

June 15, 1937.

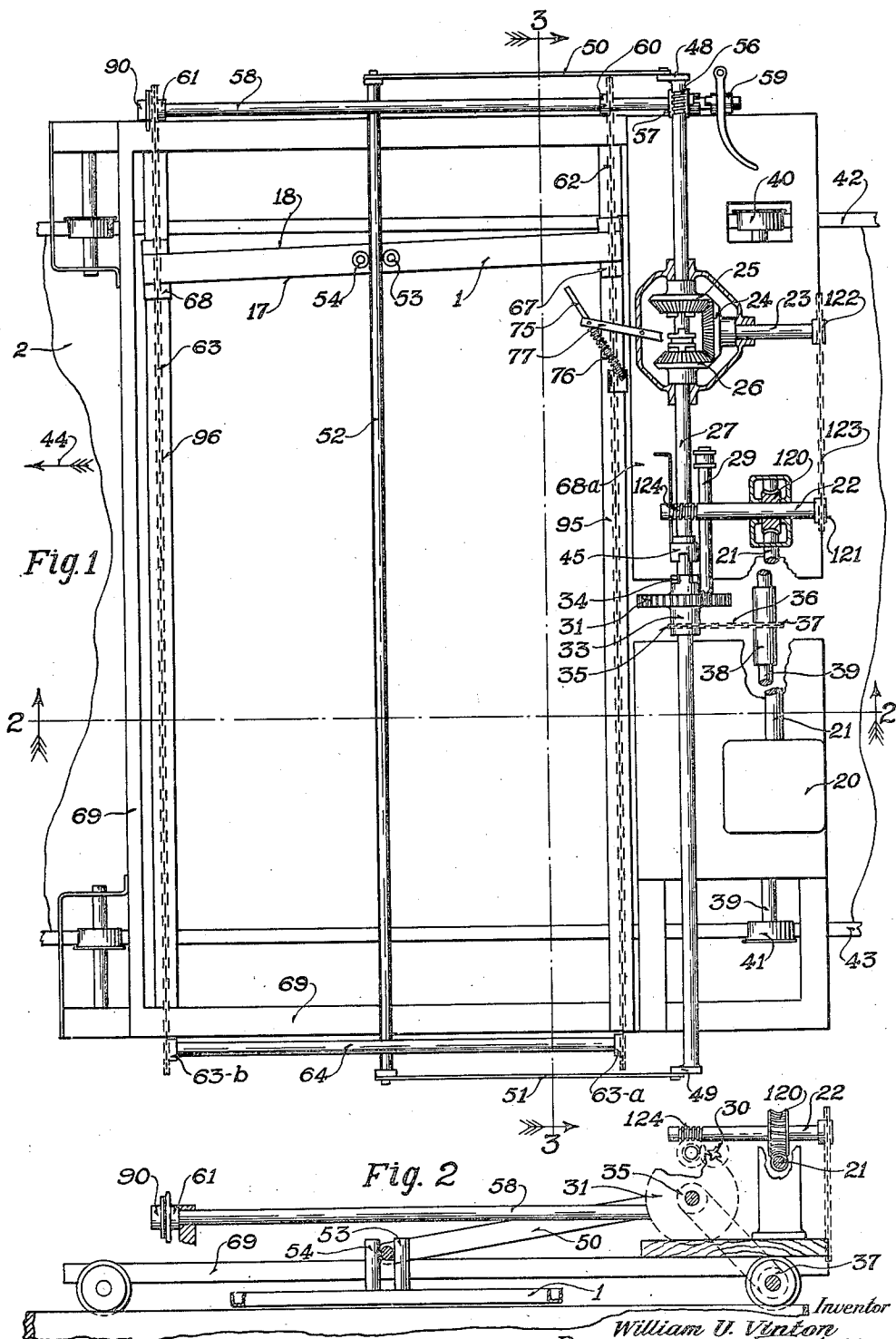
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2,084,068

