July 17, 1934. G. A. ROSS 1,966,647

MACHINE FOR MIXING PAVING MATERIAL

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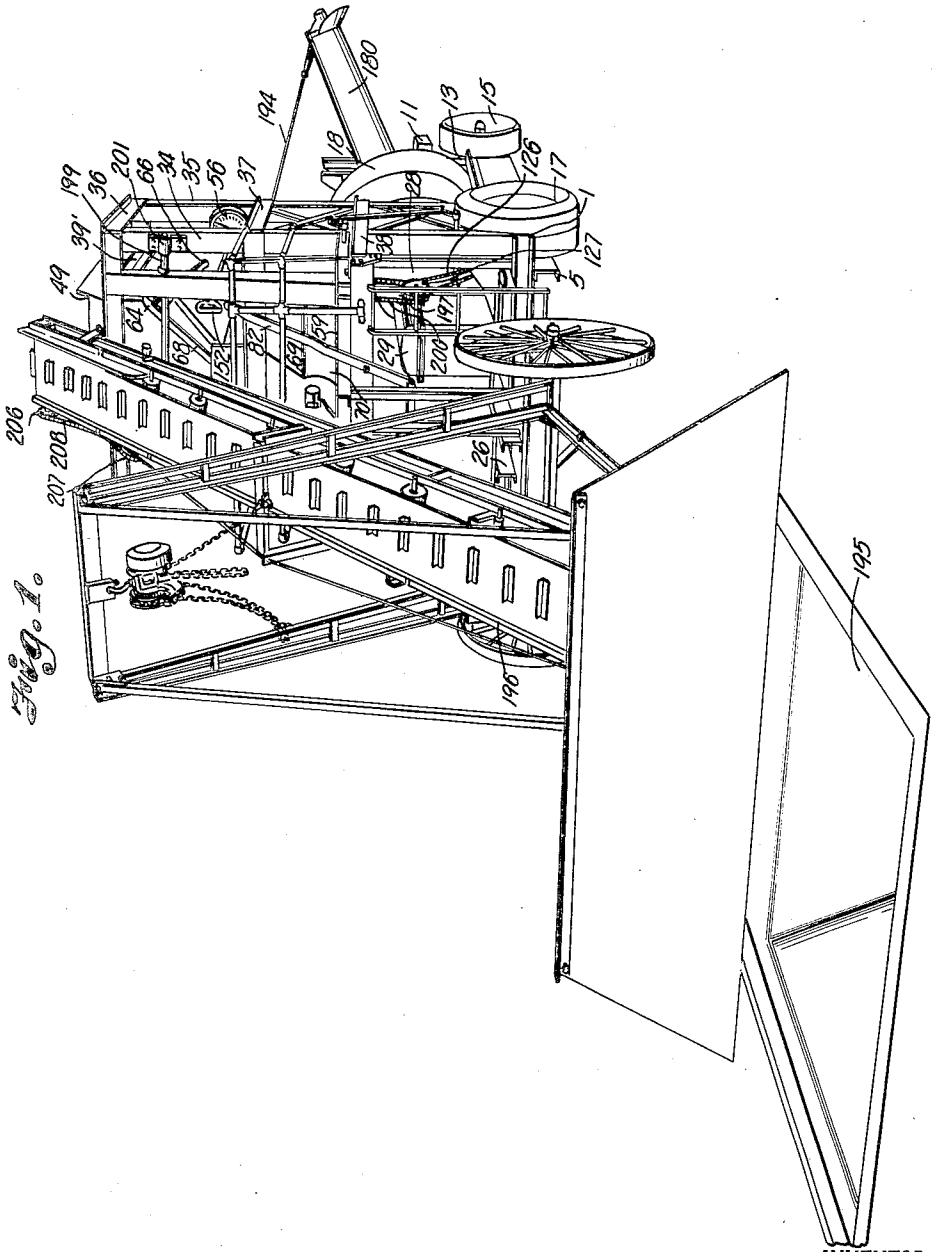



Fig. 1.

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Fig. 2.

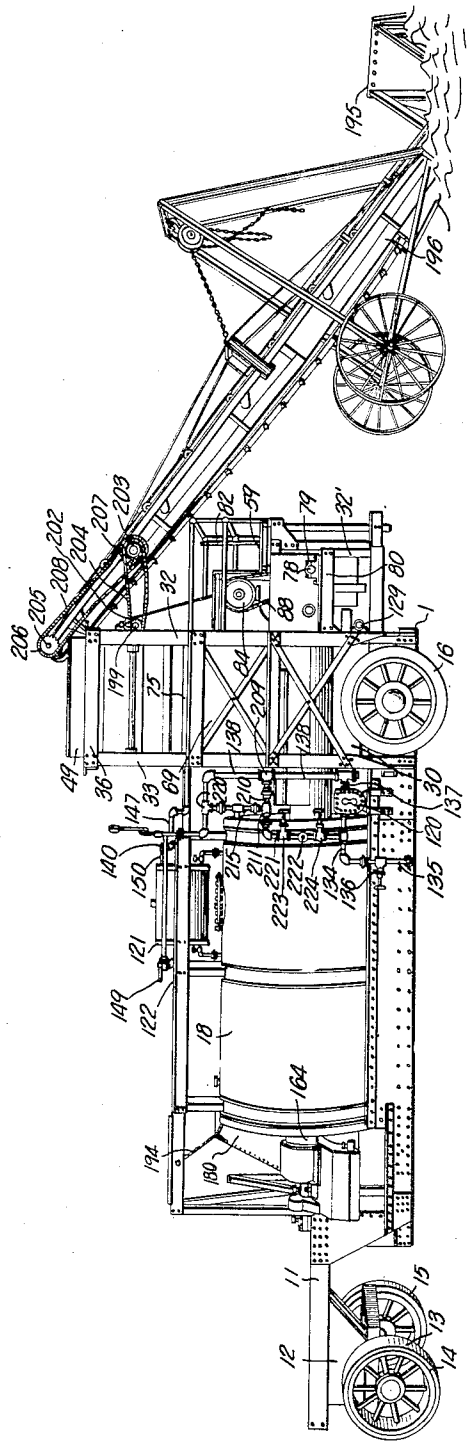
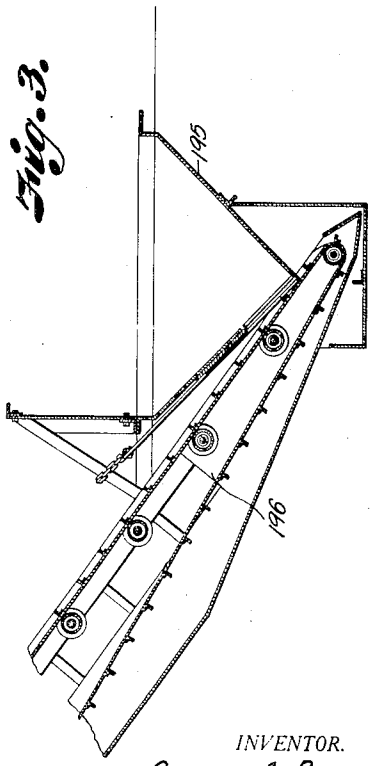



