The present invention relates to improvements in methods and apparatus for building concrete roads, and has for an object to provide an improved method and apparatus whereby central mixed concrete, which may be mixed at a central point and hauled to the job, may be remixed and distributed on the road bed efficiently and economically.

The chief objection to central mixed concrete has been that in hauling it to the job, the coarser materials settle to the bottom and this segregation of materials is very objectionable and does not produce uniform concrete in the road; and it is a primary object and purpose of this invention to obviate this difficulty by the provision of a local mixing apparatus designed to receive the central mixed concrete from the trucks or transit mixers, and remix the same just prior to its distribution over the road bed.

Another object of the invention is to provide an improved apparatus whereby concrete transported by trucks or transit mixers may be used efficiently on road work where mesh reinforcing is employed in the construction.

A further object of the invention is to provide improved means for distributing and spreading the lower course of the concrete to the required depth to receive reinforcing mesh.

A further object of the invention is to provide a transverse screeding attachment to screed off and finish the concrete, and means for producing both longitudinal and transverse joints in the roadway.

A still further object of the invention is to provide an improved apparatus in advance of the subgrader to elevate the trucks or transit mixers to the proper elevation to facilitate the discharging of the contents into the local mixing device.

A still further object of the invention is to provide means whereby the subgrader, containing the power unit, may be detached from the mixing and spreading and finishing portion of the machine to permit of the subgrader being advanced independently of the remaining portion of the machine to do the preliminary subgrading in advance of the concreting operation.

A still further object of the invention is to provide means whereby the entire weight of the machine is not required to operate on top of the side forms, thus relieving the side forms of pressure to avoid their settling out of alignment.

However, the screed is supported by, and is reciprocated over the tops of, the side forms; therefore, the forms are not depressed as in the case of the old practice, where the forms support the entire weight of the heavy finishing machine.

A still further object of the invention is to provide an improved subgrader capable of a transverse reciprocating motion to plane down the subgrade and supported upon endless tread which may operate either upon the side forms or to the inner or outer sides thereof, whereby not only the forms may be relieved of the pressure of the heavy apparatus, but wherein the subgrade may also be relieved of such pressure which might tend to depress the same.

With the foregoing and other objects in view, the invention will be more fully described hereinafter and more particularly pointed out in the appended claims.

In the drawings, in which like reference symbols indicate like parts throughout the several views:

Figure 1 shows a side elevation of an improved machine constructed according to the present invention.

Fig. 2 is a vertical longitudinal sectional view taken through the rear portion of the machine and the roadway being operated upon.

Fig. 3 is a vertical cross section taken on the line 3—3 in Fig. 2.

Fig. 4 is a fragmentary longitudinal vertical sectional view taken through the forward portion of the machine.

Fig. 5 is a front elevation of the machine.

Fig. 6 is a vertical cross section taken on the line 6—6 of Fig. 4.

Fig. 7 is a fragmentary front elevation with one of the side forms shown in section, of a modified form of the device.

Fig. 8 is a side view, with parts broken away, of a modified form of local remixing device.

Fig. 9 is a vertical cross section taken on the line 9—9 in Fig. 8.

Fig. 10 is a side view, with parts shown in section, of a further modified form of local remixing device and

Fig. 11 is a cross section taken on the line 11—11 in Fig. 10.

Referring more particularly to the drawings, 12 designates the side forms between which the concrete roadway is filled in and molded; the lower course of the concrete being represented at 13, the mesh reinforcement at 14, and the surface course at 15; such concrete being discharged onto the subgrade from the screw conveyor spout 16 through the discharge gates 17 in the lower portion of the spout, and distributed and leveled off by the longitudinal leveler 18, which may be
-reciprocated transversely across the roadway by any appropriate means, such as the endless chain 19, shown in Fig. 6 as being trained about sprockets 20 carried upon the traveling bridge or carriage 21. The leveler frame 22 is attached to the lower end of the chain 19 whereby to move therewith, such leveler frame 22 being supported by rollers 23 which travel back and forth in the channels of channel or I beams 24.

10 The spout 16 extends with its axis longitudinally of the roadway and is supported above the roadway so that the spout 16 will roll along the side forms with the wheels 25.

The traveling bridge or carriage 21 is supported by rollers 25 which roll along the side forms 12. The longitudinal member or blade 18 is adjusted up and down by the screws 26, permitting the blade 18 to be adjusted quickly to strike off the bottom course to receive the reinforcing mesh 14. The screw member 26 engages with the blade 18 and has threaded engagement with one end of a lever 27 fulcrumed intermediate its ends upon a bracket 28 and at its other end pivoted, as indicated at 29, to a part of the frame or traveling bridge 21.

