July 6, 1937. R. S. SPENCER 2,086,395

ROAD MAKING APPARATUS

Filed April 28, 1933 4 Sheets-Sheet 1

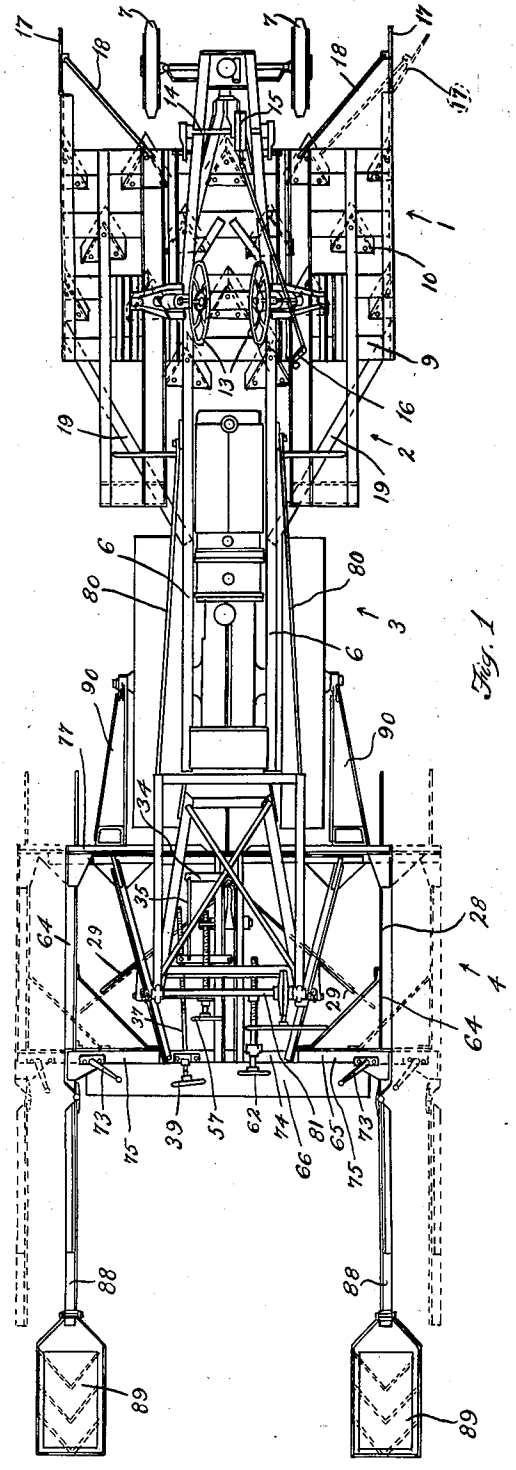


Fig. 1

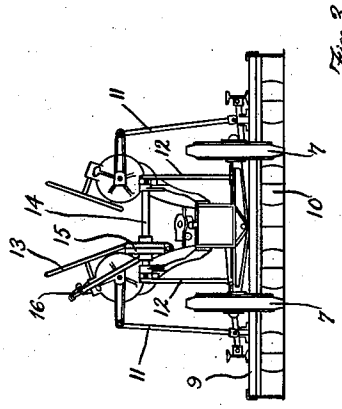


Fig. 3

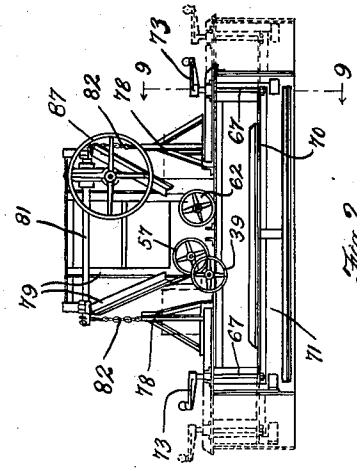


Fig. 2

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ROAD MAKING APPARATUS

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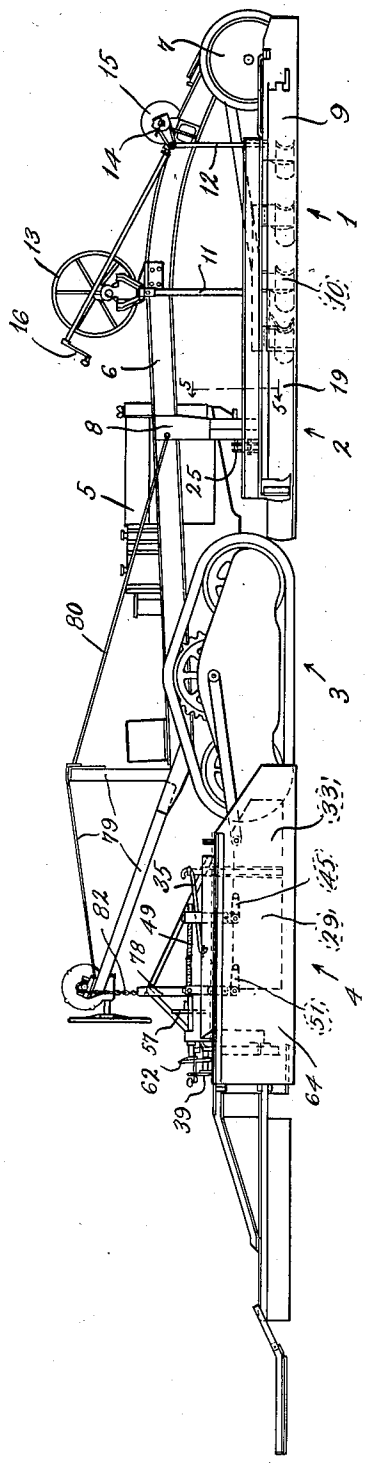