Fig. 3.



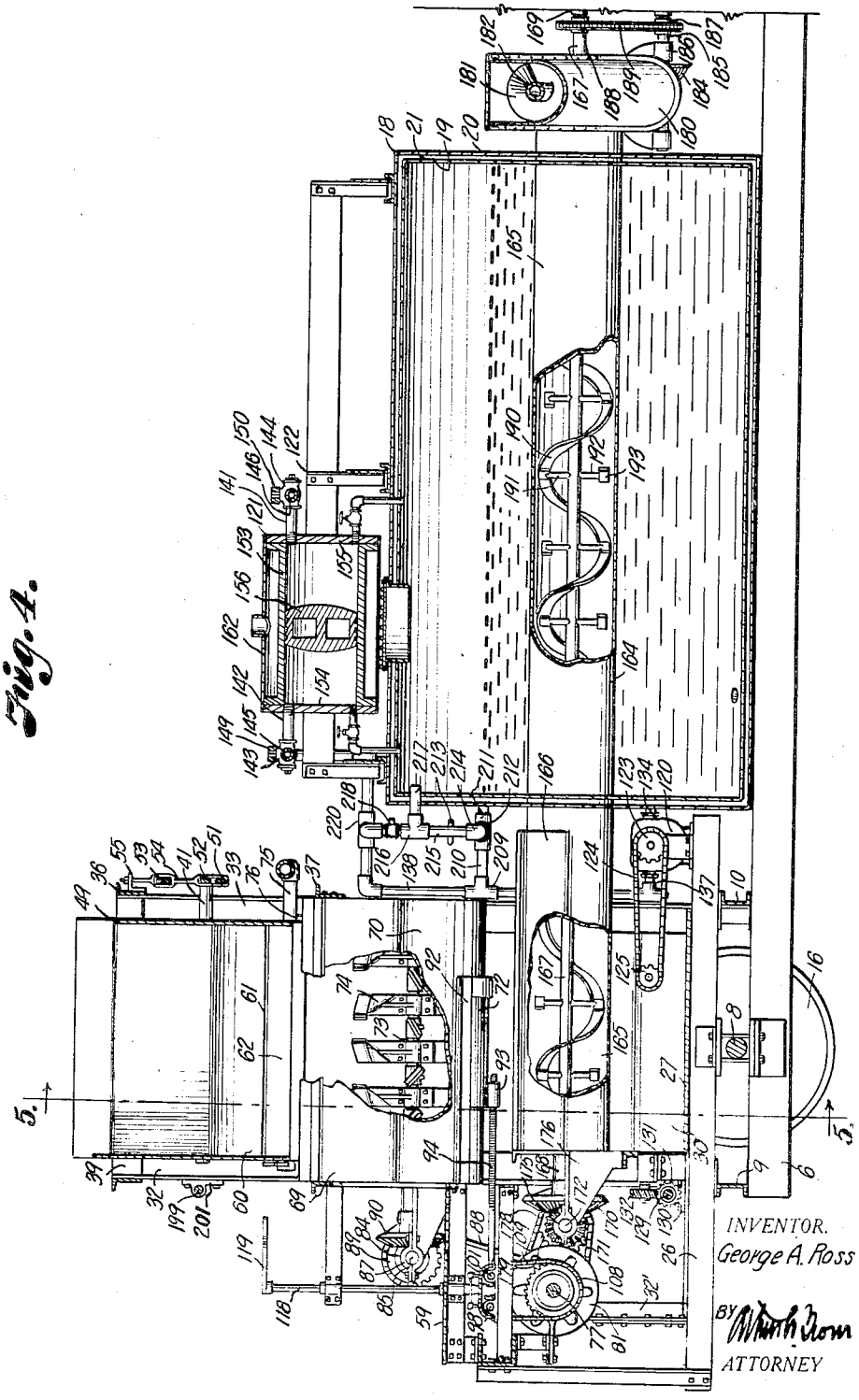

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Fig. 4.



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Fig. 6.