ROAD FINISHING MACHINE

Filed March 17, 1934

4 Sheets-Sheet 1



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4 Sheets-Sheet 2

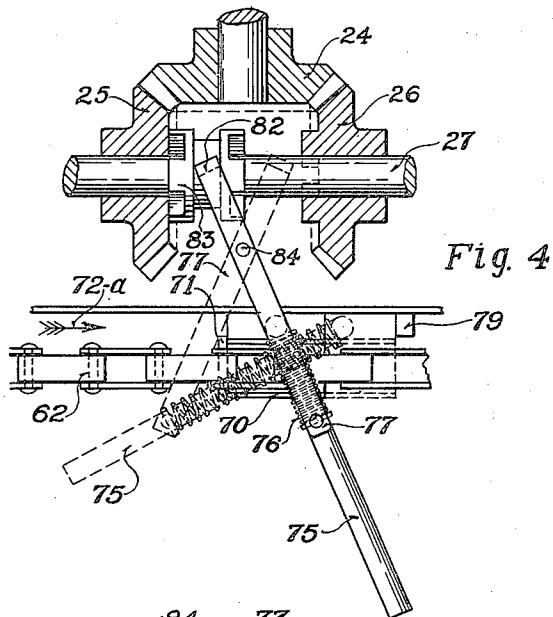
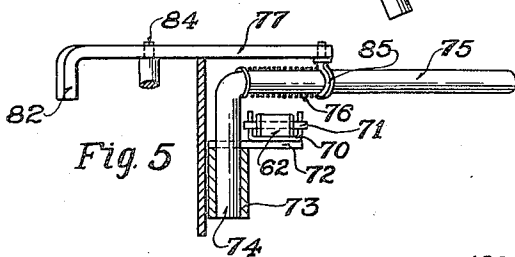
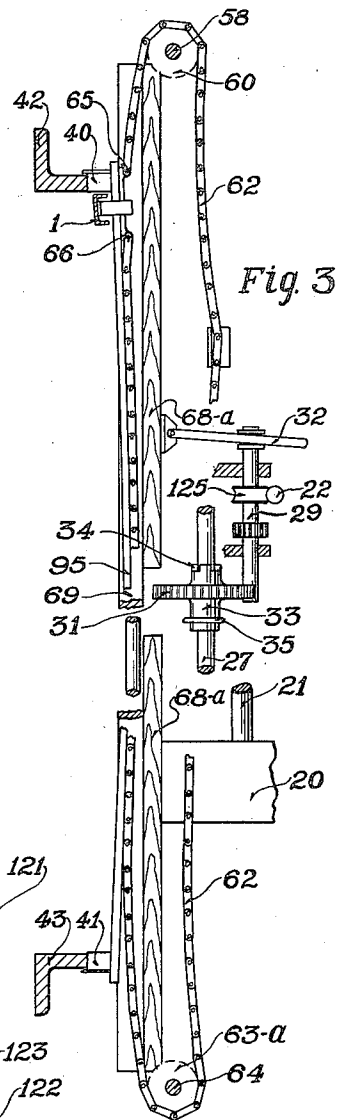
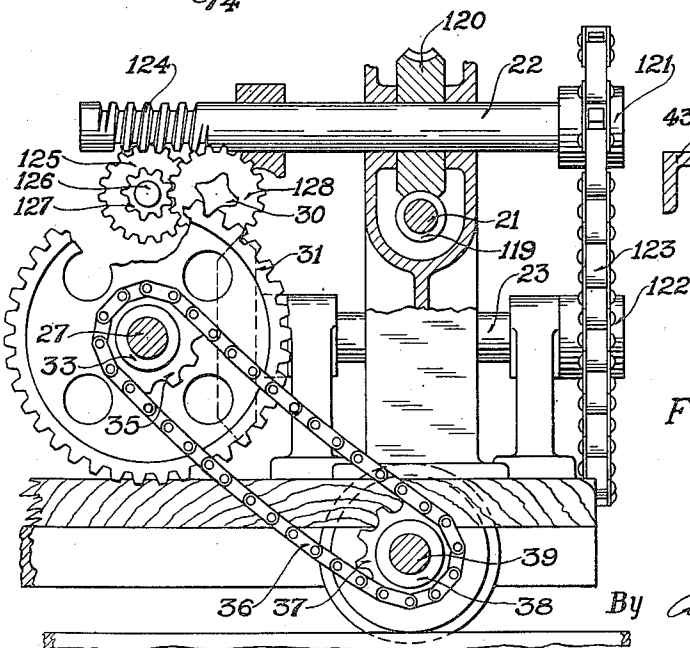