At 30 is represented a transversely-reciprocating scree 56 or finishing member traulled loosely back of the machine by chains or rod members 31 attached to the traveling bridge. The scree 30 includes an upwardly substantial vertically corrugated plate 32 constructed to buck a mass of concrete. This corrugated plate 32, during a rapid transversely reciprocatory movement, agitates the concrete and produces a more compact structure. The scree 30 has attached thereto a truss member 33 with upstanding arms 34. Such truss member is provided with adjusting means 35 to flex the scree member 30 whereby to vary the crown of such scree member. The vertical corrugations in the vertical plate 32 will permit the flexing of the scree without breaking the continuity of said vertical plate 32. The scree member is reciprocated laterally by means of an eccentric 36 operating through an arm 37, the eccentric 36 being mounted upon a shaft 38. The shaft 38 is in axial alignment with the scree conveyor shaft 39 which extends through the conveyor spout 16 and carries the scree conveyor 40 thereon. A clutch 40 is mounted between the shafts 38 and 39 and may be connected and disconnected through the use of a lever 41. In this way the scree member 30 may be thrown into and out of motion as desired. The scree member 30 is movable to and from the concrete by the suspending chains or other members 42 which are wound upon the drums 43 carried by a transversely extending shaft 44.

The drums are rotated by means of ratchet wheels 45 cooperating with pawls 46 carried by levers 47 pivoting about the shaft 44. Dogs 48 engage the ratchet wheels to prevent retrograde motion of the drums and thereby hold the chains 42 and the scree member 30 in adjusted position.

A radial joint cutting blade 49 is also trulel on the rear of the machine for producing a longitudinal center joint progressively as the machine advances. The joint is so arranged as indicated at 50 in Fig. 2. This joint 50 may consist of an open groove, or joint material of various types may be installed in the groove, as desired. The blade 49 is pivoted, as indicated at 51, at or near its forward end upon a pin journaled to rotate in lugs 53 of a vertically and horizontally extendable plate 54. The adjustable plate 54 is adapted to slide on a plate 55 which is adjustable horizontally along the frame work of the traveling bridge or carriage as shown in Fig. 3. An adjusting screw 56 carried by the plate 55 is engaged with the plate 54 for the purpose of adjusting such plate 54 together with the joint blade 49 up and down. An adjusting screw 57 connecting with the plate 55 acts to adjust both plates 54 and 55 in a horizontal direction, whereby to bring the joint installing blade 49 to a correct position laterally of the roadway.

After raising the scree 30, the joint installing blade 49 is raised out of the concrete by manipulation of the screw 56, such blade may be swung about the pivot pin 52 as a center to the position shown by dotted lines in Fig. 3, the blade 49 thus taking up a position extending transversely of the roadway for the purpose of cutting a transverse joint. The blade 49 may be reciprocated transversely by means of arm 58 having lugs 59 adapted to register in a seat 60 of the blade 49. The arm 58 receives its vibratory motion from eccentric 61 carried by the shaft 38 behind the eccentric 36 its other end pivoted, as indicated at 62.

After the transverse joint has been cut at one side of the roadway by the reciprocating action of the blade 49 in the concrete, when that blade 49 is in the position indicated in Fig. 3, the blade may be thereupon lifted out of the concrete by raising the plate 54 through action of the adjusting screw 56, and thereupon swung around through 180 degrees to the opposite side of the roadway and into alignment with the joint groove previously produced. Such blade 49 may be then lowered into the concrete and reciprocated by the eccentric motion, the arm 58 having been swung around to the opposite side of the machine and the opposite lug 59 reengaged in the seat 60 of the blade.

The grooves having been cut, suitable joint material may be inserted in the grooves; such joints may consist of premolded material to remain in place, or steel plates may be inserted in the grooves, and it is to be understood that the scree will surface over the joint material or joint plates after they have been installed; provided, in order to facilitate a more rugged removable steel plates are used, these may be removed later and the open grooves filled with a suitable material.

After the transverse joint has been installed, the blade 49 is then swung around to the center 125 of the road, and is again engaged longitudinally in the plastic concrete for further advancement of the machine to produce a longitudinal joint. The blade 49 is thus adjustable vertically by the screw 56 and adjustable laterally by the adjust 130 screw 57. Such blade 49 is also suitably supported by the chain 62 including a turnbuckle, as indicated in Fig. 2, and also in Fig. 3. At the forward portion of the machine is mounted a power plant or motor 63 adapted to drive the endless treads 64, which produce the necessary traction to propel the apparatus. The motor 63 is installed on an forward frame 65 which is detachable from the traveling bridge or carriage, the forward frame 65 being carried upon the end 140 frame 66 and being equipped with one or more rollers 67 for reciprocating transversely of the roadway as indicated in Fig. 5 by means of an arm 67 pivoted to the carrier beam 68 of the blade 66, which carrier 145 beam has a reciprocating motion transversely in the same manner. The arm 67 is connected to an eccentric 69 driven by a worm 71 carried by the power shaft 72. The shaft 72 is also provided with a worm wheel 73.
meshing with a worm 74 at the forward portion of the screw conveyor shaft 39 which extends through the screw spout or trough 16.