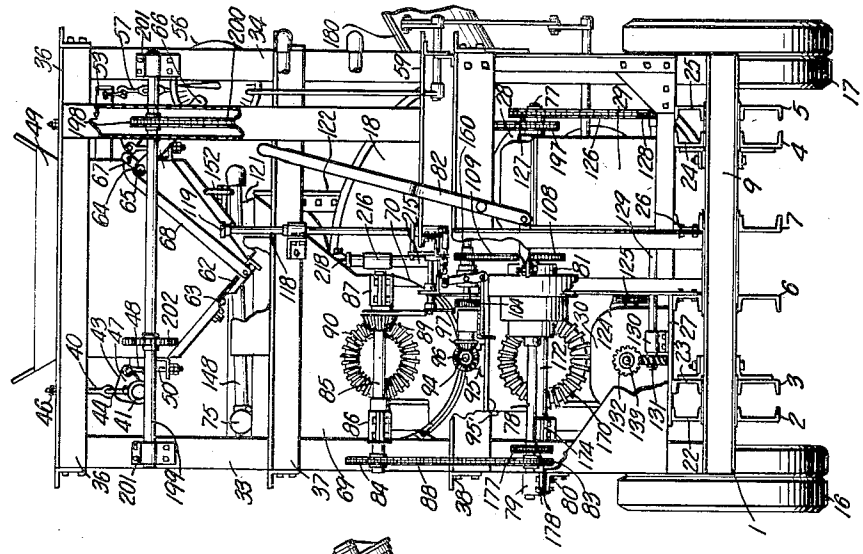
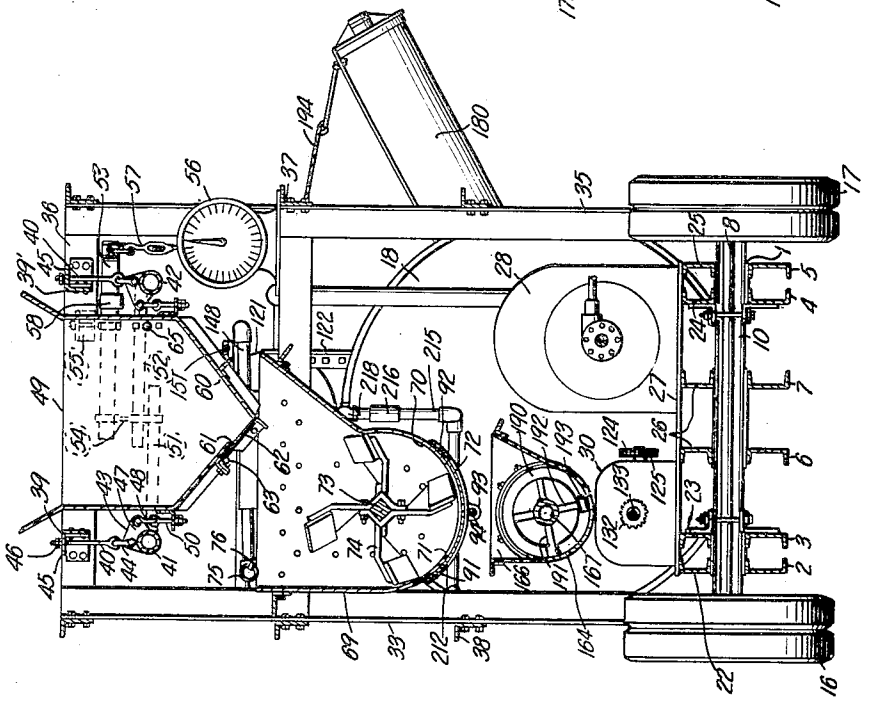


Fig. 5.



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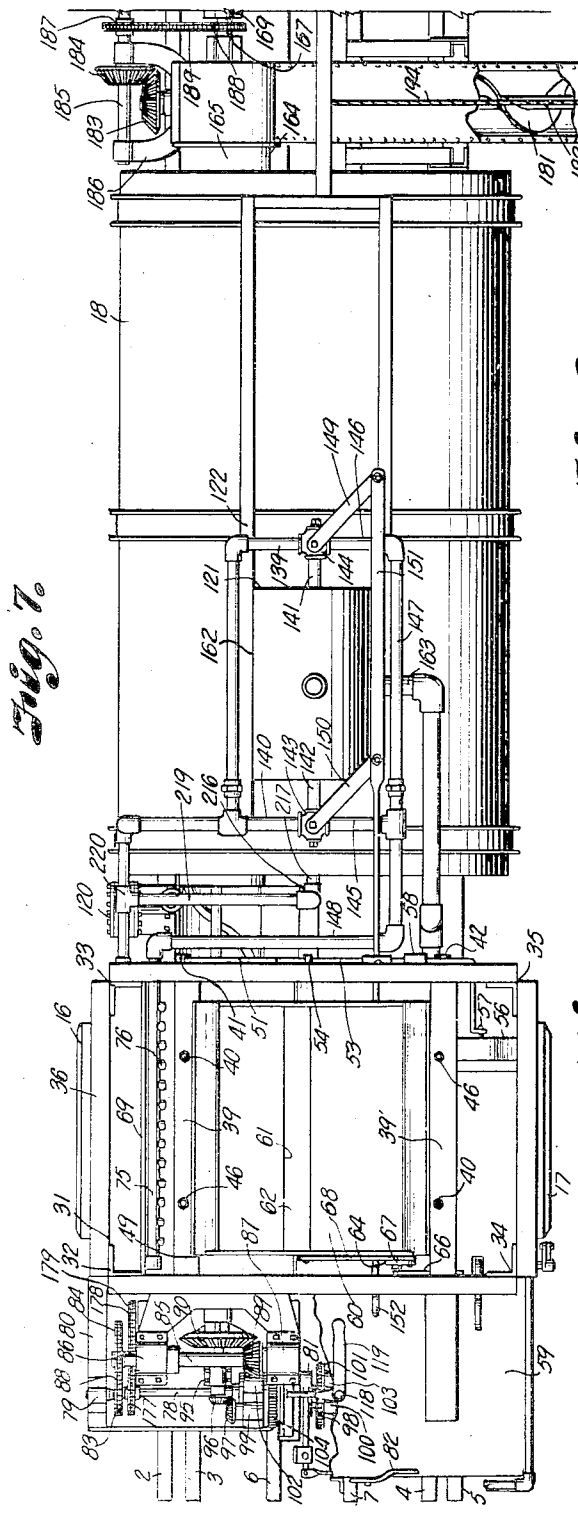


