Feb. 13, 1940. H. C. POLLITZ 2,190,044

MIXING PLANT

Filed March 14, 1938 5 Sheets-Sheet 1

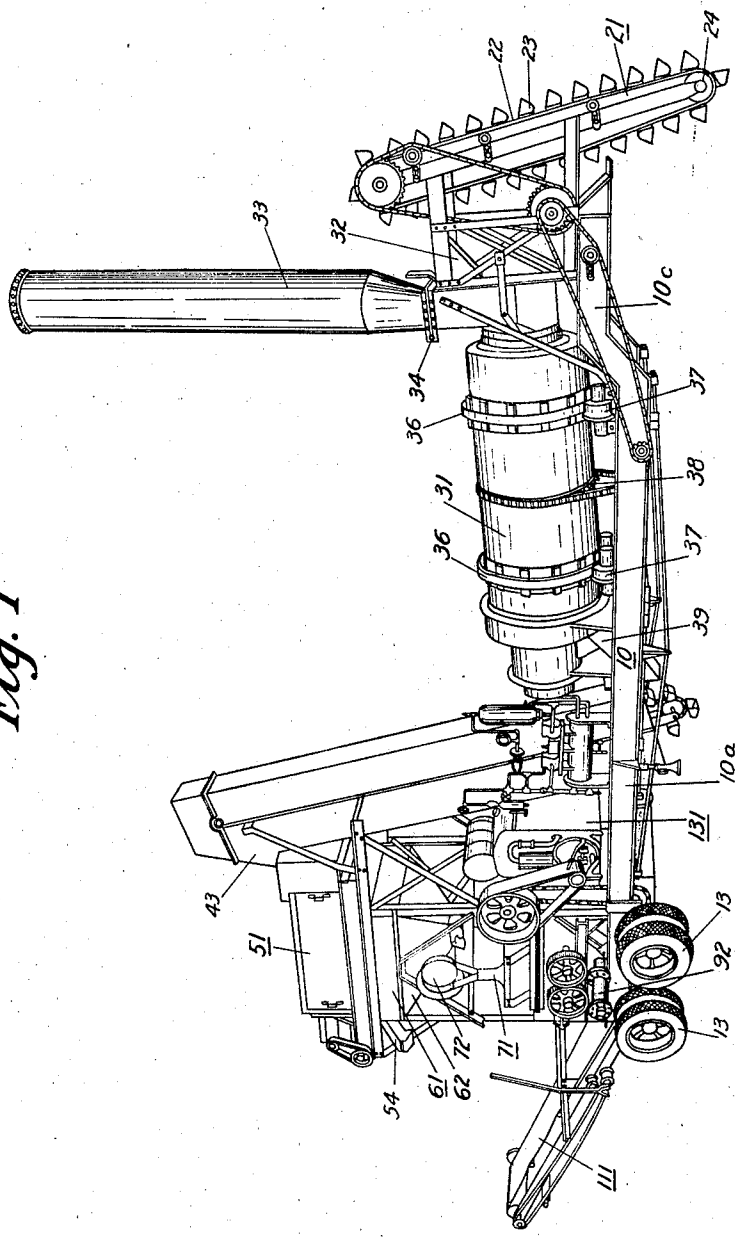

Fig. 1

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MIXING PLANT

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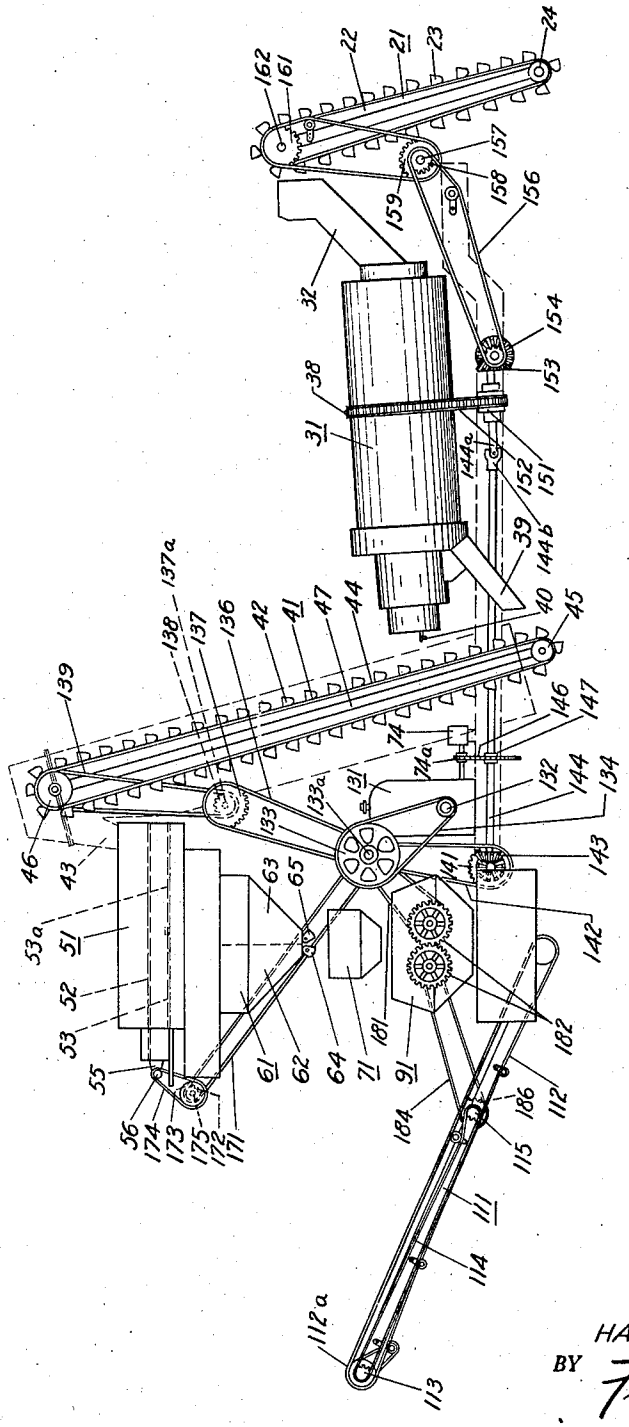
Fig. 2