Fig. 6

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4 Sheets-Sheet 3

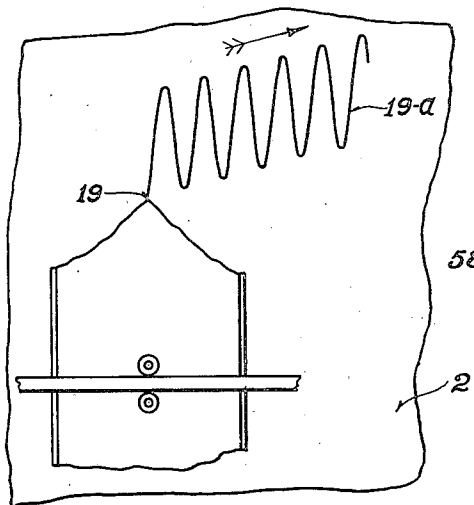


Fig. 8

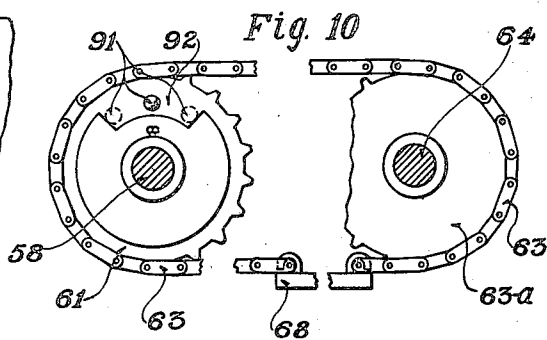


Fig. 10

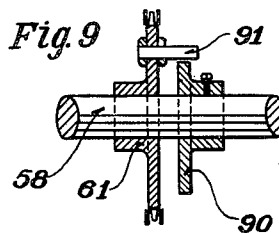


Fig. 9

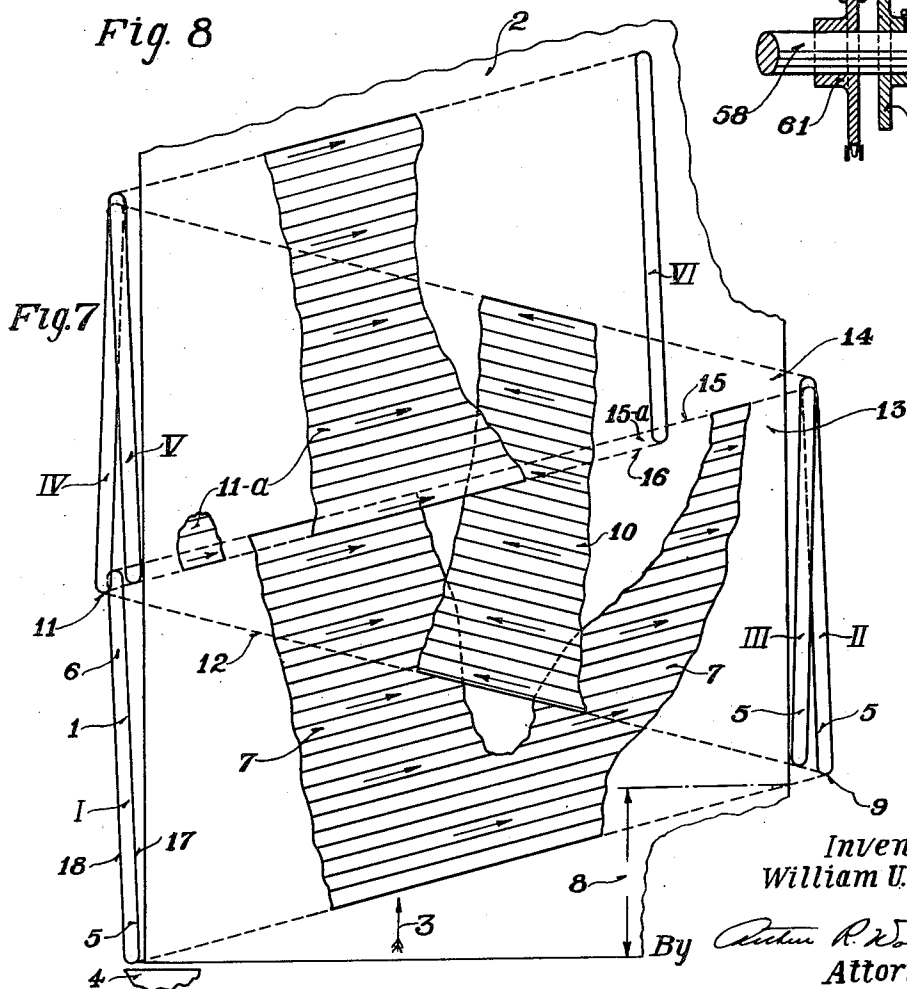


Fig. 7

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UNITED STATES PATENT OFFICE

2,084,068

ROAD FINISHING MACHINE

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Application March 17, 1934, Serial No. 716,036

21 Claims. (Cl. 94—45)

The invention provides a continuous longitudinal road finishing machine, that is to say, a machine for use in the forming of concrete roads and the like, its screed lying longwise of the roadway, and its action being automatic and continuous.

The operations that are usual in laying concrete roads, and the machines that are used in performing those operations, are frequently referred to hereinafter, in describing the present invention. The usual practice is therefore now described as follows:—

First usual operation.—The “paver”, so called, advances intermittently, this being a power machine that mixes the concrete, deposits it at different places in the width of the roadway, and spreads it, approximately only, to the desired road surface.

Second usual operation.—Close behind the paver a “finishing machine”, so called, usually follows. This machine is also a power driven machine. It may better be described herein as a “transverse” finishing machine, because its screed lies transverse of the roadway, this name distinguishing it from the present invention, which is a “longitudinal” finishing machine. The screed of said transverse finisher reaches right across the roadway, its ends resting upon the “forms” at the edges of the roadway, whereby the depth of its cut is regulated by said forms. Said screed has an oscillatory movement, longwise of itself, and at the same time it advances with the machine as a whole, along the roadway. Said screed is arched to conform to the crown desired for the roadway.

Third usual operation.—After the said transverse finisher, a hand-operated treatment usually follows, and it is this hand operation that the present invention is designed to replace. The hand operation is as follows:—Two bridges stand across the roadway. A “bull float” lies longwise of the roadway, in the gap between the two bridges. And two men, on the bridges, grasp plow handles attached to the float and work it, entirely by hand power, its function being to smooth down the undulations left by the transverse finisher.

Fourth usual operation.—Finally a “belting” machine, so called, usually follows, in order to give a roughness to the actual surface, to provide a grip for rubber tires.

As stated above, it is in the third of the foregoing four operations that the present invention is meant to be employed. That is to say, it will replace the hand-operated longitudinal screed or float by a power-operated longitudinal screed, for use in correcting the faults left by the transverse screed of the transverse finisher.

When the present invention is employed for

said third operation, said first, second and fourth operations will still be desirable, and will still be performed in the same way as hitherto, except that fewer treatments by the transverse finisher, second operation above, will then suffice. Whereas it is now usually specified that said transverse finisher must return and advance over the same ground again, covering the ground perhaps as many as three times in all, it will then suffice for it to cover the ground once only. Thus a saving will be effected in respect of said second operation, in addition to advantages in the operation which the present invention itself performs, namely, the third operation.

Truth of the riding surface in the direction of traffic, that is, longwise of the road, is obviously more important than truth in the crosswise direction. And the present invention, by introducing mechanical accuracy into the longwise treatment of the road, supplies the desired truth in the longwise direction, thus enabling the ever increasing stringency of the regulations of highway departments to be met.

Another advantage is that, being power driven, the invention can deal with concrete of a stiffer consistency than the hand float can. Accordingly, a longer time-interval can be allowed to precede it. Thus it may be timed to follow the transverse finisher after an interval which allows the concrete to approach its “initial set”, by which time much of the excess water of the wetter batches of concrete deposited by the paver will have had time to escape into the sub-grade or into the air, whereby the concrete as a whole will have become more uniform in consistency, and consequently the tendency for hollows to be formed, due to unequal final shrinking, subsequent to all operations, will be reduced.

