wheel 102 through rod 103 connected at 104 with the worm gearing mechanism, the tension of the spring 96 will rotate the lever 93, which is keyed to shaft 4, thus rotating shaft 4, to which is keyed the casting 5b which carries the wheel 5, so as to vary the height of the wheel relatively to the frame, correspondingly adjusting the height of the frame of the machine, and correspondingly varying the elevation of the blades relative to the road surface.

The worm gearing will lock itself to hold the frame and blades in desired adjustment.

This mechanism is duplicated at each side of the machine for each end of the rear axle, and is also duplicated at the front of the machine for lifting the front end of the frame, the mechanism being mounted on the auxiliary frame before described, being interconnected by chains 105 with the cross bar 3 of the main frame of the machine. The arrangement of this mechanism is shown in Figs. 1 and 2, from which views it will be seen that the heavy spring 106 is connected by a chain 107 to a segmental rack 108, there being associated therewith self-locking worm gearing 109 which is releasable through a hand wheel 110 and operating rod 111 having a universal joint 112 with a second rod 113 which is directly connected with the self-locking worm gearing 109. The other end of the spring 106 is interconnected by means of a rod 114 to a

bracket 115 mounted on the brace member 34 of the main frame of the machine.

The various controls are readily accessible to the operator positioned on a seat 116 located at approximately the center of the machine, steering being effected through a wheel 117 positioned in proximity to the operator's seat 116 mounted on the edger blade 43. The wheel 117 operates a rod 119 which is interconnected at 120 with a second rod 121, which has another universal joint at 122 connecting with the rods 123 and 124, these latter rods being interconnected by a universal joint 125. The rod 124 goes to the worm and worm gear steering device 17.

In practice, the seat 116 may be omitted, in which event the operator may make various adjustments of the double arm levers 87, 88, 102 and 110 while standing on the platform 127 formed by crosspieces between the side members 1 of the drag frame.

It will therefore be seen that the machine of the present invention may be quickly hitched to any power unit and in practice the road material passes back and forth across the width of the cut of the machine four times in a single trip of the machine, and is evenly feathered out by the rear strike-off blade. This rear strike-off blade is conveniently formed with a plurality of blades separately adjustable, if desired, for adjusting the crown of the road. The entire operation of the machine and the adjustment thereof is continuously within a convenient range of vision of the operator, and any necessary adjustments for maintenance of the desired operating conditions can be quickly and conveniently made at any given moment.

It will also be seen that the edger 43 which is shown in Fig. 1 as extending the full length of the spreader unit and even beyond the forward and rear ends thereof, may serve as an adjustable gauge to move along a predetermined line of the road surface in accordance with which leveling or crowning operations can be carried out by the spreading and mixing blades, and simultaneously the straight edge of the spread material may be maintained. That is to say, by reason of the elongation of the edger 43 so as to extend at least the full length of the machine, the straight bottom edge or traction shoe 52 will not be affected by inequalities of the road surface but will be adapted to support the adjacent side of the drag frame 1 at substantially uniform elevation relatively to the road surface during all spreading operations of the machine. This is true not only when the spreader blades are acting as levelers while the edger 43 contacts with the road surface but also when that side of the drag frame 1 is supported by the edger 43 in a higher position than the remote side of the frame 1 for crowning purposes. The various adjustments shown in the accompanying drawings render the machine very flexible for various operations including edging only when the frame supports the edger closely adjacent to the road surface, and gauging only when the runner 43 is supported entirely above the road surface, but when the runner 43 engages the road surface and supports the adjacent side of the drag frame, the runner acts not only as said support but also as an edger, a gauge, and an equalizer by maintaining the spreader blades at adjusted level or transverse inclinations in accordance with the adjustments between the drag frame 1 and the runner 43.

Obviously those skilled in the art may make

various changes in the details and arrangement of parts without departing from the spirit and scope of the invention as defined by the claims hereto appended, and I wish therefore not to be restricted to the precise construction herein disclosed.

Having thus described and shown an embodiment of my invention, what I desire to secure by Letters Patent of the United States is:

1. In a road building machine, the combination with a portable frame, of road leveling mechanism mounted thereon and comprising parallel rearwardly inclined spaced-apart blades, a longitudinal runner spaced laterally from said frame and carried on the outer ends of said parallel spaced-apart blades, and means for adjusting the elevation of said runner relative to the road surface.