Fig. 4

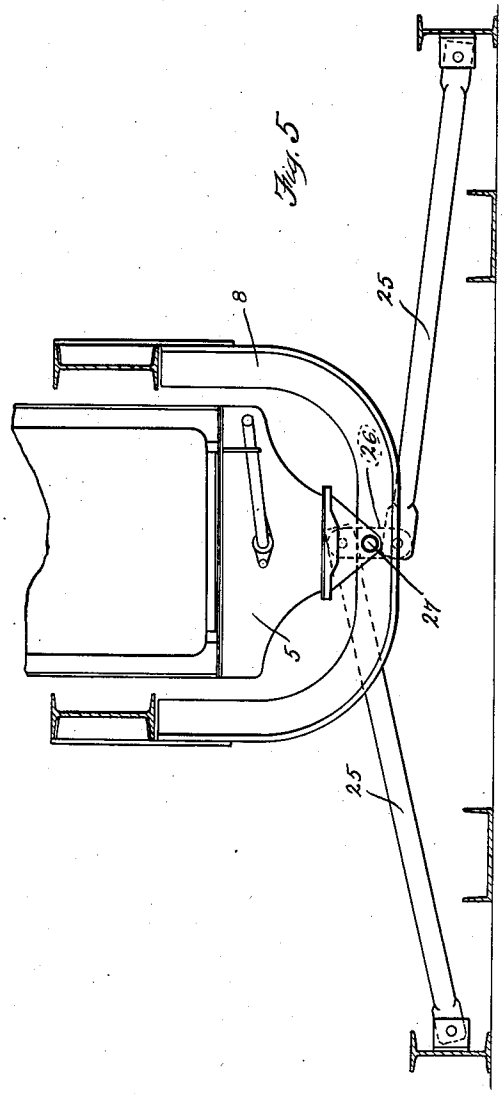


Fig. 5

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ROAD MAKING APPARATUS

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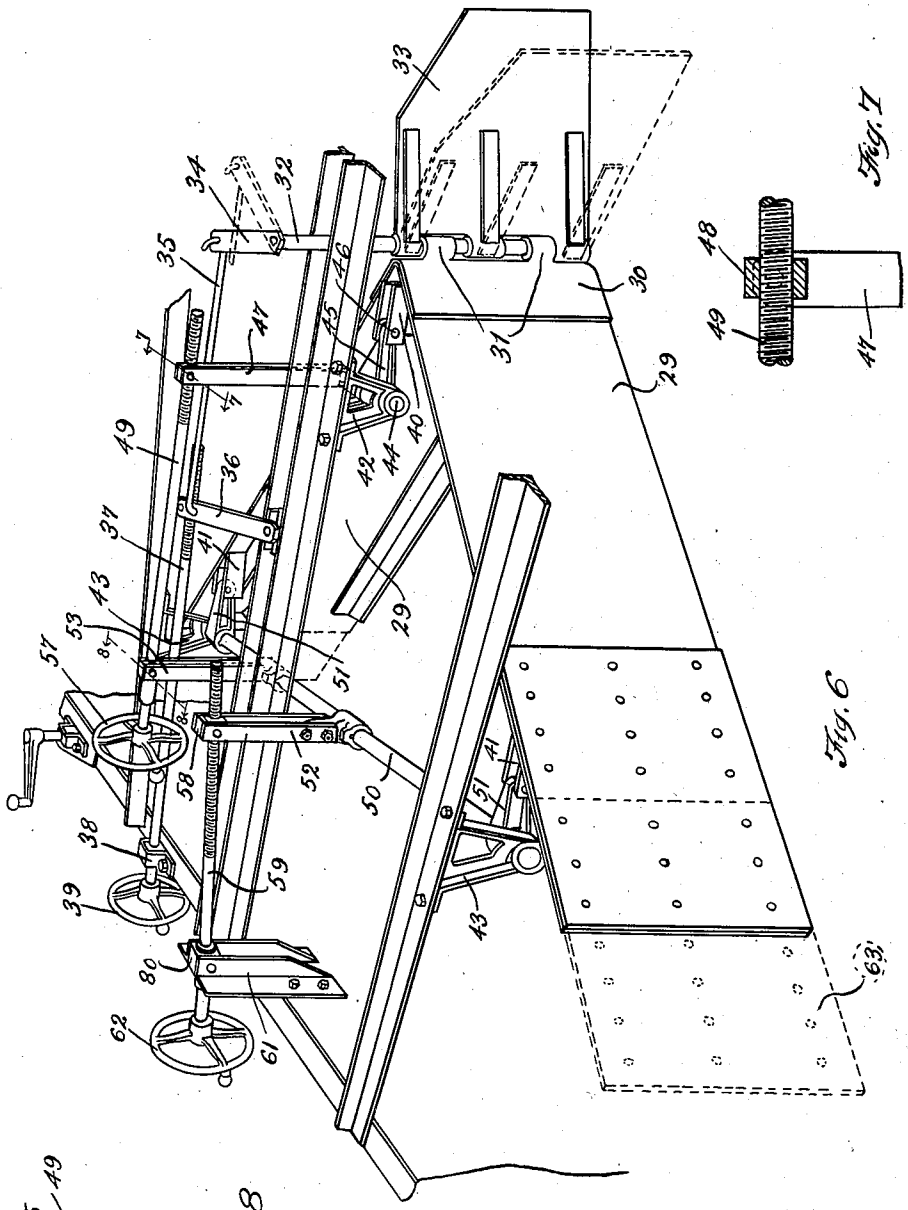


Fig. 6

Fig. 7

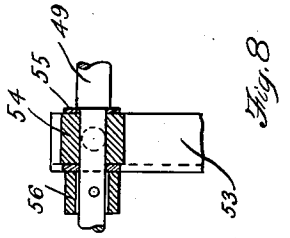


Fig. 8

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ROAD MAKING APPARATUS

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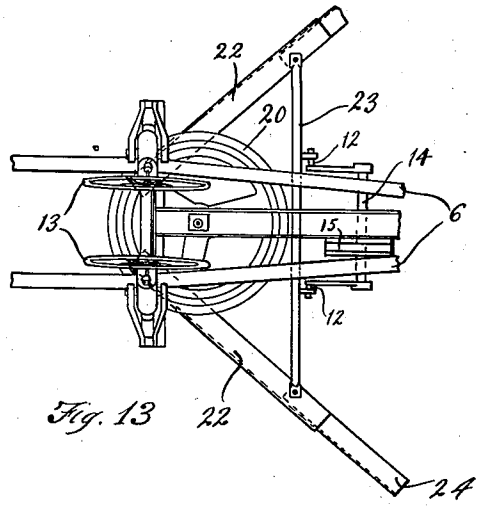