Other advantages will appear in the course of the description.

In the drawings:—

Fig. 1 is a plan of a complete machine with some minor parts broken away or removed.

Fig. 2 is an end sectional elevation on line 2—2, Fig. 1, with some parts broken away and some parts removed.

Fig. 3 is a cross sectional elevation on line 3—3, Fig. 1, with some gearing removed.

Figs. 4 and 5 are details of the main-shaft reversing clutch shown in Fig. 1, Fig. 4 being a plan, and Fig. 5 being an end view, both being partly in section.

Fig. 6 is an end elevation showing detail of some of the gears of Fig. 2.

Fig. 7 is a diagram, showing the general course travelled by the screed relative to the direction of the road, the oscillatory movement of the screed endwise of itself being here disregarded.

Fig. 8 is a diagram, showing all of the three simultaneous movements of the screed, namely,

oscillating, and transverse of the road, and advancing along the road.

Figs. 9 and 10 show the retarding device which retards the forward end of the screed, Fig. 9 being a side sectional elevation, and Fig. 10 being a front elevation.

Figs. 11, 12, and 13 are details of the shoe at the rear end of the screed, and associated parts, including automatic lift-over mechanism. Of these figures, Fig. 11 is a plan; Fig. 12 is a side elevation, that is, viewed from the side of the screed, the view being sectional, on line 12-12, Fig. 13, and the hinged plate being removed; and Fig. 13 is a front elevation, that is, viewed longwise of the screed, partly in section.

Referring to the drawings:—

The action of the machine will be best understood by referring first to the two diagrams, Figs. 7 and 8:—

In Fig. 7, the screed 1, in position I, is ready to start. The roadway 2 is to be finished or screeded, and the arrow 3 represents the direction of advance of the machine as a whole as it works, the main part of the machine at rear of the screed being here indicated by the character 4.

In said position I, the rearward end 5 of said screed 1 is somewhat to the right of its forward end 6. The shaded parallelogram, or diagonal zone, 7 indicates the portion of the road surface that is treated by the screed in its first stroke, said stroke being crosswise of the roadway and at the same time advancing along the roadway a distance 8, equal to a little less than half the length of the screed. At the end of said first stroke, the position II is reached, said forward end 6 still having the same tardiness in relation to said rearward end 5.

At the point 9, the crosswise travel mechanism reverses, whereupon the second stroke of the machine begins. Said rearward end 5 then travels a short distance to the left without said forward end 6 having begun to travel, until position III is reached, in which position said forward end 6 slants as much to the right as originally it did to the left. Then the whole screed begins to move, and moves, at a constant slant, to the left, treating the shaded parallelogram or diagonal zone 10, until position IV is reached. Then, at point 11, reversal again takes place, and the third stroke of the machine begins, it now travelling again to the right.

At position V the forward end of the screed again slants to the left, as it did at position I, and the treatment of the shaded parallelogram or diagonal zone 11a begins, which treatment is, in the diagram, discontinued at position VI.

The overlapping of the zones is such that all parts of the road surface, after the machine has finished its first stroke, receive two treatments at least. In order to demonstrate this fact, said parallelogram or diagonal zone 10 may be taken as an instance, as follows:—

Assume, then, that said second stroke of the screed has just been completed, during which stroke it has treated the whole of said parallelogram 10, and has halted at said position IV. Said parallelogram 10 may be said to consist of two triangles, namely, a lower triangle 13 and an upper triangle 14, separated by the broken line 15. Therefore both of said triangles have just received a treatment, the result of said second stroke. But said lower triangle 13 had already received an earlier treatment during said first stroke of the screed, making two treatments in

all for the lower triangle; and said upper triangle 14 is just about to receive a second treatment, as part of said third stroke of the screed, which will make two treatments in all for the upper triangle. That is to say, the whole of said parallelogram 10 has been, or will be as the machine proceeds, treated twice.

There is, moreover, a small portion of said parallelogram 10 which receives a total of three treatments, namely, the narrow strip 15a which lies between said broken line 15 and the broken line 16. But there is no portion which receives less than two treatments.

Generalizing from the preceding two paragraphs, it is to be noted that, after the first stroke of the machine, no portion of the road surface receives less than two treatments. Also that the two treatments are from almost opposite directions, which is of great importance, as is herein-after explained.

Also it is to be noted that sometimes the right-hand edge 17 of the screed is the screed's leading or cutting edge, and sometimes the left-hand edge is such.

Referring more particularly to Fig. 8:—

A movement not indicated in Fig. 7 is a constant oscillation of the screed endwise of itself. That oscillation is indicated in Fig. 8, in which figure the point 18, chosen as an instance, in said screed 1, will, if the machine is started, trace the path indicated by the line 19a, due to the three simultaneous movements of the screed, namely, first, its movement of translation to the right, across said roadway 2; second, its movement of advance, along said roadway; and, third, its movement of oscillation, endwise of itself.

While a screed is being translated, sideways of itself, in its work, it may push protruding stones in the direction of its translation, leaving holes in the concrete at rear of such stones. This is apt to happen notwithstanding the smoothing effect of any simultaneous oscillatory movement of the screed, endwise of itself. But, if the screed can be made to work back again over the same ground, in substantially the opposite direction, said holes will be filled up more effectively than if the screed went back empty, and then covered the ground a second time in the original direction. Hence the importance of the fact demonstrated hereinabove that, in the present invention, the screed, in the regular course of its movements, treats all parts of the road surface twice, from substantially opposite directions.

