March 26, 1940. H. D. JOHNSON 2,194,754

MECHANICAL CEMENT FINISHER

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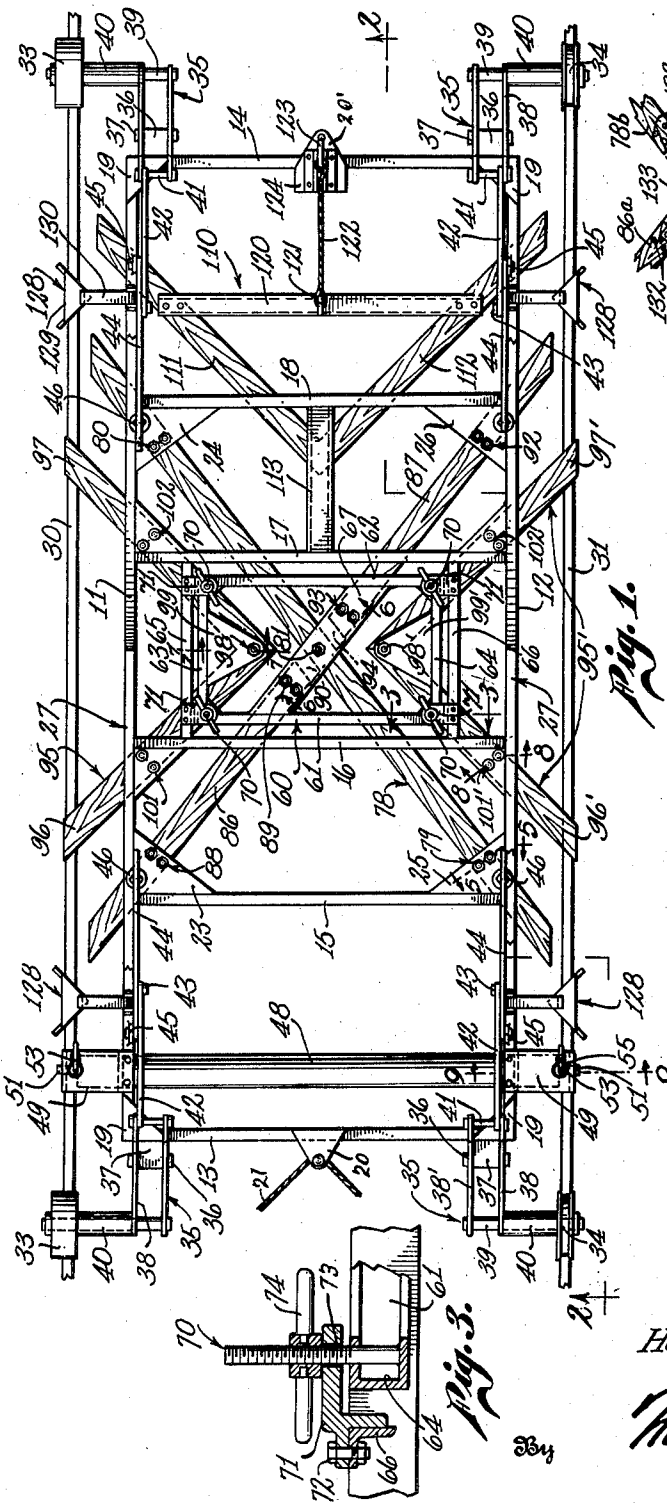


Fig. 1.

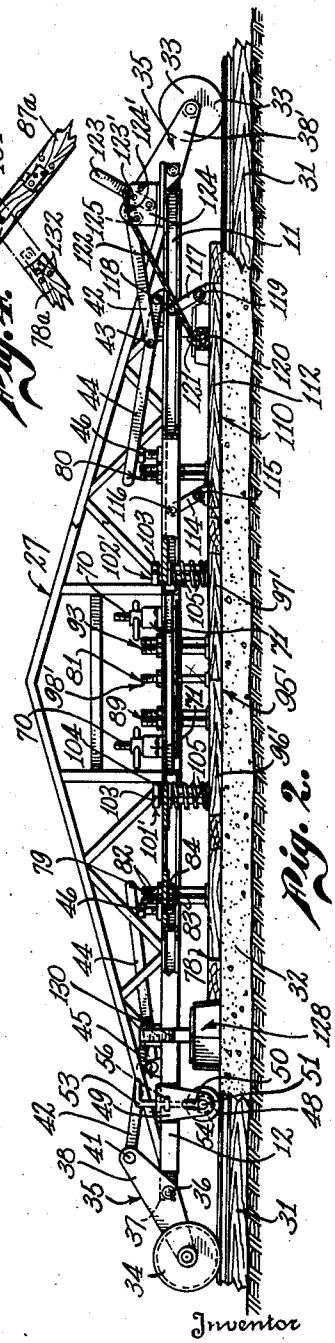


Fig. 2.