2. In a ground leveling device of the character described, a frame, longitudinally spaced ground engaging blades on said frame, a longitudinally extending ground runner reaching substantially the full length of one side of said frame and adapted for the support of the said one side at various heights to control the depth of cut of said blades, and means for relatively adjusting the frame and runner at longitudinally spaced points to vary the height of one side of the frame.

3. In a leveling and spreading machine, the combination with a frame having spaced-apart elongated parallel side members rigidly connected by spaced-apart transverse members, of cutting and spreading blades connected to said frame to form a rigid unit, means comprising ground engaging supporting devices for supporting said rigid unit for variation in elevation relative to the road surface to effect adjustment of said blades to operating positions, an elongated runner separate from the aforesaid supporting means and extending along the entire length of one side of said frame parallel to said side members, and means between the frame and the runner for adjusting said runner relative to said frame to support the adjacent side of said frame in the position to which it has been adjusted as aforesaid to enable said runner to act as a gauge by riding over a predetermined path of a road surface adapted to act as a guide for the leveling operation.

4. In a leveling and spreading machine, the combination with a frame having spaced-apart elongated parallel side members connected rigidly by transverse members, of cutting and spreading blades connected to said frame to form a rigid unit, adjustable means for supporting said rigid unit relative to the road surface to predetermine the cutting and spreading positions of said cutting blades, an elongated runner extending along the entire length of one side of said frame parallel to said side members, and adjustable means at the outer ends of two of said blades and co-acting with the latter to support such adjacent side of said frame at various elevations relative to the road surface to enable said runner to act as a gauge spaced laterally from the adjacent frame side member while sliding along a guiding road surface to control the depth of cut of said blades and the spreading of the material in conformance with such guiding surface.

5. In a leveling and spreading machine, the combination with a frame comprising elongated parallel spaced-apart side members and transverse members rigidly connecting the same, of cutting and spreading blades connected to said frame, adjustable mechanism comprising ground

engaging supporting devices for supporting said frame for travel at adjusted elevation relative to the road surface, an elongated runner separate from said adjustable supporting mechanism and extending along the entire length of one side of said frame parallel to said side members, and adjustable means between the frame and the runner for supporting said runner on one side of said frame at various elevations relative thereto while out of ground engaging position and for supporting said side of said frame at various elevations relative to the runner while the latter is sliding along a guiding ground surface thereby controlling the depth of cut of said blades and predetermining the level of the spread material in accordance with such guiding ground surface.

6. In a ground leveling device of the character described, the combination with a portable frame having parallel spaced-apart side members and transverse members rigidly connecting the same, of material spreading mechanism rigidly connected to said frame to form a single rigid unit, means comprising ground engaging wheels for supporting said unit on a roadway, an elongated longitudinal skid extending along the entire length of one side of the machine parallel to said side members separately from said supporting means, and means comprising spaced-apart screw adjusting devices each associated with said skid for supporting the adjacent side of said unit with the spreading mechanism at adjusted elevation relative to the road surface for regulation of the thickness of the material spread by the machine.

7. In a leveling and spreading machine, the combination with a portable frame, of means comprising front and rear wheels for supporting said frame, leveling and spreading mechanism carried by said frame and comprising a transverse blade rearwardly of the rear wheels, an elongated runner extending along the entire length of one side of said frame, and means for adjusting the elevation of said runner relative to said frame.

8. In a ground leveling and spreading machine, the combination with a portable frame, of leveling and spreading mechanism carried thereby to move bodily therewith, an elongated ground runner extending along one side of said frame to reach substantially the full length thereof, a plurality of spaced-apart devices for adjusting the elevation of said runner relative to the road surface when the runner is up off the ground and for adjusting the height of said side of said frame relatively to the road surface when the runner is in supporting contact with the ground, and adjustable means comprising ground engaging wheels for supporting the frame at adjusted elevation relative to the road surface when said runner is out of contact therewith.

9. In a ground leveling device of the character described, the combination with a frame, of longitudinally spaced ground engaging leveling and spreading blades on said frame, a runner extending longitudinally along one side of said frame and adapted to support the latter, mechanism comprising ground engaging wheels and means for raising and lowering the same relatively to said frame for adjusting the elevation of said ground engaging blades relative to the road surface, and means for adjusting the runner relatively to said frame to bring said runner into ground engaging position to afford a longitudinal supporting gauge for the adjacent side of the

frame and the ground engaging blades carried thereby.