Fig. 13

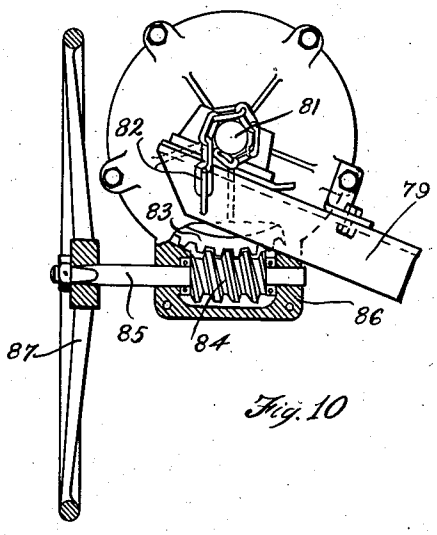


Fig. 10

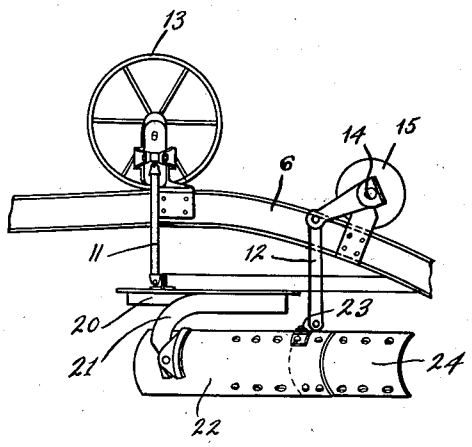


Fig. 14

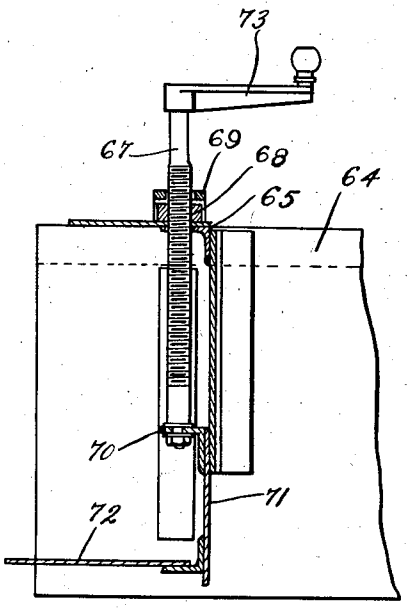


Fig. 9

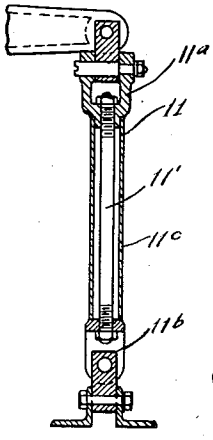


Fig. 12

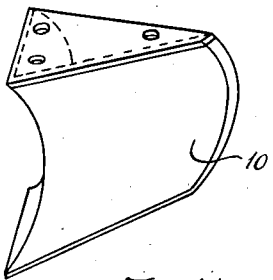


Fig. 11

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Patented July 6, 1937 2,086,395

UNITED STATES PATENT OFFICE

2,086,395

ROAD MAKING APPARATUS

Ralph S. Spencer, Massillon, Ohio, assignor, by mesne assignments, to W. A. Riddell Corporation, Bucyrus, Ohio, a corporation of Ohio

Application April 28, 1933, Serial No. 668,340

7 Claims. (Cl. 94—44)

This invention relates as indicated to road making apparatus and more particularly to apparatus designed for use in applying a layer of bituminous bound aggregate on a road surface whether new or one which, due to being worn by usage, must be repaired and resurfaced.

There are two principal processes employed in surfacing roads by means of a layer of bituminous bound aggregate. These two methods are characterized by the time at which the mixing of the aggregate and the bituminous binder occurs.

In one process aggregate such as stone, slag and the like is deposited on the road and after having been deposited is sprayed with the binder material. This requires that the aggregate and the binder be mixed so as to evenly distribute the binder through the mass of aggregate before the resultant mixture is uniformly distributed in place over the road surface.

Re-surfacing in the manner above defined is also frequently carried out by mixing the aggregate with a suitable amount of binder before being deposited on the road surface so that after the material is deposited on the road, the only step which remains is to distribute such deposited mass to form a smooth road surface.

It is among the objects of my invention to provide a road making apparatus particularly designed to carry out either or both of the above named processes and in a fashion more expeditious than has been possible with equipment available for this purpose to the present date.

Other objects of my invention will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims; the annexed drawings and the following description setting forth in detail certain means and one mode of carrying out the invention, such disclosed means and mode illustrating, however, but one of various ways in which the principle of the invention may be used.