Fig. 3.

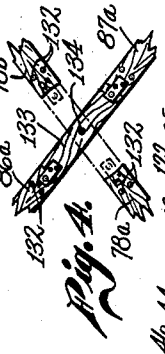


Fig. 4.

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Fig. 5.

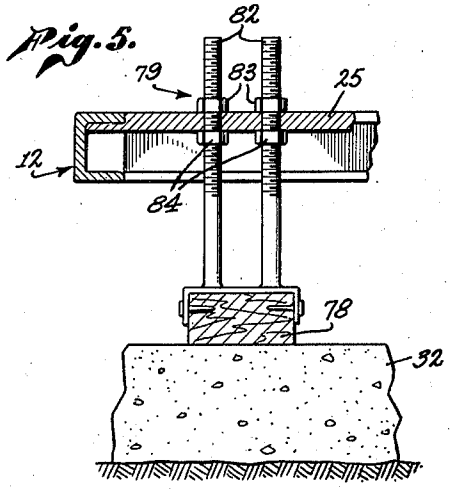


Fig. 6.

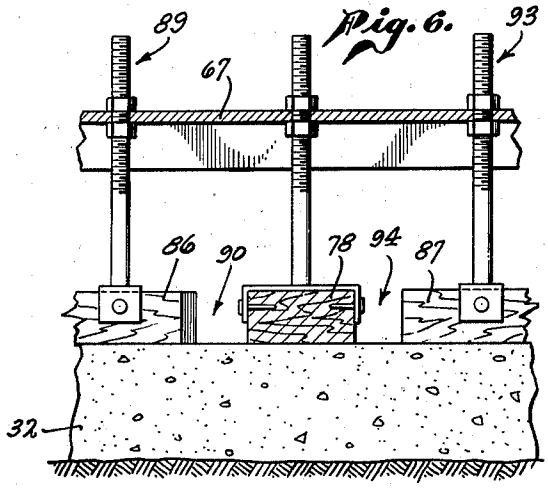


Fig. 7.

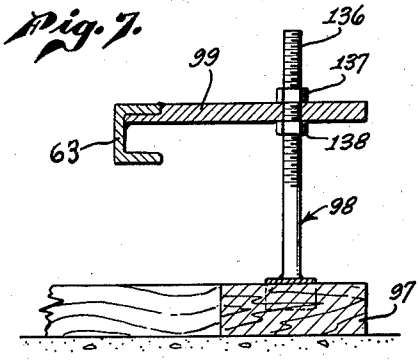
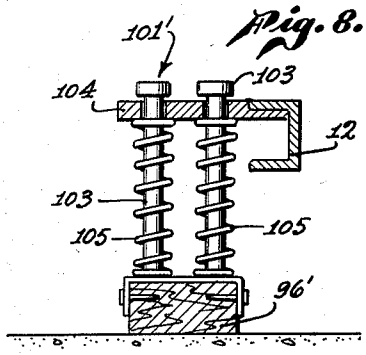


Fig. 8.



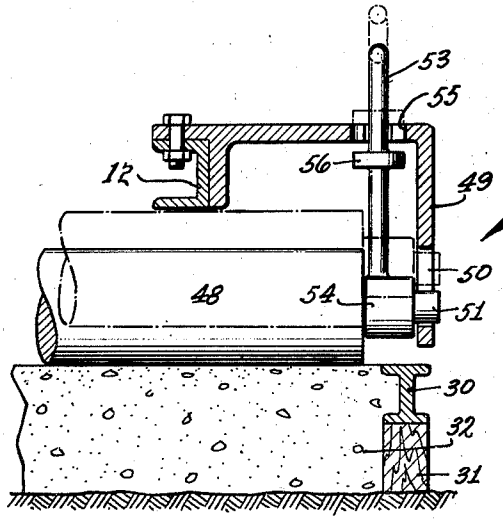


Fig. 9.