10. In a road building machine, the combination with a portable drag frame, of mechanism mounted thereon for spreading material on a road bed, means for adjusting the longitudinal tilting of said frame, an elongated gauge device extending substantially the full length of the machine at one edge of the path of travel thereof and adapted to ride over the surface of the road bed and limit the lateral spreading of the material thereon to effect a straight edge of the spread material, and means for adjusting the elevation and longitudinally tilting of said gauge device as a whole relative to said drag frame.

11. In a road building machine, the combination with a vehicle comprising a front steering wheel unit connected to a frame the rear end of which is pivoted to a drag frame intermediate the ends of the latter with ground-engaging supporting wheels for the rear portion of the drag frame, of a plurality of scraping and mixing blades carried by said drag frame, an elongated longitudinal gauge device at one side of the machine and extending parallel to the path of travel thereof, means on the vehicle for adjusting the said blades relative to the road surface to vary the depth of the material spread, mechanism within the vision of the operator for indicating transverse inclination of the drag frame, and mechanism associated with said longitudinal gauge device for varying the transverse inclination of the drag frame to secure such crowning position as that indicated by said indicating mechanism.

12. In a ground leveling machine, the combination with a supporting frame, of ground engaging blades carried by said frame, means for adjusting the frame relative to the roadway by moving both sides thereof equally to various elevations to secure adjustment for leveling of the roadway by means of said blades, a longitudinally extending runner reaching substantially the full length of one side of said frame and adapted for the support of the adjacent side of said frame at various heights relative to the road surface while the other side of the frame is at a different height to control the crowning of the roadway, and means for relatively adjusting the frame and runner to render the latter effective to limit the lowering toward the road surface of the adjacent side of said frame.

13. In a planer and spreading machine, the combination with a frame, of converging cutting blades on the forward portion of said frame, spreader blades on said frame rearwardly of said converging cutting blades, mechanism for adjusting the elevation of the forward end of said frame together with said converging cutting blades relative to the road surface, mechanism for adjusting the elevation of the rear end of said frame together with said spreader blades relative to the road surface, a longitudinally extending ground runner reaching substantially the full length of one side of said frame and adapted for the support of the said one side at various heights to control the crowning of the roadway by the machine, and means for relatively adjusting the frame and runner at longitudinally spaced points to vary the height of the one side of said frame forwardly and rearwardly in accordance with the aforesaid forward and rearward adjustments of said frame relative to the road surface.

14. In a road working machine, the combina-

tion with a frame, of a transverse scraper blade carried thereby, a longitudinal runner at one side of the machine, an adjustable connection between said blade and said runner, and means for adjusting the elevation of said blade and by said connection varying the elevation of said runner.

15. The combination with a road working machine, of a ground engaging straight edge device at one side of the machine, spaced-apart brackets rigidly connected to the machine and extending through openings in said device, vertical screw-threaded rods secured to the upper ends of said brackets, and each extending through a hole in a horizontal upper plate of said straight edge device, spiral springs on said rods above said horizontal plates, nuts on the upper ends of said rods, and additional nuts on said rods below said plates, said nuts and screw-threaded rods being adapted to vary the extent of compression of each spring and thereby vary the elevation of that side of the machine adjacent to the straight edge device while the latter is in ground engaging position and to vary the elevation of the straight edge device when out of ground engaging position.

16. A straight edge device for road working machines, comprising the combination with a straight angle iron ground engaging shoe, of a straight angle iron spaced above said shoe, mechanism for rigidly connecting said angle irons in parallelism to each other, and means comprising spaced-apart plates having openings therein adjacent to openings in the upper angle iron to afford connections to the road-working machine for the support therefrom of the device in a vertical plane.

17. A straight edge device for road working machines, comprising the combination with a straight elongated ground engaging shoe, of a diagonal ground engaging deflector at the front end of said shoe, frame structure extending upwardly from said shoe and rigidly connected thereto to keep the same straight, spaced-apart plates carried by said frame structure to afford the mounting of the straight edge device at one side of the road working machine, and an additional slotted plate at the rear end of the frame structure to facilitate connection of the straight edge device to a road working implement of the road working machine.

18. In a road building machine, the combination with a vehicle comprising a main frame and a machine drawbar frame pivoted thereto intermediate the ends thereof with rear wheels for supporting the main frame and steering wheels for supporting the front end of the drawbar frame, of diagonally arranged scraper blades carried under said main frame and adapted to move material on the roadway back and forth transversely thereof to spread the same uniformly, mechanism between said frames for adjusting the elevation of the front portion of the main frame relative to the road surface, mechanism for adjusting the rear wheels relative to said main frame to vary the elevation of the rear portion thereof relative to the road surface, a straight edge device extending along one side of the main frame, mechanism for supporting said straight edge device from said main frame at spaced-apart points longitudinally thereof, and means for independently adjusting the elevation of said straight edge device at such spaced-apart points to enable the bottom of said straight edge device to remain in contact with the ground throughout its full length during operation of

the machine notwithstanding the longitudinal tilting of the main frame by the adjusting mechanism thereon as aforesaid.