Fig. 7.

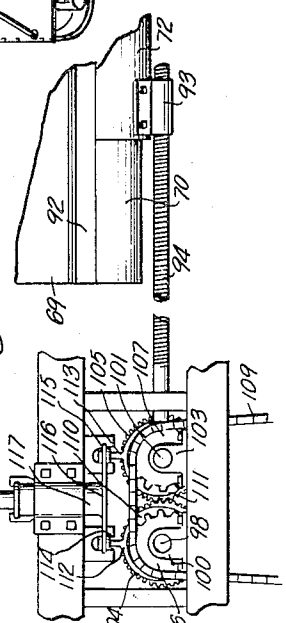


Fig. 9.

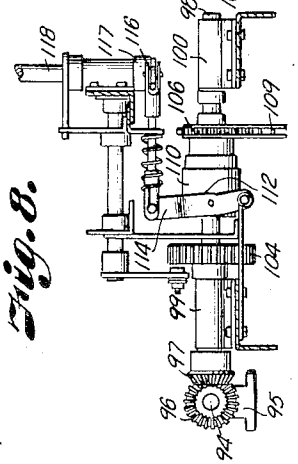


Fig. 8.

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# UNITED STATES PATENT OFFICE

1,966,647

## MACHINE FOR MIXING PAVING MATERIAL

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Application June 5, 1933, Serial No. 674,317

13 Claims. (Cl. 94—43)

This invention relates to mixing apparatus and more particularly to a machine for the production of synthetic asphalt and similar paving materials employed in highway construction, and has for its principal object to provide a portable machine that can be set up and operated in close proximity to a highway under construction and which may be readily moved to new locations along the highway as the work progresses.

In accomplishing this and other objects of the invention, I have provided improved details of structure, the preferred form of which is illustrated in the accompanying drawings, wherein:—

Fig. 1 is a perspective view of a portable mixing machine constructed in accordance with my invention.

Fig. 2 is a side elevational view of the machine.

Fig. 3 is a detail sectional view through the pit into which the mineral aggregate is dumped and the lower end of the elevator for conveying the dumped material into the weighing hopper of the mixing machine.

Fig. 4 is a longitudinal, vertical, sectional view through the mixing machine, part of the side walls of the pug-mill and the mixing conveyor being broken away to better illustrate the agitators for mixing the paving material.

Fig. 5 is a cross sectional view through the machine on the line 5—5, Fig. 4, particularly illustrating the weighing hopper, pug-mill and mixing conveyor.

Fig. 6 is an end view of the machine, particularly illustrating the driving mechanism for controlling operation of the pug-mill and the mixing conveyor, and the gate controlling discharge from the pug-mill.

Fig. 7 is a plan view of the machine.

Fig. 8 is an enlarged detail view of the actuating mechanism for moving the sliding gate controlling discharge from the pug-mill.

Fig. 9 is a side view of the control mechanism illustrated in Fig. 8.

Referring more in detail to the drawings:—

1 designates the main frame of the machine which includes spaced, longitudinally extending side channels 2—3 and 4—5, intermediate channels 6—7 connected adjacent their rear ends by the rear axle 8 of the machine, and spaced cross channels 9 and 10 located at opposite sides of the axle. The front ends of the longitudinal beams are provided with upwardly offset portions 11 having depending brackets 12 supported on a front truck 13 which includes wheels 14 and 15 cooperating with wheels 16 and 17 on the axle 8 to support the frame. The structure thus far described constitutes a wheeled truck or transport on which the mixing apparatus is mounted as now to be described.

Supported by the longitudinal channels 2—3, 4—5, and the intermediate channels 6—7, at the rear of the offset portions 11, is a horizontally arranged cylindrical tank 18 to carry oil asphalt used in preparing the paving material. The tank is preferably provided with spaced inner and outer walls 19 and 20 to provide a dead air insulation space 21 therebetween to retain the heat of the oil asphalt material carried in the tank.

Extending rearwardly from the tank 18 above the longitudinal beams 2—3, 6—7 and 4—5, and supported on the channels 9—10, are side beams 22—23 and 24—25 and intermediate beams 26 arranged to support a horizontal platform 27 on which is mounted an engine 28, transmission gearing 29 directly connected with the engine, and reduction gearing 30 for driving the pump mechanism later described.

Supported on the ends of the cross channels 9 and 10 is a vertical frame-work 31 including leg members 32—33 and 34—35 connected at their upper ends by angle bars 36 and at points spaced below the angle bars 36 by angle bars 37 and 38.

Extending between the front and rear angle bars 36 are spaced angle bars 39—39', and suspended therefrom on eye-bolts 40 are rock shafts 41 and 42 having pairs of bell crank levers 43 connected to the eye-bolts by links 44, the eye-bolts 40 being adjustably supported by the horizontal flanges 45 of the angle bars 39 and 39' by nuts 46 threaded on the ends of the bolts projecting through the flanges. Fixed to the inwardly projecting arms 47 of the bell crank levers are links 48 connected to a weighing hopper 49 suspended from the links by eye-bolts 50.