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UNITED STATES PATENT OFFICE

2,194,754

MECHANICAL CEMENT FINISHER

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Application February 28, 1938, Serial No. 193,104

7 Claims. (Cl. 94—44)

This invention relates to the construction of concrete roads and particularly to means for finishing the surface of the roads.

In the construction of concrete roads it is the usual practice to lay the concrete between side forms in strips 10 feet wide. After the proper grade has been obtained by suitable grading machines, a machine termed a "paver" lays the concrete. This machine is followed by a tamping machine which both scrapes and tamps the concrete. The tamping machine is not effective to remove long undulating irregularities in the surface and for this reason the concrete is then subjected to finishing operations. At present the method of finishing comprises, first, dragging a float—usually a long board approximately 20 feet in length having a handle extending from its mid portion by means of which the operator can guide it—lengthwise of the strip of concrete being finished by means of a mule, the float being disposed at approximately a 45 degree angle to the sides of the strip. Following this operation floats comprising two or three parallel disposed planks are dragged by hand across the strip being finished, thus concluding the surface finishing operation.

The method just outlined has many disadvantages in that it requires experienced men in order to obtain even fairly satisfactory results. When done by the most experienced men obtainable it is still an inaccurate method, since it is too largely dependent upon the human element and is not effective to remove undulating irregularities of the surface. Furthermore, this is a slow method of finishing the concrete and reduces the capacity of the "paver" since it must continually be slowing down in order to allow the "finishers" to catch up to it. It is also a costly method because it requires several experienced men and because it scrapes a great deal of the concrete off of the strip being finished, thus wasting the concrete.

In view of the disadvantages attendant upon the ordinary method of finishing concrete roads, it is a primary object of this invention to provide a mechanical cement finisher which will accurately, quickly, and economically finish the concrete without any of the disadvantages of the ordinary methods.

It is a particular object of this invention to provide a machine of the type indicated which will plane the surface of the concrete and "work" the concrete from side to side of the strip being finished, thus producing a surface free of irregularities and at the same time conserving the concrete. In this connection it is also an object of the invention to provide a machine which will function accurately regardless of the density or moisture content of the concrete being finished.

It is also a particular object of this invention to provide a machine of the type indicated, which is readily adjustable to accommodate the machine to a change in the gradient of the road.

These objects are attained in the machine illustrated in the accompanying drawings in which:

Fig. 1 is a plan view of a preferred form of finishing machine with the truss support partly broken away.

Fig. 2 is a sectional elevation on line 2—2 of Fig. 1.

Fig. 3 is a sectional elevation of the adjusting mechanism at one corner of the blade supporting structure on line 3—3 of Fig. 1.

Fig. 4 is a fragmentary plan view of a modified form of blade structure.

Fig. 5 is a fragmentary sectional elevation on line 5—5 of Fig. 1.

Fig. 6 is a fragmentary sectional elevation on line 6—6 of Fig. 1.

Fig. 7 is a fragmentary sectional elevation on line 7—7 of Fig. 1.

Fig. 8 is a fragmentary sectional elevation on line 8—8 of Fig. 1.

Fig. 9 is a fragmentary sectional elevation on line 9—9 of Fig. 1.

Referring to the drawings, the machine comprises a main frame consisting of side channels 11 and 12, end channels 13 and 14, and cross channel members 15, 16, 17 and 18. These members are preferably welded together, and are further supported by the triangular plates 19 welded thereto at each corner of the frame. Supporting means in the form of plates 23, 24, 25, and 26 are provided, connecting the cross channel members 15 and 18 with the channels 11 and 12. Additional support is given the frame by means of a truss structure 27 over each of the side channels 11 and 12.

The machine is adapted to ride on the side forms 30 and 31 enclosing the concrete strip 32 and accordingly has wheels 33 on the one side and wheels 34 on the other side. The wheels 33 have a flat running surface and are thus adapted to ride either on the side form 30 or on a finished strip of concrete in the event the side form 30 has been pulled out. The wheels 34 are double flanged in order to hold the machine upon the side form 31. All the wheels are similarly

mounted on wheel supports 35, which are pivotally mounted at 36 on brackets 37 attached to the frame members 13 and 14. The wheel supports 35 comprise spaced plates 38 and 38' connected at their lower end by axles 39 which extend outwardly beyond the outer plates. The wheels are mounted at the outer end of the axles 39 and are held in proper spaced relation to the plates by means of collars 40 interposed between the wheels and the plates. This construction makes possible the interchangeability of the flanged and non-flanged wheels.