19. The combination with a spreader unit, of
 5 mechanism comprising a front steering wheel unit for supporting the front portion of said spreader unit at adjusted elevation relative to the road surface, mechanism comprising rear
 10 wheels for supporting the rear portion of said spreader unit at adjusted elevation relative to the road surface, an elongated runner extending substantially the full length of the spreader unit and adjustably supported at longitudinally
 15 spaced-apart points on said spreader unit, and individual adjusting mechanism at said spaced-apart points for varying the elevation and longitudinal inclination of the said elongated runner relative to said spreader unit to enable said
 20 runner to support one side of the spreader unit independently of the adjacent rear wheel or to contact with the road surface while the rear portion of the spreader unit is supported by both rear wheels or to amply clear the road surface for transportation of the machine.

20. In a road building machine, the combination
 25 with a portable frame, of road working mechanism carried thereby, an elongated longitudinal skid at one side of the machine parallel to the path of travel thereof, and means comprising a screw
 30 device for adjusting the relative elevations of the skid and the frame, said means comprising a positive support of the skid on the frame when the skid is up off the road surface and a yielding support of the frame on the skid when the
 35 latter engages the road surface and the road working mechanism is in adjusted position for securing a predetermined working of material on the road surface.

21. In a road building machine, the combination
 40 with a portable frame, of road working mechanism carried thereby, an elongated longitudinal runner at one side of the machine extending parallel to the path of travel thereof, a plurality of devices spaced-apart longitudinally
 45 of the machine for positively supporting the runner on the frame when the runner is up off the road surface, and means comprising springs on top of the said runner for yieldingly supporting the frame on the runner when the latter
 50 engages the road surface and the road working mechanism is in position for securing a predetermined working of material on the road surface.

22. In a road working machine, the combination
 55 with a frame, of road working mechanism mounted thereon, an elongated runner at one side of the machine, spaced-apart brackets extending from said frame through said runner at spaced-apart positions, upright screws one on
 60 each bracket, mechanism comprising nuts on said screws for positively supporting said runner on said brackets at adjusted elevation, springs surrounding the upwardly projecting portions of said
 65 screws and resting on top of said runner, and means comprising nuts at the upper end portions of said screws for adjusting the tension in each spring individually and to secure yielding support of the frame on said runner.

23. The combination with a spreader unit, of
 70 mechanism comprising a front steering wheel unit for supporting the front portion of said spreader unit at adjusted elevation relative to the road surface, mechanism comprising rear wheels for supporting the rear portion of said
 75 spreader unit at adjusted elevation relative to

the road surface, an elongated runner extending approximately the full length of the spreader unit and adjustably supported on the spreader unit, and mechanism for varying the elevation and longitudinal inclination of the said elongated
 5 runner relative to said spreader unit to enable said runner to support one side of the spreader unit independently of the adjacent rear wheel or to contact with the road surface while the rear portion of the spreader unit is supported
 10 by both rear wheels or to amply clear the road surface for transportation of the machine.

24. In a road building machine, the combination with a vehicle comprising a main frame and a machine drawbar frame pivoted thereto in-
 15 termediate the ends thereof with rear wheels for supporting the main frame and steering wheels for supporting the front end of the drawbar frame, of diagonally arranged scraper blades carried under said main frame and adapted to
 20 move material on the roadway back and forth transversely thereof to spread the same uniformly, mechanism between said frames for adjusting the elevation of the front portion of the main frame relative to the road surface, mechanism
 25 for adjusting the rear wheels relative to said frame to vary the elevation of the rear portion thereof relative to the road surface, a straight edge device extending along one side of the main frame, and means operable inde-
 30 pendently of the aforesaid adjusting mechanisms for adjusting the elevation of the straight edge device and also its longitudinal inclination to enable the bottom of the straight edge device to remain in contact with the ground throughout
 35 its full length during operation of the machine notwithstanding tilting of the main frame by the adjusting mechanisms connected thereto as aforesaid.