The object in retarding the forward end of the screed as described is three-fold. First, it increases the tendency to push forward, as well as sideways, relative to the road, the excess concrete which the working edge of the screed dislodges. Second, it avoids an exact parallelism in the two treatments aforesaid of the surface, thereby avoiding any tendency to accentuate, in the second treatment, any ridges and furrows left by the first treatment. And, third, it reduces the tendency of the paving material near the rear end of the screed to escape round that end, and thus to form a ridge across the pavement.

Trains or groups of gearing contained in the machine are as follows:—

Referring more particularly to Figs. 1, 2, and 3:—

The engine 20 drives the power output shaft 21, which, by means of suitable gearing, drives the first cross shaft 22, which in turn, by means of suitable gearing, drives the second cross shaft 23.

Said second cross shaft 23 actuates what may

be described as the second train of gearing, as follows:—

Said second cross shaft 23 drives the central bevel wheel 24, which is always in mesh with the two bevel wheels 25 and 26. These wheels, co-operating with the clutch gear hereinafter described, cause the main shaft 27 to be driven in one direction or the other, there being no pause at neutral position.

Said first cross shaft 22 actuates what may be described as the first train of gearing, as follows:—

Said first cross shaft 22 by suitable gearing drives the sliding shaft 29, Fig. 1, which, by means of the small pinion 30 at its end, drives the large pinion 31 when said sliding shaft 29 is slid into gear by means of the clutch lever 32, Fig. 3.

Said large pinion 31 is integral with a sleeve 33 which sleeve has at one end the clutch dogs 34, and carries at its other end the sprocket 35, which, by means of the chain 36 and sprocket 37, drives the sleeve 38, which drives the travel shaft 39, which drives the travel wheels 40 and 41, which wheels, rolling respectively upon the forms 42 and 43, placed at the edges of said roadway 2, cause the whole machine either to advance in the direction of the arrow 44, or to retreat.

Further details of the gearing in said two trains are given at the end of this specification.

The moving of the machine as a whole is accomplished as follows:—

When the engine is running, said first and second cross shafts 22 and 23 are both always running.

Said first train of gearing gears downward. Consequently, when said first train is in gear with said large pinion 31, as hereinabove described, the machine travels at its slower speed, and such slow travel is in one direction only, namely, the forward direction.

But, when said sliding shaft 29 is out of gear with said large pinion 31, the clutch 45 may be put into gear with said clutch dogs 34, whereupon said large pinion 31 will be caused to drive said travel shaft 39 at its faster speed, to travel the machine at its faster speed, either advancing or retreating, according to the direction in which said main shaft 27 is running at the moment.

The endwise oscillating of the screed, hereinbefore described, is accomplished as follows:—

Said main shaft 27 has at its ends the cranks 48 and 49, actuating the connecting rods 50 and 51, causing the oscillator bar 52 to move backward and forward of the roadway, whereby, with the help of the posts 53 and 54 mounted upon the screed, said screed 1 is caused to oscillate endwise of itself. Because said main shaft 27 is always running in one direction or the other while the engine is running, and because its direction of rotation make no difference to the action of said oscillator bar 52, said endwise oscillation of the screed is a constant motion, while the engine is running.

The translation of the screed from side to side of the roadway, hereinbefore described, is accomplished as follows:—

A worm 56, upon said main shaft 27, gears into the worm wheel 57 running idle upon the screed-chain driver-shaft 58 at the right of the machine. When the clutch 59 is thrown into gear with said worm wheel 57, said driver shaft is caused to revolve in one direction or the other, according to the direction in which said main shaft 27 happens to be running at the moment.

Sprockets 60 and 61, mounted upon said driver

shaft 58, operate the rearward and forward screed-chains 62 and 63, which chains pass over sprockets 63a and 63b mounted upon a driven shaft 64, provided at the left of the machine. The ends of said rearward screed-chain 62 are attached at points 65 and 66, Fig. 3, to the rearward shoe 67 at the rearward end of said screed 1. And, similarly, the ends of said forward screed-chain 63 are attached to the forward shoe 68.

By these means the screed is translated from side to side of said roadway 2, its direction, either to right or to left of said roadway, depending upon the direction of rotation, at the moment, of said driver shaft 58, which in turn depends for its direction upon the direction, at the moment, of said main shaft 27.

In the transverse finisher hereinbefore described, as the screed moves transversely of its length, in the course of its treatment of the road surface, the whole machine necessarily moves with it. In contrast with that, it is to be noted that, in the present invention, the movement of the screed transversely of its length is a movement relative to the machine as a whole.

Summing up, mechanisms have been described for giving three movements to the screed, namely, first, a movement of advance along the roadway, of the machine as a whole, including the screed; second, a movement of oscillation of the screed endwise of itself; and third, a movement of translation of the screed across the roadway. And it will be noted that all three of such movements can be caused to occur simultaneously.

The engine and most of the gearing above described are carried on the non-continuous platform 68a, which is carried by the frame 69 of the machine.

The reversing of the direction of translation of the screed, from one side of the road to the other, at the right moment, is accomplished as follows:—

Referring more particularly to Figs. 1, 4, and 5:—

In Fig. 4 the full lines show the reversing mechanism when on dead centre and just about to spring over; and the dotted lines show the condition after the spring-over has taken place.

Said rearward screed chain 62 passes through the channel-shaped guide 70, and carries the chain stop 71. Said channel 70 is attached by means of the plate 72 to the sliding block 73 into which block is pivoted the vertical post 74, having upon it the swinging horizontal arm 75.