For the purpose of adjusting the wheel supports 35 the plates 38 and 38' are connected at their upper ends by pins 41 on which are pivotally mounted connecting rods 42. The connecting rods are pivotally mounted at 43 on actuating levers 44 which are pivotally mounted at 45 on the frame of the machine. Bolts 46 are threaded into the frame and are positioned underneath the actuating levers 44 for the purpose of holding them in an adjusted position.

By referring to the drawings, it should be apparent that the movement of the actuating levers serves to raise or lower the frame through the connecting means 42 and the pivoted wheel supports 35. The purpose of this mechanism is to provide means for raising the blade members and roller (which will subsequently be described) as a unit out of engagement with the cement-concrete being finished.

The forward end of the machine carries a roller 48 which is mounted in the depending brackets 49 which are vertically slotted at 50 to allow the axle 51 extending through the roller to move vertically with respect to the machine. With this construction the roller rides merely of its own weight on the concrete being finished. The roller serves to work the moisture in the cement-concrete to the surface and also serves to depress or work the stones in the cement-concrete down so that there is no possibility of them interfering with the finishing operations on the surface of the road.

For the purpose of lifting the roller out of contact with the surface being finished a bar 53 is provided at each end of the roller. The bars each have an eye 54 at their lower end through which the axle 51 extends, and are bent at their upper ends to form a handle portion. Each bar extends up through an irregular opening 55 in the brackets 49. A nut 56 is welded to the bar and is of a size to pass through the larger portion of the irregular opening 55, but sufficiently large not to pass through the slotted or smaller part of opening 55. Normally the roller engages the surface being worked upon and is in the position shown in Fig. 2. In this position the nuts 56 are below the openings 55 in brackets 49. To raise the roller the bars are pulled up until the nuts are above the openings 55. The bars are then pulled back into the slotted portions of holes 55. The nuts rest on the top of the slotted portion and hold the roller in the raised position.

For leveling and finishing the concrete a plurality of blades or floats are provided, made of mahogany or other suitable material. A central blade adjusting and supporting structure indicated generally by reference numeral 60 is mounted in the center of the frame. This structure comprises the side channel members 61 and 62 and end channel members 63 and 64. This structure is mounted for vertical adjustment by means of vertically extending bolts threaded on their upper ends and indicated by reference numeral 70. These bolts extend upwardly respectively through apertured brackets 71. The details of this structure are shown in Fig. 3 where a bracket 71 is shown bolted at 72 to channel 66. Channels 65 and 66 connect the cross channel members 16 and 17. The bolt 70 extends through hole 73 in the bracket and has threaded on its upper end the hand nut 74. By means of the hand nuts 74 and cooperating means the structure 60 may be vertically adjusted.

The machine embodies a plurality of blades or floats mounted beneath the frame for finishing the surface of the concrete. A main blade is provided which extends diagonally across the machine forming an acute angle of less than 45 degrees with the side channels and is designated by reference numeral 78. This blade is preferably 2 inches thick and 6 inches wide and has its ends cut to parallel the side forms a short distance inwardly therefrom, as shown in Fig. 1. It is mounted near its ends by means of the bolt structure, generally indicated at 79 and at 80 and is mounted at its center point by bolt structure indicated by reference numeral 81 which extends upwardly through a diagonal cross plate 67 in the supporting and adjusting structure 60. These bolt structures together with the bolt structures supporting the other blades (to be later described) are identical and a description of bolt structure 79 should be sufficient. This bolt structure 79 (see Fig. 2) comprises two upwardly extending bolts 82 mounted on the blade 78. The bolts extend through holes in the plate 25 and have threaded on their upper ends nuts 83 by means of which vertical adjustment of the member may be achieved. The bolts are locked in adjusted position by lock nuts 84.