Fixed to the ends of the shafts 41 and 42 are lever arms 51 and 52 connected to a scale beam 53 by a link 54. The scale beam 53 is pivotally supported on a bracket 55 carried by an adjacent angle bar 36 and has its free end connected to a scale 56 by a link 57, the hopper being balanced by an adjustable weight 58 on the scale beam. The scale 56 is preferably located in view of the operator's platform 59 supported above the engine and gearing previously described. It is thus apparent that when material is dumped into the hopper as later described, the weight of the material will be indicated by the scale 56.

The weighing hopper 49 is provided with a trough-shaped bottom 60 having an outlet opening 61 in one side thereof controlled by a gate 62 hinged adjacent the upper side of the opening 61 as at 63. The gate is opened by a bell crank lever 64 pivoted to the hopper by a bolt 65 at the side adjacent the platform 59. The bell crank lever includes a depending handle portion 66 by which it is actuated, and a lever arm 67 operably connected with the gate 62 by a connecting link 68. It is thus apparent that when the handle 66 of the bell crank lever is swung in an upward direction on the pivot 65, the arm 67 will move in an anti-clockwise direction (Fig. 6) to open the gate 62 and allow discharge of material from the hopper, as later described.

Supported between the angle bars 37 and 38 in receiving relation with the weighing hopper is an open top pug-mill 69 having a semi-cylindrical bottom 70 provided with an outlet opening 71 closed by an arcuate-shaped sliding gate 72 conforming to the curvature of the bottom 70. Rotatably mounted in the end wall of the pug-mill is a shaft 73 carrying an agitating mechanism indicated by the arms 74 for mixing the material discharged from the hopper with an oil asphalt carried in the tank 18 and which is sprayed into the pug-mill through a pipe 75 extending longitudinally along the upper side wall of the pug-mill, as best illustrated in Figs. 5 and 7.

The pipe 75 includes a plurality of spray nozzles 76 so that the oil asphalt may be sprayed into the material as it is discharged from the hopper. The shaft 73 of the pug-mill is operated from the transmission 29 as now described. The transmission 29 is provided with a transverse shaft 77 aligning with a shaft 78 having its outer end rotatably mounted in a bearing 79 carried on an angle bar 80 connecting the leg 32 and an angle bar 32', as illustrated in Fig. 2. The shaft 77 is interconnected with the shaft 78 by a clutch 81 operable by a lever 82 adjacent the operator's platform.

Fixed on the shaft 78 is a sprocket 83 for actuating a sprocket 84 on the counter shaft 85 rotatably mounted in bearings 86 and 87 carried on the end wall of the pug-mill to support the shaft 85 in the plane of the axis of the shaft 73. Operating over the sprockets 83 and 84 is a chain 88 for driving the pug-mill shaft 73 from the shaft 85 through meshing bevel gears 89 and 90 on the shafts 85 and 73, respectively.

The gate 72 is slidingly supported in covering relation with the opening 71 in the pug-mill by longitudinal guides 91 and 92 carried by the pug-mill at opposite sides of the opening. Owing to the weight of material in the pug-mill, being supported on the gate, the gate is actuated by the engine as now to be described. Depending from the gate 72 adjacent its rear end is an internally threaded lug 93 carrying one end of a threaded shaft 94 having its opposite end rotatably mounted in a bearing 95 carried on a horizontal plate 95' supported by the angle bars 38.

Fixed to the end of the shaft 94 is a bevel gear 96 meshing with a bevel gear 97 on a shaft 98 which is rotatably mounted in bearings 99 and 100 also carried on the plate 95'. Extending in spaced parallel relation with the shaft 98 is a shaft 101 mounted in similar bearings 102 and 103 supported in spaced relation with the bearings 99 and 100. Fixed to the respective shafts are intermeshed spur gears 104 and 105.

Loosely mounted on the shafts 98 and 101 are sprockets 106 and 107, and operating thereover and over a sprocket 108 fixed to the shaft 77 of the transmission 29 is a chain 109 whereby the sprockets 106 and 107 are actuated to drive either of the shafts 98 or 101 under control of clutches 110 and 111 which operably connect the sprockets with their respective shafts.

The clutches 110 and 111 are provided with yokes 112 and 113 having upwardly projecting studs 114 and 115 connected to the ends of a lever 116 having a hub 117 thereon intermediate the connections of the studs 114 and 115. The hub 117 is fixed on the depending end of a vertically arranged shaft 118 extending upwardly to a point above the operator's platform 59, and is provided with a rocking lever 119 by which the shaft may be oscillated to move one of the clutches into driving relation and the other out of driving relation with their respective sprockets so that the shaft 98 may be driven either directly through the sprocket 106 or through the sprocket 107 on the shaft 101 and through the spur gears 104 and 105 to respectively move the gate 72 to open position or to closed position as later described.

In order to deliver a measured quantity of oil asphalt to the spray pipe 75 upon each dumping of the weighing hopper, I provide a pump 120 mounted on the channel beams 22 and 23 at a point adjacent the end of the tank 18 for delivering oil from the tank 18 to a cylinder 121 carried on a frame 122, supported above the tank 18.