When said stop 71, during the course of its travel upon said chain in the direction of the arrow 72a, Fig. 4, meets said channel, it pushes said channel along in front of it, meantime compressing the spring 76 until said swinging arm 75 is in line with the clutch arm 77, a dead-centre condition having been thereby reached. A moment later, while the chain still travels, the spring-over takes place, causing said block 73 to slide a little further to the right, as shown by the dotted position of said block in Fig. 4, where it is stopped by the block-stop 79, the block carrying with it said channel 70, and said post 74, and said swinging arm 75.

The spring meantime causes said swinging arm 75 to assume its dotted position, Fig. 4, which in turn causes said clutch arm 77 to assume its dotted position, which in turn, by means of its downwardly projecting finger 82, causes the clutch member 83 to slide out of engagement with said bevel wheel 25 and into gear with said

bevel wheel 26, (the new position of said clutch member being not shown in the drawings) thereby causing the direction of said main shaft 27 to be reversed.

5 Immediately thereupon, said chain 62 travels in the opposite direction, carrying said chain stop 71 away from said channel, and eventually bringing a second chain stop, not shown, to push the channel at its other end, and to thereby again reverse the movement at the right moment.

10 Said clutch arm 77 is pivoted at 84. Attached to it is the swivelling eyelet 85, through which said swinging arm 75 is free to run.

15 In practice, a hand-operated mechanism is provided for lifting the screed above its working elevation, in order to avoid obstacles, or in order to put the machine in readiness to travel without screeding. But such mechanism is not shown in the present drawings.

20 Said travel shaft 33, Fig. 1, may be broken at its middle in accord with known practice, suitable clutches being provided, whereby either half of said shaft may be driven while the other half stands idle. The mechanism for accomplishing this is not shown in the present drawings. Portions of it may be located within said sleeve 38, Fig. 1.

The retarding of the forward end of the screed hereinbefore described, is accomplished as follows:—

30 Referring more particularly to Figs. 1, 9, and 10:—

Said screed-chain driver-shaft 58 has its said forward sprocket 61 running loosely upon it, while, near said sprocket, the gapped wheel 90 is fixed rigidly to said shaft. The pin 91, projecting in axial direction from said sprocket, enters the arcuate gap 92 provided in said wheel 90.

40 When said driver shaft 58 is put in motion in either direction, the fact that said forward sprocket 61 is loose upon it causes said forward screed chain 63 to remain without motion until said pin 91 has reached either end of said gap 92, as shown by the two dotted positions of said pin in Fig. 10, whereupon motion of said screed-chain will begin, because said sprocket 61 will then be driven by said gapped wheel 90.

50 Upon said driven shaft 64, whereas the rearward sprocket 63a is rigid, the forward sprocket 63b is loose, permitting the latter to accord itself to any lost motion of said driver-sprocket 61. Accordingly, said forward screed-chain 63, attached at its ends to said forward shoe 68 as hereinbefore described, transmits the movements of said sprocket 61, including the losses in motion of said sprocket, to said shoe, thereby effecting the desired retarding of the forward end of the screed.

60 Mechanism for governing the working depth of the screed is as follows:—

Referring first more particularly to Figs. 1, 2, and 3, the rear template 95 and the forward template 96, Fig. 1, are rigid members arched to the desired road contour, as shown in side view in Fig. 3, and are attached to contiguous parts of said frame 69. Said rearward and forward shoes 67 and 68 are supported respectively by said templates, upon which they are free to run or slide; and said screed-chains 62 and 63 pull said shoes either to the right or to the left across the roadway, as hereinbefore described.

70 By these means, the weight of the screed is carried by the templates, and the templates, in turn, are carried by, or are a part of, the machine itself. And it follows that the regulating of the

depth of the cut of the screed is a matter relative to the templates, or to the frame of the machine, quite independently of the forms.

This arrangement is in contrast with that of the transverse finishing machine described in "Second usual operation" above, in which the screed rests, not upon the machine, but upon the forms at the edges of the road. That transverse finisher has also further disadvantages as follows:—(1) Any unevennesses in the forms directly affect the screed, causing ridges and furrows crosswise of the roadway, whereas in the present invention the length of the wheel-base of the machine softens said unevennesses of the forms; (2) In the transverse machine, the fact that the forms which carry the screed, and the machine that moves the screed, are separate entities tends to cause a vibration in the transmitting of the motion, resulting in crosswise furrows; and (3) In the transverse machine, the screed must be a long one, because it must span the whole roadway, and therefore must be correspondingly strongly braced and heavy, to prevent any springing of its arch during work, which would cause untruth in the road contour; whereas in the present invention the screed can be as short as may be found convenient.

That is to say, several marked disadvantages, inherent when the screed rides upon the road "forms", are eliminated by the present invention, in which the screed rides upon templates, which are carried by the machine itself.

Another inherent difference is the fact that, in said transverse finisher, the movement of the screed sideways of itself, to perform its work, occurs only when the machine as a whole moves in that direction; whereas, in the present invention, the movement of the screed sideways of itself is relative to the frame of the machine.

40 An automatic "lift-over" mechanism, for preventing concrete from being wiped off, over the forms, at the sides of the road, is as follows:—

Referring more particularly to Figs. 11, 12 and 13:—

45 In those figures the screed 1, with its rearward shoe 67, is shown near the other end of its crosswise travel, as compared with Figs. 1 and 3.