Mounted beneath the frame are two blades 86 and 87, each less than half the length of the main blade 78, which, together with blade 78, substantially form an X in plan view. The blade 86 is mounted similarly to blade 78 near its forward end by means of the bolt structure 88 and is mounted at its other end on the adjusting structure 60 by bolt structure 89 mounted in plate 67. Blade 86 has its inner end spaced from blade 80, leaving the passageway 90 between it and blade 89. The blade 87 extends rearwardly of the blade 78 in alignment with blade 86 and is mounted at its outer end upon the bolt structure 92 and at its inner end by bolt structure 93 which cooperates with the plate 67. This blade is also spaced from the blade 78 and there is left between the blade 78 and the inner end of blade 87 the space 94 which is similar to space 90.

Mounted at the side of and outwardly from the blades 86 and 78 is the blade structure generally indicated by reference numeral 95 which comprises blades 96 and 97 which are mounted at their inner ends by the bolt structure 98 cooperating with a bracket 99 on the center supporting structure 62. These blades converge at their inner end and are disposed to form substantially a right angle and are of a length to extend out and slightly beyond the side rail 30. Similar to this structure 95 is a structure 95' mounted on the opposite side of the machine and similar in all respects to it, and for this reason its various parts will bear the numbers given to the structure 95, except for the distinguishing prime mark.

The blades 96 and 97 are mounted near their outer ends by means of a spring and bolt supporting mechanism generally indicated at 101 and 102. These structures are identical and the

description of the structure 101' which appears in Fig. 2 will be adequate. The structure comprises an upwardly extending bolt 103 which is mounted on the blade and extends upwardly through a hole in a plate 104 on the frame. Interposed between this plate and the blade is a compression spring 105. With this construction the blades 96, 97, 96' and 97' are forced downwardly and are held against the side forms 30 and 31 on which they ride.

With this construction it is evident that all of the blades heretofore described, since they are mounted at their inner ends on the central supporting structure 60 except blade 78 which is mounted thereon at its center, may be raised or lowered near the central part of the machine as desired. This adjustment is necessary for change in gradient of the road being finished as will subsequently be explained. The various bolt structures supporting the blades enable an operator to adjust the blades so that their lower surfaces are all in the same plane so that they may accurately finish the concrete.

Near the rear of the machine is mounted a secondary blade structure generally indicated by reference numeral 110 which comprises blades 111 and 112 which converge at their forward ends, being secured together at that point. The blade structure 110 is mounted dependently from plate 113 by means of a connecting link 114 which is pivotally mounted on the blade structure 110 at 115 and on the blade 113 at 116. The blades 111 and 112 extend outwardly and rearwardly to the same lateral extension as the blades 78 and 87 and are supported near their outer ends by means of links 117 which are pivotally mounted on the frame at points 118 and on the blades at points 119. The blades are connected by a cross channel 120 which has an eye bracket 121 at its center for the reception of a cable 122 which is connected thereto. The cable 122 extends rearwardly and upwardly and is fastened at its other end to a lever 123 mounted on bracket 124, the cable passing over a pulley 125 in the bracket. The lever 123 is adapted to be adjusted in any ordinary manner as by means of a pin extending through a hole 123' in it and any one of holes 124' in the bracket.

By means of this structure the secondary blade structure 110 may be raised out of engagement with the surface of cement-concrete being finished. This feature is desirable when the machine is moved in a rearward direction. Additional channels may be placed inside of channel 120 as desired for the purpose of increasing the weight of the blade structure 110.

The secondary blade structure 110 just described is for the purpose of providing a "finish" to the surface of the road and merely rides of its own weight upon the cement-concrete.

For the purpose of keeping the concrete between the side forms and for the purpose of cleaning and clearing the side forms of any accumulation of dirt or concrete thereon, scraper elements 128 have been provided and are mounted on the side channels 11 and 12 adjacent the wheels. These comprise a triangular scraper 129 which is mounted on the end of a lever 130 pivotally mounted on the side channels of the frame of the machine.

In Fig. 4 there is shown a modified form of blade structure comprising blades 78*a* and 78*b* and 86*a* and 87*a* which are used in place of blade 78 and blades 86 and 87 of the preferred form of the invention. The blades are suitably mounted on the blade supporting structure 60 at their inner ends by means of bolts 132. A short blade 133 is pivotally mounted on the supporting structure by bolt 134. This short blade is adapted to be used to join the ends of either pair of aligned blades to make in effect one continuous blade. Thus either of the aligned blades 78*a*, 78*b* or 86*a*, 87*a* may be joined to form in effect one continuous blade. By this construction it is possible to control the working of the excess concrete to either side of the machine. This feature is desirable where the machine is surfacing elevated or banked curves.