The pump 120 is driven by a sprocket 123 through a chain 124 operating over a sprocket 125 on the transmission 30 which is driven from the shaft 77 of the transmission 30 by a chain 126 operating over a sprocket 127 on the shaft 77 and a sprocket 128 on a counter shaft 129, the counter shaft 129 being rotatably mounted in bearings 130 supported on the platform 27. Fixed to the end of the shaft 129 is a spiral gear 131 meshing with a spiral gear 132 on the transmission shaft 133 of the transmission 30.

The pump 120 has its inlet 134 connected with the bottom of the tank 18 by a pipe 135 provided with a valve 136. The outlet 137 of the pump is connected by a pipe 138 through branch pipes 139 and 140 leading to the opposite ends of the cylinder 121. The branch pipes 139 and 140 include nipples 141 and 142 and valves 143 and 144 for controlling flow to and from the cylinder 121. Also connected with the three-way valves in line with the branches 139 and 140 are the branches 145 and 146 of a discharge pipe 147 connected with the end of the spray pipe 75 by a pipe 148. The valves 143 and 144 are provided with lever arms 149 and 150, respectively, which are interconnected by a reciprocating rod 151 extending rearwardly of the machine and having a handle 152 thereon in reach of the operator's platform previously described.

The three-way valves are so adjusted that when the oil is flowing into one end of the cylinder through the valve 143 the valve 144 at the opposite end of the cylinder is positioned to discharge oil in that end of the cylinder through the branch line 146, pipe 148, to the spray pipe 75, and when the other three-way valve 144 is opened to permit the pump to discharge oil into

that end of the cylinder the three-way valve 143 is opened to establish communication with its end of the cylinder and branch line 145.

The cylinder 121 includes a cylindrical section 153 having closed ends 154 and 155, and movable in the cylinder is a piston 156 adapted to be reciprocated from one end of the cylinder to the other depending upon which of the three-way valves is open to pump pressure.

The cylinder 121 is preferably provided with a jacket 162 having connection 163 with the exhaust pipe of the engine 28 so that the exhaust gases may be circulated around the cylinder to heat the oil delivered to the spray pipe 75.

After the material is mixed with the oil asphalt in the pug-mill, the gate 72 is opened to discharge the material into a mixing conveyor 164 which includes a tubular conduit 165 having a hopper-shaped end 166 located directly under the opening 71 in the pug-mill and which has its opposite end extending entirely through the tank 18 in direct contact with the hot oil asphalt contained therein, as clearly illustrated in Fig. 4, so that the material delivered to the conveyor is carried through the heat zone of the oil and discharged at the front end of the machine adjacent the end of the tank opposite to the pug-mill.

The mixing conveyor includes a shaft 167 extending longitudinally through the conduit and having its ends rotatably mounted in bearings 168 and 169, as best illustrated in Figs. 4 and 7. The end of the shaft adjacent the pug-mill is provided with a bevel gear 170 which meshes with a bevel gear 171 on a counter shaft 172 which is rotatably mounted in bearings 174 and 175 carried on arms 176 projecting from the end of the conveyor housing, as best illustrated in Fig. 4. The shaft 172 is driven from a sprocket 177 on the shaft 78 by a chain 178 running thereover and over a sprocket 179 on the shaft 172 (Figs. 4, 6 and 7).

Pivotally mounted on the discharge end of the mixing conveyor is a laterally extending conveyor housing 180, and rotatably mounted therein is a spiral screw 181 for conveying the material discharged from the mixing conveyor to load the mixed material onto trucks for transport to the highway under construction. The shaft 182 of the screw 181 is provided with a bevel gear 183 meshing with a bevel gear 184 on a shaft 185, the shaft 185 being rotatably mounted in arms 186 fixed to one end of the housing 180, as clearly illustrated in Fig. 7. The shaft 185 is provided with a sprocket 187 aligning with the sprocket 188 on the mixing conveyor shaft 167 and is operable by a chain 189 running over the respective sprockets. The mixing conveyor shaft carries a spiral ribbon 190 supported by arms 191 extending radially from the shaft, as best illustrated in Fig. 4.

Located intermediate the arms supporting the spiral ribbon 190 are arms 192 having blades 193 arranged to retard the material as it is fed longitudinally of the conveyor and the spiral ribbon so that while the material is travelling through the heat zone of the asphalt oil in the tank 18 it is retarded sufficiently by the blades 193 to absorb a maximum amount of heat from the oil in the tank. The lateral conveyor housing 180 may be adjustably supported from the frame-work of the machine by a cable 194.

In order to deliver the mineral aggregate to the weighing hopper, I provide a pit 195 arranged so that the material may be dumped directly from the trucks into the pit and elevated to the weighing hopper by a suitable portable elevator 196 which may be driven from the shaft 77 as now to be described.

Fixed to the shaft 77 is a second sprocket 197 and running thereover and over a sprocket 198 on a counter shaft 199 is a chain 200, the counter shaft 199 being rotatably mounted in bearings 201 carried by the angles 32 and 34, as best illustrated in Fig. 6. Fixed on the counter shaft 199 is a sprocket 202 for driving a sprocket 203 on the elevator through a chain 204. The operating shaft 205 of the elevator is provided with a sprocket 206, and operating thereover and over a sprocket 207, fixed in driving relation with the sprocket 203, is a chain 208.

In order to fill the tank 18 by means of the pump 120, the pipe 138 is provided with a T-fitting 209 to which is connected a horizontally arranged pipe 210 having a T-fitting 211 to which is connected a pipe section 212 provided with a cut-off valve 213. The pipe 212 carries an L 214 to which is connected a vertical pipe 215 having a T 216 provided with a nipple 217 that discharges into the tank.

The upper end of the pipe 215 is provided with a pressure actuated valve 218 which in turn is connected by a pipe 219 with the pipe 138 by a T fitting 220. The T 211 is connected to the pipe 134 by a pipe 221 having a hose connection 222 and cut-off valves 223 and 224 located on opposite sides of the connection.