50 Said rear template 95 is attached to a contiguous portion of said frame 69 of the machine, Fig. 12, as hereinbefore related. Also attached to said frame is the bracket 97 from which are suspended the rigid plate 98, Fig. 13, and the hinged plate 99. The latter is hinged to said rigid plate 98 by the hinge 100, and is permitted to rise upward by the bolts 101 passing freely through the slots 102 in said bracket 97.

60 Upon said template 95 said rearward shoe 67 slides, as hereinabove described, during most of the journey of the screed from side to side of the roadway, at which times the screed forms the concrete to the line 103, Fig. 13, as shown by the dotted position VII of said screed 1.

Rising from said shoe are brackets 105 and 106 carrying inwardly projecting lips 107 and 108.

65 Referring to Fig. 13:—When the screed 1 is at said dotted position VII, said lip 107 will be at its dotted position VII. Thereafter, while the movement of the mechanism progresses further to the right, pulled by said rearward screed chain 62, said lip 107 will slide upward upon said hinged plate 99 until it reaches its full-lined position aforesaid. It will then have lifted said shoe 67 to its suspended position, as shown in full lines in the drawings, and, at the same time, will have lifted said screed 1 from said dotted position VII

to its full-lined position, during which time said screed will have formed the concrete 109 to the line 110 at a higher elevation than the dotted line 111, to which it is desired, eventually, to form it.

Continuing the whole movement still further to the right, said lip 107 will keep said shoe suspended until said lip has passed beyond said rigid plate 98. Thereupon the whole of the suspended mechanism will drop. That is to say, said shoe 67 will again rest slidably upon said template 95, while said lip 107 and screed 1 will be in the dotted position VIII. The automatic reversal of the direction of sideways travel of the screed, hereinbefore described, will be timed to take place at about this moment, whereupon the screed, progressing to the left from said dotted position VIII, will pass over said form 43, and will wipe in an inward direction the surplus concrete that lies between said lines 110 and 111, said screed, in so doing, passing along said dotted line 111, while said lip 107, leaving its said dotted position VIII, will pass under said rigid plate 99, lifting the latter to enable it so to do, the latter thereafter dropping to its normal position ready for a repetition of the process.

A corresponding automatic lift-over mechanism is provided at the other end of said rearward template 95. Also the mechanisms are repeated in respect of said forward template 96.

By these means such amount of concrete as is pushed along by that edge of the screed which is, at the time, the working edge, is not swept over the form, but is swept inward of the roadway, to fill up low places.

Some further details of Figs. 11, 12, and 13 are as follows:—

A U-bracket 112 suspends the screed by means of the adjustable hanger-bolts 113 from the axle 114 of the wheels 115, running on said shoe 67. By these means the height of the screed relative to the shoe, and hence relative to the template, is adjusted, while the wheels facilitate the oscillation aforesaid of the screed endwise of itself.

Also, the employment of said U-bracket 112 makes it possible for said template to stand at a convenient clearance above the concrete, while none the less carrying the weight of the screed.

Arms 116, extending downward from said shoe 67, carry guide rollers 117 on either side of the screed, which rollers prevent tilting of the screed, while facilitating said endwise oscillation of the screed.

Further details of the gearing in the two trains of gearing aforesaid are as follows:—

Referring more particularly to Figs. 1, 2, 3, and 6:—

The gearing by means of which said power output shaft 21 drives said first cross shaft 22, as aforesaid, consists of a worm 119, carried upon said shaft 21, gearing into the worm-wheel 120 on said cross shaft 22.

The gearing aforesaid, as between said first and second cross-shafts 22 and 23, consists of sprockets 121 and 122 on said shafts respectively, geared together by the chain 123.

The gearing aforesaid, as between said first cross-shaft 22 and said sliding shaft 29, consists of the worm 124 carried upon said cross shaft, gearing into the worm-wheel 125 carried upon the jack-shaft 126, which shaft carries also the pinion 127, gearing into the pinion 128 upon said sliding shaft.

I claim:

1. A road finishing machine comprising a

screed, means for causing said screed to automatically treat twice, from substantially opposite directions, a portion of a roadway, and means for causing the angular set of the leading edge of said screed, during said second treatment, to be substantially out of parallel with the angular set which had been employed by the leading edge during said first treatment.

2. A road finishing machine comprising a screed, means for continuously translating and returning said screed in a direction substantially transverse of its length while such screed operates, and automatic retarding means for causing the front end of said screed to lag behind its rear end during such translations and returns.

3. A road finishing machine comprising, when in position upon a roadway, a screed lying substantially longwise of the roadway, means for translating said screed from side to side of the roadway, and automatic means for raising said screed above its operating elevation when near the end of a translation and for lowering same again before its return translation, whereby excess paving material may be wiped inward of the roadway rather than be wiped off the roadway.

4. A road finishing machine comprising a machine frame, a screed, means for translating said screed in a direction substantially transverse of its length and for returning it in the opposite direction, a lip attached to said screed, and a hinged sloping plate attached to said frame, said plate being adapted to co-operate with said lip to lift said screed above its working elevation during translation in said first direction, and being adapted to allow said lip to pass under it during said return.

5. A road finishing machine comprising a screed, a shoe at a higher elevation than said screed, a bracket attached to said screed and supported by said shoe, a track along which said shoe is adapted to be travelled in a direction crosswise of said screed, and a guide extending downward from said shoe adapted to prevent tilting of said screed sideways of itself during operation.