In said annexed drawings:—

Figure 1 is a plan view of a road making apparatus embodying and containing my invention; Figure 2 is a rear view of the apparatus illustrated in Figure 1; Figure 3 is a front view of the apparatus illustrated in Figure 1; Figure 4 is a side elevational view of such apparatus; Figure 5 is a fragmentary sectional view drawn to an enlarged scale of a portion of the apparatus illustrated in Figure 4 taken on a plane substantially indicated by the line 5—5; Figure 6 is a perspective view of a portion of the material spreading apparatus which is carried at the rear of the tractor as illustrated most clearly in Figures 1 and 4; Figure 7 is a fragmentary sectional view of a portion of the apparatus illustrated in Figure 6 taken on a plane substantially indicated by the line 7—7; Figure 8 is a fragmentary sectional view of the portion of the apparatus illustrated in Figure 6 taken on a plane substantially indicated by the line 8—8; Figure 9 is a fragmentary sectional view of a portion of the apparatus as illustrated in Figure 2 taken on a plane substantially indicated by the line 9—9; Figure 10 is a part sectional, part elevational view of a portion of the means for raising and lowering the spreading apparatus positioned to the rear of the tractor as viewed in Figure 1; Figure 11 is a perspective view of one of the plows of the mixing apparatus positioned between the forward end of the tractor and the steering wheels as viewed in Figure 1; Figure 12 is a longitudinal sectional view through one of the links employed for the purpose of adjustably supporting the frame carrying the mixing plows; Figure 13 is a plan view of gathering in or windrow-forming blades adapted for certain uses of the apparatus to supplant the mixing apparatus forwardly of the tractor as illustrated in Figure 1; and Figure 14 is a side elevational view of the modification illustrated in Figure 13.

Referring now more specifically to the drawings and more especially to Figures 1 and 4, it will be noted that the apparatus comprising my invention consists generally of four parts, namely, mixing apparatus, generally indicated at 1, windrow-forming apparatus, generally indicated at 2, a power plant in the form of a tractor, generally indicated at 3, and a spreading and leveling device rearwardly of the tractor, generally indicated at 4.

The power plant, as above indicated, generally indicated at 3, consists of a normal tractor 5 illustrated in the drawings for purposes of convenience as of the rear crawler type from the forward end of which the steering wheels have been removed and an elongated frame 6 is secured to the tractor at the rear thereof, extends forwardly therefrom and has at its forward end attached thereto steering wheels 7. The forward end of the tractor 5 is supported in the frame 6 by means of a yoke 8.

It will be noted that this portion of the apparatus, i. e., the tractor elongated frame and forward steering wheels, forms the body structure of so-called one-man graders which, for a number of reasons, have recently become exceedingly popular. The apparatus comprising my inven-

tion is, therefore, adapted to be employed in conjunction with one-man graders and this may be done with only slight modification of the original structure entailing as the principal modification the removal of the scraper blade and scarifier, if such be employed.

As previously indicated, the frame 6 intermediately of the steering wheels 7 and the tractor 5 supports a mixing device, generally indicated at 1, which will be employed in conjunction with the apparatus when the aggregate is sprayed with the bituminous binder while positioned on the road surface, necessitating a mixing of the aggregate and binder before being finally spread to a smooth road surface. If the aggregate and binder are mixed before being deposited on the road, then the mixing device, generally indicated at 1, would be supplanted by the apparatus illustrated in Figures 13 and 14 hereinafter more fully explained.

The mixing apparatus 1 consists of a frame structure, generally indicated at 9, formed of fabricated structural steel elements in any suitable fashion to provide a support for a plurality of rows of plows 10, the form of which is most clearly illustrated in Figure 11. The plows 10 in the several rows on the frame 9 are preferably arranged in staggered relation so that the aggregate and the binder will be thoroughly mixed by the action of such plows. The frame 9 is supported by two sets of depending arms 11 and 12 respectively, the former being independently controllable by hand-wheels 13 operating through the usual type of mechanism employed on graders for actuating the scraper blade. In view of the common form of this apparatus, a detailed description thereof will not be given herein, except as illustrated in Figure 12, the arms generally indicated at 11 may consist of two axially spaced bracket members 11*a* and 11*b* respectively threadably secured at opposite ends to a shaft 11′ which is laterally encompassed by a tubular member 11*c* against which the brackets 11*a* and 11*b* are drawn up by means of the nuts on opposite ends of the shaft 11′.

The forward pair of arms 12 are respectively secured to cranks associated with the opposite ends of a transverse shaft 14, such shaft being rotated through suitable gear means contained in the housing 15 and adapted to be actuated by the hand operated lever 16 as most clearly illustrated in Figure 1. The supporting arms 11 and 12, therefore, permit the shovels 10 supported by the frame 9 to be carried in a predetermined relation to the road surface so that the aggregate may be mixed to any depth, if desired.