In using a machine constructed and assembled as described, the machine is moved to a location adjacent the road under construction. A place is excavated for the pit 195 and the elevator 196 is installed between the pit and the machine to elevate the aggregate material into the weighing hopper. The tank trucks then deliver the hot oil asphalt to fill the tank 18. The hose of the delivery truck is attached to the connection 222, the valves 223 and 136 are closed, and the valves 224 and 213 are opened. The engine 28 is then started to drive the pump transmission 30 to actuate the pump. The oil is then pumped from the truck tank through the pipe 138, T-fitting 209, pipe 210, T-fitting 211, valve section 212, valve 213, L fitting 214, pipe 215, T-fitting 216, and nipple 217, to the tank. After the tank is filled, the valves 213 and 224 are closed and the valve 136 is opened.

The oil is then pumped out of the bottom of the tank through the pipe 135, pump 120, pipe 138, branch pipes 139 and 140, and into one end of the cylinder, depending which of the three-way branches 143 or 144 are opened to pump pressure.

Assuming that the three-way valve 143 is open to pump pressure, the oil will be delivered therethrough to move the piston 156 until it engages the opposite end of the cylinder. The reciprocating rod 151 is then shifted to open the three-way valve 144 to the pump pressure and to open the valve 143 so that the charge of oil in the cylinder admitted through the branch 139 will be delivered through the branch 145 to the spray nozzle by the pressure of the oil being admitted into the opposite end of the cylinder.

It is thus apparent that upon each movement of the rod 151 a charge of oil will be delivered to the spray pipe for discharge into the pug-mill.

Prior to actuation of the rod 151, the operator has operated the clutch to connect the shaft 77 with the shaft 78 to effect operation of the

pug-mill, the mixing conveyor, and the elevator 196 to elevate the material from the pit into the weighing hopper. When a predetermined amount of material to give the required aggregate and oil ratio is delivered to the hopper as indicated by the scale 56, the operator actuates the lever 64 to open the gate 62 to allow discharge of the material into the pug-mill. After the material is delivered into the pug-mill, the gate to the hopper is again closed and the hopper is refilled by the elevator.

Simultaneously with the opening of the hopper the operator has actuated the rod 151 as previously described to allow discharge of the oil asphalt into the pug-mill. The pug-mill then mixes the oil asphalt with the mineral aggregate to provide a homogeneous mixture which is discharged through the opening 71 upon operation of the gate 72. To open the gate 72 the operator shifts the lever 119 to engage the clutch 110 with the sprocket 106 which effects operation of the shaft 98 and gears 96 and 97 to rotate the screw shaft 94 in the lug 93 to effect opening of the gate and discharge of the material from the pug-mill into the mixing conveyor.

After the material has been discharged, the lever 119 is again actuated to disconnect the clutch 110 and connect the clutch 111 which then drives the shaft 98 through the shaft 101 and reversing gears 104 and 105 to effect closing of the gate. The material discharged into the mixing conveyor is then moved by the spiral ribbon 190 toward the conveyor 180. As the material is being moved through the conveyor housing it is heated by the hot oil asphalt contained in the tank 18, the blades 193 retarding travel of the material to allow a sufficient absorption of heat from the hot oil. When the material reaches the end of the mixing conveyor housing, it is delivered to the lateral conveyor 180 and is discharged into trucks waiting to convey the mixed material to the highway.

As the tank 18 is emptied, additional loads of hot oil asphalt are delivered thereto while the machine is in operation. When the hose is secured to the connection 222, the oil will be pumped directly from the tank to the measuring cylinder and surplus oil will be by-passed through the pressure valve 218 for discharge into the tank through the nipple 217, the valve 213 of course being closed to divert the oil toward the measuring cylinder.

As the highway construction progresses, it is obvious that the machine may be moved closer to the point at which the paving material is applied and set into operation as previously described.

Attention is particularly directed to the fact that any proportion of oil and aggregate may be varied by regulating the amount of aggregate delivered to the pug-mill with each charge of oil so that paving material may be prepared according to various specifications as to the oil and aggregate ratio.

What I claim and desire to secure by Letters Patent is:

1. In a machine for mixing paving material including a mobile frame, an insulated tank on the frame for containing a hot asphalt component of the paving material, a pug-mill on the frame, means on the frame for delivering measured quantities of mineral aggregate to the pug-mill, means on the frame for pumping measured quantities of a hot oil asphalt for discharge into the pug-mill, means on the frame for actuating the pug-mill to mix the oil asphalt with the mineral aggregate, and a mixing conveyor on the frame in receiving relation with the pug-mill and extending through the insulated tank whereby the hot oil asphalt in the tank heats the material discharged from the pug-mill.

2. In a machine for mixing paving material including a mobile frame, an insulated tank on the frame for containing a hot asphalt component of the paving material, a pug-mill on the frame, means on the frame for delivering measured quantities of mineral aggregate to the pug-mill, means on the frame for pumping measured quantities of a hot oil asphalt for discharge into the pug-mill, means on the frame for actuating the pug-mill to mix the oil asphalt with the mineral aggregate, a mixing conveyor on the frame in receiving relation with the pug-mill and extending through the insulated tank whereby the hot asphalt in the tank heats the material discharged from the pug-mill, and a second conveyor supported on the frame for delivering the heated mixed material from the machine.

3. A machine for mixing paving material including a mobile frame, a pug-mill supported on the frame, means for delivering measured quantities of oil asphalt and mineral aggregate to the pug-mill, means on the frame for actuating the pug-mill to mix said materials, a conveyor on the frame receiving material discharged from the pug-mill, and means on the frame for heating the mixed material moved by said conveyor.