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MIXING PLANT

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Fig. 3

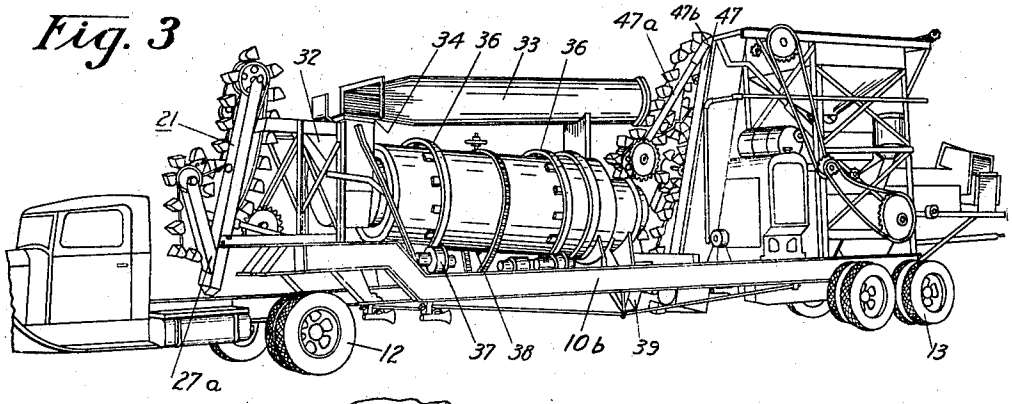
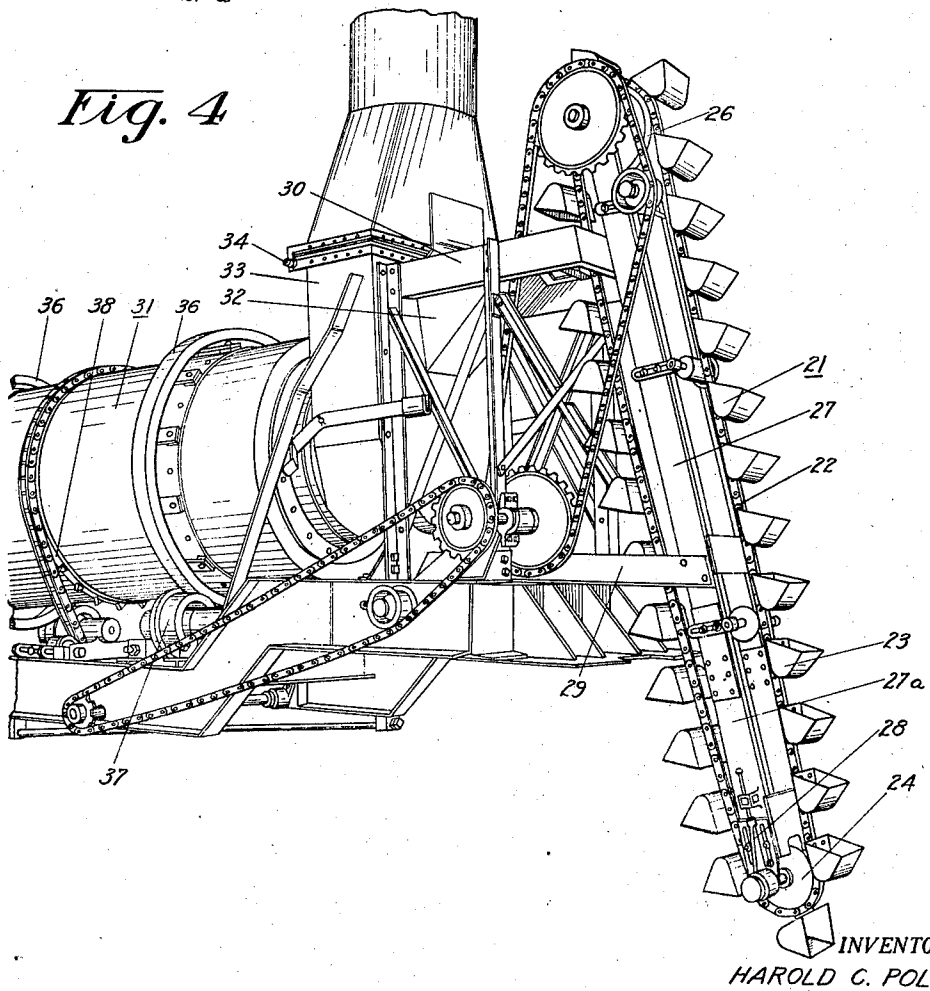