To the forward corners of the frame 9 are pivotally secured deflector blades 17 which are maintained in adjusted position by tie-rods 18. As illustrated in dotted lines at the lower front corner of the frame, as viewed in Figure 1, the tie-rod may be shifted at its inner end to a different hole adapted to receive the same on the forward sill of the frame 9 so that the angular relation of the blade 17 with respect to the frame may be varied, thereby gathering in to the mixing shovels a greater width of the deposited aggregates.

It will be noted that the road surface to be treated and over which the aggregates and either binder are deposited while being mixed is greater than the gauge of the traction mechanisms of the tractor. For a number of reasons which need not be gone into at this time, it is undesirable to have the traction members of the tractor operate on the loose material discharged from the mixing shovels 10. In order to obviate this, I provide gathering in blades 19 arranged in angular relation at the rear of the mixing frame 9. The forward ends of the blades 19 extending to the sides of the frame 9 collect all material discharged from the mixing shovels and divert the same to the central area of the apparatus to form a windrow which can be straddled by the traction members of the tractor.

At this point it may be well to note that as previously indicated, the apparatus comprising my invention may be employed in carrying out a process in which the aggregates and binder are thoroughly mixed before being deposited on the road surface. If such is the case, naturally the mixing plows 10 and their supporting frame will not be necessary.

When a normal grader apparatus is employed as the supporting means for the apparatus comprising my invention, the grader blade usually carried by the "circle" 20, as illustrated in Figures 13 and 14, may be removed from its supporting arms 21; to these arms are then secured angularly related gathering in blades, generally indicated at 22. The blades 22 are cross-braced by means of a tie-member 23 secured to the upper edges of the blades 22 at opposite points and lift links attached to tie member 23. In order that the blades 22 may be extended to accommodate various road surface widths, they are provided with extensions 24 which may be secured to the blades 22 at any one of a plurality of positions according to the holes which are provided in the blades and their extensions at longitudinally spaced points and which receive bolts or similar means to maintain the two elements in proper assembled adjusted position. The usual means such as the links 11 and 12 employed for holding the "circle" or the frame 9 will be employed for the purpose of supporting the blades 22 in proper adjusted position relatively to the ground.

Whether the gathering in blades as illustrated in Figures 13 and 14 or the plow-supporting mixing frame 9 as illustrated in Figure 1 is employed, some means should be provided as illustrated in Figure 5 for preventing lateral movement between the frame 6 and such mixing frame or gathering in blades. The form of apparatus for this purpose as illustrated in Figure 5 consists of two links 25 oscillatably secured at their outer ends to portions of the frame 9 and at their inner ends oscillatably secured to opposite ends of a link 26 which, for purposes of convenience, may be oscillatably secured to an extension of the pin 27 which is employed for the purpose of connecting the forward end of the tractor 5 to the yoke 8. This link connection permits free relative movement between the frames 6 and 9 in a vertical direction but prevents relative lateral movement therebetween.

In order to properly distribute the windrow of mixed aggregate and binder passing out from under the rear of the tractor into a smooth road surface layer, I provide the spreading apparatus at the rear of the tractor hereinbefore generally indicated at 4 in Figures 1 and 4. Such spreading apparatus consists generally of a fabricated structural steel frame 28 which adjustably supports the spreading blades 29 most clearly illustrated in Figure 6. The convergent blades 29 are, at their point of intersection, provided with a nose member 30 which is, in turn, provided with verti-

cally arranged, axially spaced and aligning bearing members 31 adapted to loosely engage a vertically disposed rod 32. To this rod intermediately and on opposite sides of the bearing members 31 is secured a rudder 33 which will engage the windrow in advance of the spreader blades 29. To the upper end of the rod 32 is secured a lever arm 34 which, at its outer end, is engaged by a drag link 35. The rear end of the link 35 is oscillatably secured to a pivoted link 36 which, at the lower surface of its outer end, carries a screw block in which the screw shaft 37 is terminally threaded. The screw shaft 37 is rotatably mounted and held against axial movement in a bearing block 38 on a transversely extending member at the rear of the frame 28. Rotation of the screw 37 and accordingly, lateral oscillation of the rudder 33 to several positions such as illustrated in full dotted lines is effected by means of a handwheel 39. The rudder 33 is employed to deflect various and selected portions of the windrow to opposite sides of the blades 29 so that there may be an even distribution of the material over the road surface.