25. In a planing and spreading machine, the
 40 combination with a frame, of scraper and spreading blades mounted thereon to form a planing and spreading unit, mechanism for adjusting the elevation and longitudinal tilting of said planing and spreading unit, a longitudinally ex-
 45 tending ground runner reaching substantially the full length of one side of said frame and adapted for the support of the said one side at various heights to control the crowning of the roadway by the machine, and means separate
 50 from said adjusting mechanism but connected between said unit and said runner for varying the longitudinal tilting of the runner relative to said unit to conform with the adjustment in elevation and longitudinal tilting of the said
 55 planing and spreading unit.

26. In a road working machine, the combination with a material spreader comprising a frame, of mechanism for adjusting the elevation of said
 60 spreader relative to the road surface, a longitudinally extending ground engaging runner reaching substantially the full length of one side of said frame and adapted for the support of the said one side at various heights relative to the road surface, means comprising a spring for resiliently supporting the forward portion of said
 65 frame on said runner, and manual mechanism connected to the rear end portion of said runner to effect variation in elevation of the adjacent side of said frame independently of the aforesaid
 70 spreader elevation adjusting mechanism.

27. The combination with a road working machine, of an elongated runner at one side thereof, mechanism comprising a bracket extending laterally from the machine through the runner and
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upwardly along the outer face thereof for connecting the runner to said machine to move bodily therewith along the roadway while having freedom of limited up and down movement relatively to the machine, and resilient mechanism on top of said runner to yieldingly hold the same down into contact with the roadway and serve as rebound shock absorbing mechanism when said runner rides over irregularities in the roadway.

28. In a road working machine, the combination with a portable frame, of scraper and spreading mechanism mounted thereon, an elongated runner at one side of the machine extending substantially the full length thereof, a transverse strike-off scraper at the rear end of the machine, means for adjusting the runner and said strike-off scraper relative to said frame each independently of the other, and a pin and slot connection between said runner and said strike-off scraper adapted to secure said strike-off scraper to the rear end portion of said runner when said adjusting means have been operated.

29. The combination with a road working machine, of a straight edge device extending along one side of the machine approximately the full length thereof, and adjustable resilient means between said straight edge device and the adjacent side of said machine for yieldingly supporting such adjacent side of said machine at adjusted elevation while said device engages the ground.

30. The combination with a road working machine, of a straight edge device carried thereby and extending approximately the full length of the machine, means for resiliently supporting the front end portion on said machine at one side thereof, and means for adjusting the elevation of the rear end portion of said straight edge device relative to said machine, comprising a screw-threaded rod threaded through a nut with the lower end of the said rod swiveled to the straight edge device to secure positive movement of the latter both upwardly and downwardly when said screw-threaded rod is rotated.

31. The combination with a supporting frame, of spreading and leveling mechanism mounted thereon and comprising a rear transverse strike-off blade, a straight edge device mounted at one side of said frame and extending the full length thereof, means between said strike-off blade and said straight edge device for adjusting the elevation of the rear end of said straight edge device, said elevation adjusting means comprising nut

and screw elements and a swiveled connection between the screw element and said straight edge device, mechanism for adjusting the elevation of the strike-off blade relative to said frame, a pin and slot connection between the strike-off blade and said straight edge device, and mechanism comprising a nut associated with said pin for holding said straight edge device in adjusted position relative to said frame and relative to said strike-off blade.

32. The combination with a spreader and leveler comprising a transverse blade, of a runner connected to one side of the machine to extend approximately the full length thereof, a pin and slot connection between said blade and said runner, a nut for securing said runner to said blade in adjusted position relative thereto, and means for adjusting the said blade relative to said runner when said nut is released.

33. The combination with a road working machine, of a straight edge device extending along one side of the machine approximately the full length thereof and parallel to the path of travel of the machine, resilient means for yieldingly supporting one side of said road working machine on said straight edge device while the latter is in ground engaging position, and means comprising a manually rotatable screw-threaded rod connected between the road working machine and said straight edge device for adjusting the elevation relative to the road surface of that side of the road working machine adjacent to said straight edge device while the latter rests on the ground and while said side continues to be yieldingly supported as aforesaid.

34. The combination with a road working machine having a transverse strike-off blade at its rear end, of a straight edge device extending approximately the full length of the machine along one side thereof parallel to the path of travel of the machine, a releasable connection between one end of said strike-off blade and the rear end portion of said straight edge device, and means on the road working machine for adjusting the elevation of that end of said strike-off blade connected to said straight edge and thereby adjust the elevation of such end of the strike-off blade relative to the road surface and relative to said straight edge device when the latter engages the ground and said connection is released.

FRANKLIN E. ARNDT.