4. A machine for mixing paving material including a mobile frame, a pug-mill supported on the frame, means for delivering measured quantities of oil asphalt and mineral aggregate to the pug-mill, means on the frame for actuating the pug-mill to mix said materials, a conveyor on the frame receiving material discharged from the pug-mill, means on the frame for heating the mixed material moved by said conveyor, and means associated with the conveyor for retarding the material while in the zone of said heating means.

5. A machine for mixing paving material including a mobile frame, an insulated tank on the frame for containing a hot asphalt component of the paving material, a weighing hopper supported on the frame for weighing and discharging measured quantities of a mineral aggregate, a pug-mill located on the frame in receiving relation with the weighing hopper, means on the frame for delivering a measured quantity of the oil asphalt into the pug-mill, means on the frame for actuating the pug-mill to mix the oil asphalt with the mineral, and a mixing conveyor on the frame for receiving material discharged from said pug-mill and extending through the insulated tank for heating the mixed material as it is moved by said conveyor.

6. A machine for mixing paving material including a mobile frame, an insulated tank on the frame for containing a hot asphalt component of the paving material, a weighing hopper supported on the frame for weighing and discharging measured quantities of a mineral aggregate, a pug-mill located on the frame in receiving relation with the weighing hopper, means on the frame for delivering a measured quantity of the oil asphalt into the pug-mill, means on the frame for actuating the pug-mill

to mix the oil asphalt with the mineral, a mixing conveyor on the frame for receiving material discharged from said pug-mill and extending through the insulated tank for heating the mixed material as it is moved by said conveyor, and a second conveyor associated with the mixing conveyor for delivering the mixed paving material from the machine.

7. A machine for mixing paving material including a mobile frame, a pug-mill supported on the frame having an inlet and a discharge outlet, means for delivering measured quantities of oil asphalt and mineral aggregate to the inlet of the pug-mill, means on the frame for actuating the pug-mill to mix said materials, a sliding gate on the pug-mill controlling said discharge outlet, and means on the frame for heating the mixed material discharged from said outlet.

8. A machine for mixing paving material including a frame, an insulated tank on the frame for containing a hot asphalt component of the paving material, a weighing hopper supported on the frame for weighing and discharging measured quantities of a mineral aggregate, means for delivering the mineral aggregate to the weighing hopper, a pug-mill located on the frame in receiving relation with the weighing hopper, means on the frame for delivering a measured quantity of the oil asphalt into the pug-mill, means on the frame for actuating the pug-mill to mix the oil asphalt with the mineral, a mixing conveyor on the frame for receiving material discharged from said pug-mill and extending through the insulated tank for heating the mixed material as it is moved by said conveyor, and a second conveyor associated with the mixing conveyor for delivering the mixed paving material from the machine.

9. A machine for mixing paving material including a mobile frame, an insulated tank on the frame for containing a hot oil asphalt component of the paving material, a pug-mill on the frame, a weighing hopper supported by the frame above the pug-mill arranged for weighing and discharging a measured quantity of mineral aggregate into the pug-mill, a measuring cylinder associated with the insulated tank for measuring and delivering measured quantities of the hot oil asphalt to the pug-mill, a pump on the frame for delivering the oil asphalt from the tank to said measuring cylinder, means on the frame for operating the pug-mill to mix the oil asphalt with the mineral aggregate, and a mixing conveyor in receiving relation with the pug-mill and arranged to move the material discharged from the pug-mill through the heat zone of the insulated tank to heat the material discharged from the pug-mill.

10. A machine for mixing paving material including a mobile frame, a tank on the frame for containing a hot oil asphalt component of the paving material, a pug-mill on the frame, means supported by the frame above the pug-mill for weighing and discharging a measured quantity of mineral aggregate in the pug-mill, a measuring cylinder associated with the insulated tank for measuring and delivering measured quantities of the hot oil asphalt to the pug-mill, a pump on the frame for delivering the hot oil asphalt from the tank to said measuring cylinder to mix the oil asphalt with the mineral aggregate, a mixing conveyor in receiving relation with the pug-mill and arranged to extend through the heat zone of the insulated tank to heat the material discharged from the pug-mill, and a second conveyor associated with the first named conveyor for delivering the heated mixed material from the machine.

11. In a machine of the character described, a frame, a tank on the frame for containing a hot oil asphalt, a pump on the frame for filling the tank with hot oil asphalt, a measuring cylinder on the frame for measuring quantities of hot oil asphalt, and means connecting the pump with the measuring cylinder whereby the hot oil asphalt is pumped from the tank to the measuring cylinder, said connecting means including a by-pass for the pump for by-passing oil asphalt to the tank when the measuring cylinder is filled.

12. In a machine for mixing paving material including a frame, an insulated tank on the frame for containing a hot asphalt component of the paving material, a mixing device on the frame, means on the frame for delivering measured quantities of mineral aggregate to the mixing device, means on the frame for pumping measured quantities of a hot oil asphalt for discharge into the mixing device, and a mixing conveyor on the frame in receiving relation with the mixing device and extending through the insulated tank for heating the mixed material.

13. In a machine for mixing paving material including a frame, an insulated tank on the frame for containing a hot liquid component of the paving material, a mixing means on the frame, means on the frame for delivering measured quantities of mineral aggregate to the mixing means, means on the frame for delivering measured quantities of the hot liquid from the tank to the measured quantities of mineral aggregate, and a mixing conveyor on the frame in receiving relation with the pug-mill and extending through the insulated tank for heating the mixed material.

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