Rigidly secured to the blades 29 are two sets of brackets 40 and 41; the former secured to the blades adjacent the nose thereof and the latter secured to the blades at rearwardly removed opposite points. Mounted on members of the frame 28 and respectively adjacent the brackets 40 and 41 are brackets 42 and 43. In the bracket 42 is journaled a shaft 44 which has secured thereto a lever arm 45 which is connected by means of a pin 46 to the bracket 40. One end of the shaft 44 has keyed or similarly secured thereto an upwardly extending lever 47 which carries a screw block 48 as most clearly illustrated in Figure 7 and in which is threadably engaged the end of a screw shaft 49.

Journaled in the brackets 43 is a shaft 50 to which are secured links 51 respectively oscillatably secured to the brackets 41 at opposite points on the blades 29. Keyed to the shaft 50 are two vertically extending arms 52 and 53. The latter carries at its upper end a thrust block 54 through which the shaft 49 extends. The shaft 49 is free to rotate in the thrust block 54 but is held against axial movement by collars 55 and 56. A handwheel 57 is secured to the rear end of the rod 49.

The upper end of the arm 52 also carries a screw block 58 in which is threadably engaged a rod 59 which, at its rear end, passes through a thrust block 60 supported by a suitable bracket such as 61. A hand-wheel 62 is secured to the rear end of the shaft 59.

Both the front and the rear portions of the blades 29, as well as the rudder 33, are moved vertically relatively to the frame 28 by rotation of the hand-wheel 62. The angular relation of the blades 29 to a horizontal plane is controlled by rotation of the hand-wheel 57.

The blades 29 may be provided with adjustable extensions 63 which may be employed to vary the width of the road surface over which the material will be spread.

The frame 28 which supports the blades as illustrated in Figure 6 includes side members 64 which, when the apparatus is in operation, ride on the road surface in the manner illustrated in Figure 4. Supported by the rear transversely extending member 65 of the frame 28 is a combination strike-off plate and operator's platform generally indicated at 66. By having reference to Figure 9, it will be noted that the transverse member 65 secured to the side frame members 64 carries adjacent its opposite ends a vertically arranged screw shaft 67. This screw shaft is threaded in a block 68 which is supported in and held against vertical movement by a bracket 69 which is secured to the transverse member 65. The lower end of the rod 67 is rotatably secured in an angle bracket 70. The angle bracket 70 respectively associated with the shaft 67 is secured and carries a strike-off blade 71. The strike-off blade has adjacent its lower edge secured thereto a rearwardly extending platform 72 upon which an operator will stand during the operation of the apparatus, such operator controlling and manipulating the various handwheels for adjusting the blades 29 and the rudder 33. Rotation of the shafts 67 by the crank arms 73 is effective to move the strike-off blade 71 relative to the lower edges of the side members 64 which act as runners.

The member, generally indicated at 65 in Figure 1, more specifically consists of a fixed central portion 74 and two end portions 75 adapted to be secured to the central portion 74 in any one of a number of selected positions. This connection between the ends and side members 74 and 75 will be had by a plurality of spaced holes in the several members and bolts for insertion in selected holes as the same are brought into register. Similar provision is made with respect to the forward transversely extending members 77 so that the side frame members 64 may be adjusted laterally as indicated in dotted lines on Figure 1 to vary the width over which the material will be uniformly distributed.

As most clearly illustrated in Figure 4, the frame 28 carrying the spreading blades and their associated apparatus is provided with vertically extending brackets 78 as also illustrated in Figure 2. These brackets 78 are the means whereby the spreading apparatus at the rear of the tractor may be supported in an elevated position above the road surface when not in use.

The apparatus for supporting the spreading device above the road surface consists of a triangular frame generally indicated at 79 in Figure 4 which is mounted on the rear end of the frame 6 and braced by means of tie-rods 80 which extend forwardly and are anchored on the opposite sides of the yoke 8. The rear end of the triangular frame 79 has rotatably supported thereon a shaft 81 to which are secured chains 82 as illustrated in Figures 4 and 10. The opposite ends of the chains 82 are secured to the upper ends of the brackets 78.

As most clearly illustrated in Figure 10, the shaft 81 has keyed thereto a worm gear 83 which meshes with a worm 84 carried by a stub shaft 85. The shaft 85 is rotatably supported in a housing 86 which is bolted to the frame 79 and such shaft terminally carries a hand-wheel 87.