In the spout or trough 16 are auxiliary blades 5 which agitate and mix the concrete as it passes through the spout under the action of the screw conveyor 40. The concrete material is discharged into the hopper 76 at the forward end of the spout 16 from a truck 77 or other means of conveyance. The worm wheel 73 is fixed to a sleeve 78, as shown in Fig. 5 loosely extending about the shaft 72 and having a clutch engagement with the shaft as indicated by the clutch 79 operable by a lever 80. The worm 71 is also carried loosely about the power shaft 72 and is connected thereto by means of a clutch 81 operable by a lever 82.

The endless treads 64 are coupled to the power shaft 72 by means of chains or other devices 83 which connect with drums 84 loose on the power shaft and adapted to be clutched thereto as by the clutches 85 operable by the levers 86. Chains or other flexible connections 87, shown in Fig. 5, are carried on the drums 84 and have their forward ends connected to stakes 88 driven into the subgrade for the purpose of advancing, or assisting to advance, the machine, when the clutches 85 are engaged and the drums 84 driven by the motor 63. When it is desired to move the machine laterally by the eccentric motion. In Fig. 7 is shown carried by and adjustable vertically from the subgrade beam 88a which is provided with rollers 99 supported upon the side forms 12. These rollers carry the weight of the subgrade only and gauge the depth of the grader blade from treads of the side forms. The shafts 100 of the rollers 99 project through such rollers and possess considerable elongation providing for movement of the shafts through the rollers 99 when the subgrade planer or blade is reciprocated laterally by the eccentric motion. In Fig. 7, the subgrade planer 66a is shown as provided with a saw toothed edge, as indicated at 101. Lateral thrust rollers 102 are also carried by the subgrade planing device. It will of course be understood that the subgrade planer is provided with the necessary clearance between the side forms 12 so as to permit the lateral reciprocation of the grader.

The eccentric arm 67 will allow for vertical adjustment of the grader as may be required. As heretofore described, the subgrader may be disconnected from the mixing and screening portion of the machine, permitting the mixing and other parts of the machine to rest in place, while the subgrader is moved forward to complete the grading operation in advance of the placing of the concrete. This method will be found advantageous whenever the delivery of the concrete by the trucks has been interrupted for some reason or other. This would permit the workmen to utilize the subgrade portion of the machine during interruption.

Referring more particularly to Figs. 8 to 11, inclusive, instead of employing the screw conveyors for spreading, agitating and remixing the concrete, an endless belt 105, of steel or other appropriate material, may be used, such endless belt being disposed about the rollers 106 and 107 and receiving material therefrom by truck or other conveyances through a hopper 76a. A shaft 108 is disposed above the belt 105 and is parallel thereto. This shaft 108 carries a series of staggered fingers 109, the lower portion of which may rest on or extend substantially close to the moving belt and perform the function of agitating the concrete as it is being conveyed from the hopper 76a along the belt to the subgrade.
The fingers 109 are fixed to the shaft 108, as is also a lever 110, whereby the fingers may be lifted from contact or close relationship with the belt.

As shown in Fig. 9, there is provided a second shaft 111 also paralleling the belt or conveyor 105, and this second shaft 111 is equipped with a plurality of scraper blades 112. A lever or handle 113 is affixed to the shaft 111 to manipulate the scraper blades whereby such scraper blades 112 may be lowered into contact with the concrete, whereby to scrape the same from the moving belt. As shown in Fig. 8, a number of the levers 113 may be provided, one lever for each scraping blade 112, which will have free movement about the shaft 111 for manipulating the scraper blades independently of one another. When the scraper blades are lifted out of contact with the belt 105, it is to be understood that the concrete will be discharged at the end of the belt over the roller 107 and onto the subgrade.

As shown in Fig. 10, the hopper 76a may be equipped with agitators or a mixing device 114, consisting of blades or paddles, having a rotary movement if desired. These blades or paddles 114 may be used in place of the agitating fingers 109 where desired. In cases where a mixer or agitator 114 is used, it will not be required to use the scraper blades 112 to sweep the concrete from the belt.