6. The method of making a concrete road and truing its surface which consists in spreading concrete to a first approximation in respect of truth of surface, and thereafter reaching a second and a third approximation respectively by means of two cutting operations free from pressing operations, such cutting operations being performed in each case by a mechanically operated screed having a cutting edge guided by spring-free means to cut to a definite cutting plane in respect of depth, each such screed accordingly cutting off such concrete as stands as excess above said cutting line, and pushing said excess before it, said two screeds lying at substantially different angles in relation to the direction of the roadway.

7. In a road surface truing machine, a slicing and pushing screed adapted to slice off the high parts from a mass of plastic road material without pressing down upon the residue of such mass, and to push such sliced off material before it, said screed lying, when in operating position upon a roadway, substantially longwise of same, in combination with means for translating said screed crosswise of the roadway, whereby said screed is enabled to work over, and thereby to correct errors in, a surface which has been roughly trued by a machine having a slicing and pushing screed set crosswise of the roadway.

8. In a road surface truing machine, a slicing and pushing screed, and means for translating said screed in either direction approximately transverse of its length, said screed being adapted to slice off the high places from a mass of plastic road material without pressing down upon the residue of such mass, and to push such sliced off material before it, when said screed is translated in either of said directions.

9. A road pavement truing machine comprising, when in operating position above a roadway, a cutting screed, lying approximately at least longwise of the roadway mechanically operated means for continuously translating said screed from side to side of the roadway, against the resistance of its cutting, and mechanical, non-elastic means for automatically controlling the cutting depth of said screed throughout such translation, said screed, comprising, as seen in cross-section, a downward face, flat, and lying substantially horizontally, and two side faces rising to a substantial height, either of said side faces and said downward face together forming a cutting and pushing edge upon said screed, whereby said screed is adapted, during such translation in the direction of either of said faces, to cut a shaving of substantial depth from a high part of a plastic mass of road material, to push such sliced off material before it, and to allow substantially all of same to drop downward to fill a depression, said screed during such operations not pressing downward upon the material to displace it.

10. A road pavement truing machine as claimed in claim 9, said side faces rising abruptly and in substantially a straight line from said downward face, whereby said sliced off material may be free to drop the more cleanly away from said faces.

11. A road pavement truing machine as claimed in claim 9, said translating means acting in a plane substantially close to the plane of travel of the bottom of said screed, whereby tendency to tilt said screed, during said translation of same against the resistance of said material, is minimized.

12. A road pavement truing machine as claimed in claim 9, said depth controlling means comprising templets transverse of the roadway, means movable along said templets supporting the ends of said screed without the intervention of springs, and means for preventing tilting of said screed relative to said templets in the direction longwise of said templets.

13. A road pavement truing machine as claimed in claim 9, said depth controlling means comprising templets transverse of the roadway, shoes supporting the screed without the intervention of springs, said shoes being adapted to be moved along said templets and having substantial length of bearing along said templets to prevent their tilting longwise thereof, and means carried by said shoes for substantially preventing the tilting of said screed relative to said shoes.

14. A road finishing machine comprising when in operating position above a roadway a screed, means for continuously translating and returning said screed in a direction substantially transverse of its length while such screed operates, and automatic retarding means for causing the front end of said screed to lag behind the rear end during such translations and returns, said retarding means comprising a horizontal shaft

at each side of the screed, a sprocket at each end of each said shaft, a front and rear chain passing respectively around the front and rear pairs of sprockets and connected to means movable with the front and rear ends respectively of said screed, whereby said chains are adapted to translate said screed when said shafts are revolved, said front sprockets being loose upon said shafts, said retarding means further comprising a wheel rigid upon each said shaft adjacent said front sprockets, and mechanism for causing lost motion between said wheels and said front sprockets.

15. A road finishing machine comprising a screed, means for translating said screed crosswise of the roadway, and means for reciprocating said screed longwise of the roadway during said translation, said reciprocating means comprising a bar extending crosswise of the roadway for substantially the full width of the roadway, a front stop and a rear stop located on said screed, slidable along said bar, and means operating at the ends of said bar to give said bar a reciprocating movement longwise of the roadway.

16. A road finishing machine as claimed in claim 15, guides being provided for guiding said bar during said reciprocation, whereby said bar is prevented from exerting angular pressure downward upon said screed.

17. In a road finishing machine, a mechanically operated screed, and mechanical means for translating said screed from side to side of a roadway, said means comprising shoes, draft elements attached to said shoes, and brackets at the ends of the screed, said brackets and screed constituting a unit, the brackets resting by the force of gravity upon the shoes, whereby said unit can be removed from the machine without any unfastening.

18. The method of making a concrete road, which includes the steps of spreading concrete to a first approximation of the truth of surface to be obtained, then subjecting the concrete to a cutting and pushing action at its surface portion, the direction of said cutting and pushing being substantially crosswise of the roadway, so as to effect a further approximation of the final truth of surface to be obtained, and at the same time to cause a substantial proportion of the concrete so cut to be pushed along while lying upon the main laid body thereof, shifting crosswise of the roadway, thereby to fill voids or depressions in the surface portions of the main body of concrete.

19. The method as claimed in claim 18, said cutting and pushing further causing said substantial proportion of the concrete to be moved to and fro crosswise of the road without being forced off the edge of the main body of concrete the surface of which is being brought to final truth or accuracy.

20. The method of making a concrete road and truing its surface, which consists in spreading concrete to a first approximation in respect of truth of surface, and thereafter cutting the upper surface portions of the concrete in a direction crosswise of the roadway, at the same time shifting the cut portions in a direction laterally across the roadway while lying upon the main body of concrete therebeneath.

21. The method as claimed in claim 20, said shifting being to and fro, across the roadway.

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