By rotating the hand-wheel 87, the shaft 81 may be rotated in a clockwise direction as viewed in Figure 10 so that the chains 82 will be wound up thereon elevating the spreading mechanism above the surface of the road, so that the tractor may freely move over the road surface without having any of the road working mechanism in contact with the ground.

Secured to the rear ends of the side frame members 64 are rearwardly extending frame members 88 which have smoothing drags 89 secured to the rear ends thereof. The smoothing drags 89 contact with the opposite edges of the layer of material which has been deposited by the spreading apparatus so as to smooth and round off such edges and obviate the necessity of finishing the edges of the deposited layer by

hand. The forward end of the frame 28 is secured to the tractor by means of brackets 90 which, for convenience, may be secured to extensions of the axle on which one of the sprockets of the driving mechanism is mounted. This connection permits relative rotation between the spreading frame and the tractor which is necessary in the operation of the apparatus, as well as to permit the spreading apparatus to be elevated above the road surface in the manner hereinbefore defined.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the means and the steps herein disclosed, provided those stated by any of the following claims or their equivalent be employed.

I, therefore, particularly point out and distinctly claim as my invention:—

1. In apparatus of the character described the combination of two convergent blades adapted to spread a windrow of loose material over a portion of the road surface, adjustable extensions on the outer ends of said blades whereby the width of the road surface covered thereby may be varied, and a rudder pivoted about a substantially vertical axis adjacent the intersection of said blades and extending forwardly thereof to selectively deflect varying portions of such windrow respectively to said blades.

2. In a convertible self-propelled road making apparatus, the combination of a power unit having traction means, an elongated forwardly extending frame secured to said unit adapted to support road working devices, a steerable wheel supporting the forward end of said frame, a rearwardly extending elongated frame secured to said unit in such manner as to be suspended therefrom and adapted to adjustably support a suspended road leveler, and a link connecting said unit and said leveler permitting free relative vertical adjustment and restraining horizontal adjustments therebetween.

3. In a convertible self-propelled road making apparatus, the combination of a power unit having traction means, elongated frames secured to said unit and extending forwardly and rearwardly, steerable wheels supporting the forward end of said frame, a circle supported by said forward frame adapted to adjustably support a grader blade, a pair of rearwardly converging blades removably attached to said circle and said forward frame adapted to form a windrow of loose material placed on the roadway, a second frame removably suspended and rearwardly extending from said power unit, means to raise and lower said second frame and adjustable means mounted thereon adapted to spread and level loose material, said last-named means including two rearwardly diverging blades adjustable as to length and adjustable as to elevation both at the front and at the rear.

4. In a self-propelled road making apparatus, the combination of a power unit having traction means, elongated frames secured to said power unit and extending forwardly and rearwardly thereof, steerable wheels supporting the forward end of said frame, elements supported from said frame forwardly of said power unit adapted to plow through and turn over loose material through which they are driven, a second frame suspended and rearwardly extending from said power unit, means to raise and lower said second frame, and adjustable means mounted on said second frame adapted to spread and level loose material over which it is dragged.

5. In a road surfacing apparatus, the combination of a mixing frame, a tractor and a spreading frame, said mixing frame arranged forwardly of said tractor, supported forwardly on steerable wheels and rearwardly on said tractor and provided with a plurality of alternately arranged rows of mixing plows and convergent blades, the latter arranged to gather the material mixed by said plows into a single windrow centrally of the wheels of said tractor, and said spreading frame extending rearwardly of said tractor and provided with a plurality of angularly related blades arranged to spread said windrow uniformly over the road area traversed by said spreading frame.

6. In a road surfacing apparatus, the combination of a mixing frame, a tractor and a spreading frame, said mixing frame arranged forwardly of said tractor and provided with means for mixing material and gathering said material into a single windrow centrally of the wheels of said tractor, and said spreading frame extending rearwardly of said tractor and provided with lateral adjusting means to vary the spreading range of said frame and a plurality of angularly related blades arranged to spread said windrow uniformly over the road area traversed by said spreading frame.

7. In a road surfacing machine, in combination, a mobile frame, a second frame connected to, and drawn by, the forward end thereof and adjustably supported below same, and a third frame adjustably suspended from the rear end of said mobile frame to which its forward end is connected whereby it is drawn in operation; said second frame carrying tools positioned to break up, mix, and windrow road-surfacing material over which it passes and said third frame carrying leveling tools and adjustable edging tools whereby such material is formed into the surface of a road.

RALPH S. SPENCER.