As shown in Figs. 10 and 11, in lieu of the blades 112, a plurality of rollers 115 may be used, such rollers being disposed beneath the upper run of the belt 105 and serving as supports to the conveyor. These rollers 115 are carried by frames 116 pivotally mounted, as indicated in Fig. 11, and having levers 118 whereby the rollers may be tipped at an angle either to right or left, and independently of one another whereby the concrete will slide laterally off the belt and discharge onto the subgrade in the position as may be desired.

The rods 105 may be connected between the subgrader frame and the traveling carriage or bridge, and these rods will be so arranged as to be detachable when the subgrader frame is removed from the remainder of the machine.

When the chute 16 and conveyor of the screw type is employed, the gates 17 may be hinged as indicated at 120 in Fig. 2 and provided with levers or handles 121 for the purpose of raising and lowering the gates 17. The gates may be held closed in any appropriate manner or in any intermediate open position. One or all of the gates 17 may be opened to permit the discharge of concrete at the various local positions desired.

A final surfacing or smoothing operation, if desired, may follow rearwardly of the machine; this surfacing operation may consist of a hand operated belt, or the longitudinal dragging of burlap over the surface, which operations are well known in the art.

Referring now to Figures 2 and 6, the disc cutter 122 is securedly attached to the shaft 123, to which is also secured a gauge wheel 124. The shaft 123 has bearings 125 carried on depending arms 126 for attachment to the carriage frame 19 for vertical adjustment thereof. The shaft 123 is provided in the bearings 125 so that the carriage may move or reciprocate laterally without reflecting on the cutting disc 122.

Having thus described the invention, what is claimed as new is:

1. In a machine for building roads, a long local remixing device for the road material extending above the roadway with its length extending longitudinally of the roadway, a movable carriage for supporting said device, a transversely moving screed supported by said carriage for movement beneath the device, and means for adjusting said screed as to height.

2. In a machine for building roads, a remixing spout having a receiving hopper at one end and provided with discharge openings in its lower portion distributed along the length thereof, discharge gates for controlling said openings, a screw conveyor lying through said spout, means for operating said conveyor, fixed mixing blades in said spout adjacent the conveyor, and means for supporting the spout for movement longitudinally of the roadway.

3. In a machine for building roads, a traveling carriage, a joint installing member trailed after said carriage and supported at its forward portion for transverse swinging movement to engage in the concrete to form a transverse joint groove, and means for raising and lowering said joint installing member.

4. In a machine for building roads, a traveling carriage, a joint installing member trailed after said carriage and pivotally supported at its forward portion for swinging to a position transversely of the roadway, and means for imparting to the joint installing member a rapid transversely reciprocating movement.

5. In a machine for building roads, a traveling carriage, a joint installing member trailed after said carriage and having a pivotal movement at its forward portion whereby the member may be swung to either side of the roadway, and means having detachable connections to said member at either side of the roadway for imparting to the member a rapid transversely reciprocating movement.

6. In a machine for building roads, a traveling carriage, a joint installing member trailed after the carriage and pivoted at its forward end for transverse movement, means for vibrating the member when in the transverse position, and means for raising and lowering said member and for transverse movement.

7. An apparatus for building roads comprising a carriage, a longitudinal and transverse joint cutting blade pivoted to the carriage at its forward part being trailed after the carriage and movable in a horizontal plane at a pivot point to enable the blade to assume a position transverse of the roadway at either side of the pivot point, said blade having a socketed part, a transversely-reciprocating drive member on the carriage having a transversely-disposed end to engage the socketed part in either lateral position of the blade, a screed coupled to the carriage and lying back of the transverse position of the blade, and means to elevate the screed.

8. An apparatus for building roads comprising a carriage, a joint-cutting blade pivoted to the carriage at its forward part being trailed after the carriage and movable in a horizontal plane about the pivot point to enable the blade to assume a position transverse of the roadway at either side of the pivot point, and means to reciprocate drive member on the carriage having detachable connection with the blade in either transverse position of the blade, and means to raise and lower the screed.

9. An apparatus for building roads comprising
a carriage, a cutting blade pivoted to the carriage at its forward part being trailed after the carriage and movable in a horizontal plane about the pivot point to enable the blade to assume a position transverse of the roadway at either side of the pivot point, and a transversely-movable drive member on the carriage having detachable connection with the blade in either transverse position.

10. An apparatus for building roads comprising a carriage, a cutting blade, vertically and horizontally adjustable supporting means on the carriage for pivotally receiving said cutting blade whereby the blade is movable through an arc of substantially 180° from one side to the other of the road, and drive means on the carriage detachably connected to the blade to vibrate the blade.

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