In the operation of the machine it is placed upon the side forms 30 and 31 and drawn by means of suitable motive power attached to it by the hawser 21 and the connecting means 20 or 20'. The wheel supports 35 are adjusted at the proper height as shown in Fig. 2 and the blades are adjusted by means of the various bolt supporting structures so that they are all in the same plane. The machine is then ready to operate and is drawn forward. As the machine moves the roller 48 serves to slightly roll and level the cement-concrete being finished. It works the mortar up and the stones down. The blades, due to their position and placement tend to work the concrete back and forth across the strip being finished and at the same time plane the concrete, thus removing all irregularities in the surface. When a point is reached in the road where the gradient of the road is changed and if, for example, the change is downward, the central supporting structure is raised by means of the hand nuts 74 in order to eliminate the possibility of the blades unduly scraping at the point where the change in gradient occurs, the raising of this structure being effective to raise the inner ends of blades 86 and 87 and of the blade structure 95 and 95'. The reverse procedure is followed when there is an increase in the gradient of the road. The scraper elements 128 serve to keep the side forms free of dirt so that the machine may proceed on a level plane.

After proceeding a desired distance the machine is then pulled back over the cement-concrete over which it has just passed. Before the machine is pulled in the rearward direction, the lever member 123 is actuated to raise the blade structure 110 out of engagement with the concrete. The machine may then be pulled forward and backward a desired number of times to complete the finishing operation.

From this description it is evident that the machine disclosed herein is an accurate, easily adjustable machine adapted to quickly finish the surfaces of newly laid cement-concrete roads. With this machine accelerated paving is possible, since the machine is capable of keeping up with the paving machine. Furthermore, the machine does not waste the concrete, since it works the concrete back and forth across the strip being finished but does not work it over the edges thereof. In practice it has been found that the machine of this invention is particularly accurate in finishing a road free of irregularities in its surface.

By reason of the length of the machine, it being preferably 20 feet or slightly more, and by reason of the fact that the machine rides upon level side rails, the blades, with the exception of the rear blade structure, planes the surface thus removing even the long undulating irregularities which it was formerly impossible to remove. The

rear blade structure rides of its own weight upon the surface being finished and is principally designed to "finish" the surface.

Although the machine of this invention was primarily designed for use in finishing cement-concrete roads, it is within the scope of this invention to use the machine in surfacing and resurfacing asphalt roads. It might also be used upon other materials where a level surface is required and such changes as might be necessary to accommodate the machine for use in such capacities are within the scope of the invention.

I claim as my invention:

1. In a cement-concrete finishing machine, a frame, wheels mounted on said frame, a blade supporting structure mounted on said frame, means for vertically adjusting said structure, a main blade dependently mounted on said frame near its ends and having its center supported by said blade supporting structure, said main blade being diagonally disposed relative to said frame, a second blade dependently mounted on said frame at its outer end and having its inner end supported by said blade supporting structure, a third blade dependently mounted on said frame at its outer end and having its inner end supported by said blade supporting structure, said main blade and said second and third blades cooperating to form a compound troweling and scraping element substantially X-shaped in plan view, all of said blades normally being in the same horizontal plane, said blades each having a flat cement-concrete engaging face whereby said blades produce a troweling effect.

2. In a cement-concrete finishing machine, a frame, wheels mounted on said frame, a blade supporting structure mounted on said frame substantially centrally thereof, means for vertically adjusting said structure, a main blade dependently mounted on said frame near its ends and having its center supported by said blade supporting structure, said main blade being diagonally disposed relative to said frame, a second blade dependently mounted on said frame at its outer end and having its inner end supported by said blade supporting structure, a third blade dependently mounted on said frame at its outer end and having its inner end supported by said blade supporting structure, said main blade and said second and third blades cooperating to form a compound trowelling and scraping element substantially X-shaped in plan view, a V-shaped element at each side of said X-shaped element, each of said V-shaped elements comprising two blades joined at the apex of the V and being supported at their inner ends by said blade supporting structure, said blades being dependently supported near their outer ends on said frame, all of said blades normally being in the same horizontal plane, said blades each having a flat cement-concrete engaging face whereby said blades produce a troweling effect.

3. In a cement-concrete finishing machine, a frame, wheel supporting means pivotally mounted on said frame, wheels mounted on said wheel supporting means, means for adjusting said wheel supporting means whereby said frame may be raised or lowered, a blade supporting structure mounted on said frame, means for vertically adjusting said blade supporting structure, a main blade extending diagonally relative to said frame in a horizontal plane below said frame and having its center supported by said blade supporting structure, a blade mounted on each side of said main blade spaced therefrom at their inner ends and mounted at their inner ends on said blade supporting structure, said main blade and said other blades forming an X-shaped troweling and scraping structure, and means for separately mounting each of the blades adjacent to their extremities on said frame, said blades each having a flat cement-concrete engaging face whereby said blades produce a troweling effect.

4. In a cement-concrete finishing machine, a frame, wheel supporting means pivotally mounted on said frame, wheels mounted on said wheel supporting means, means for adjusting said wheel supporting means whereby said frame may be raised or lowered, a blade supporting structure mounted on said frame, means for vertically adjusting said blade supporting structure, a main blade extending diagonally relative to said frame in a horizontal plane below said frame and having its center supported by said blade supporting structure, a second blade having its inner end supported by said blade supporting structure, a third blade having its inner end supported by said blade supporting structure disposed on the side of said main blade opposite to said second blade and being in alignment with said second blade, the inner ends of said second and third blades being spaced from said main blade, means for separately mounting each of the blades adjacent to their outer ends on said frame, said above-mentioned blades cooperating to form an X-shaped troweling and scraping element, a V-shaped member between said main blade and said second blade and having its apex supported by said blade supporting structure, said member comprising two blades, a second V-shaped member between said main blade and said third blade and having its apex supported by said blade supporting structure, said second member comprising two blades, and means for separately mounting each of the blades adjacent to their outer ends on said frame, said blades each having a flat cement-concrete engaging face whereby said blades produce a troweling effect.

5. In a cement-concrete finishing machine, a frame, wheel supporting means pivotally mounted on said frame, wheels mounted on said wheel supporting means, means for adjusting said wheel supporting means whereby said frame may be raised or lowered, a blade supporting structure mounted on said frame, means for vertically adjusting said blade supporting structure, a main blade extending diagonally relative to said frame in a horizontal plane below said frame and having its center supported by said blade supporting structure, a second blade having its inner end supported by said blade supporting structure, a third blade having its inner end supported by said blade supporting structure disposed on the side of said main blade opposite to said second blade and being in alignment with said second blade, the inner ends of said second and third blades being spaced from said main blade, said above-mentioned blades cooperating to form an X-shaped troweling and scraping element, means for separately mounting each of the blades adjacent to their extremities on said frame, a V-shaped member between said main blade and said second blade and having its apex supported by said blade supporting structure, said member comprising two blades, a second V-shaped member between said main blade and said third blade and having its apex supported by said blade supporting structure, said second member comprising two blades, means for separately mounting each of the blades adjacent to their outer ends

on said frame, a third V-shaped member mounted rearwardly of said blade supporting structure mounted on said frame, comprising two blades, and means for vertically adjusting said third V-shaped member, said blades each having a flat cement-concrete engaging face whereby said blades produce a troweling effect.

6. In a cement-concrete finishing machine, wheel supporting means pivotally mounted on said frame, wheels mounted on said supporting means, means for adjusting said wheel supporting means whereby said frame may be raised or lowered, a supporting structure mounted on said frame for vertical adjustment, an X-shaped member supported adjacent its ends on said frame and supported at its middle on said blade supporting structure, a V-shaped member mounted on each side of said X-shaped member and having their apexes supported by said blade supporting structure and having their outer ends adjustably supported by said frame, and a third V-shaped member mounted on said frame behind said X-shaped member.

7. For use in a cement-concrete road finishing machine, a troweling and scraping element comprising four blades disposed to form substantially an X in plan view, said blades being spaced apart at the center of said X, and a short blade pivotally mounted at the center of said X adapted to join either of opposite pairs of aligned blades to form in effect a continuous blade of the joined blades.

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