Fig. 4



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MIXING PLANT

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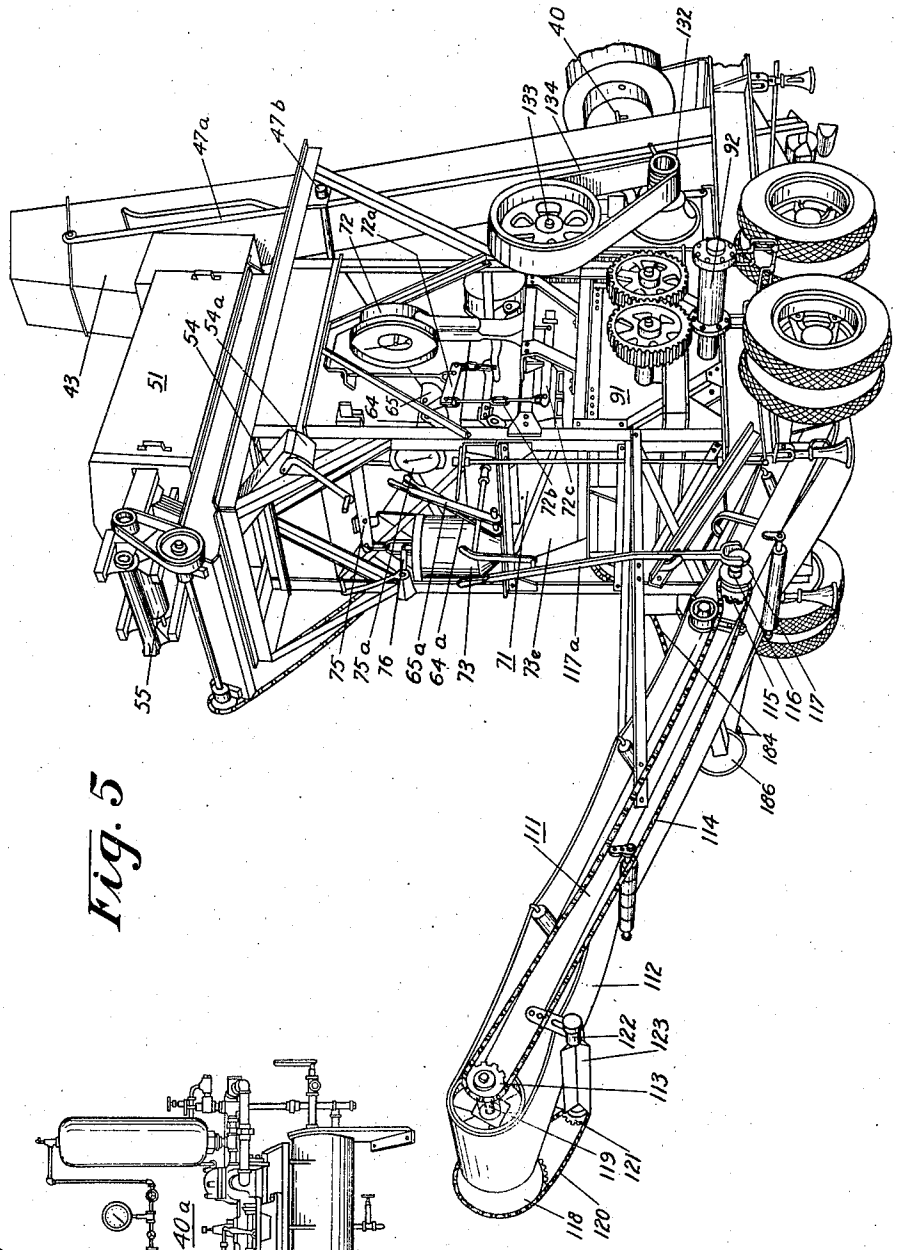

Fig. 5

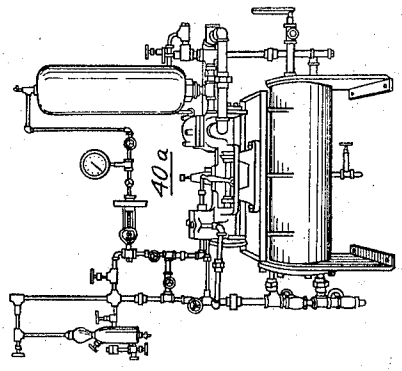

Fig. 7

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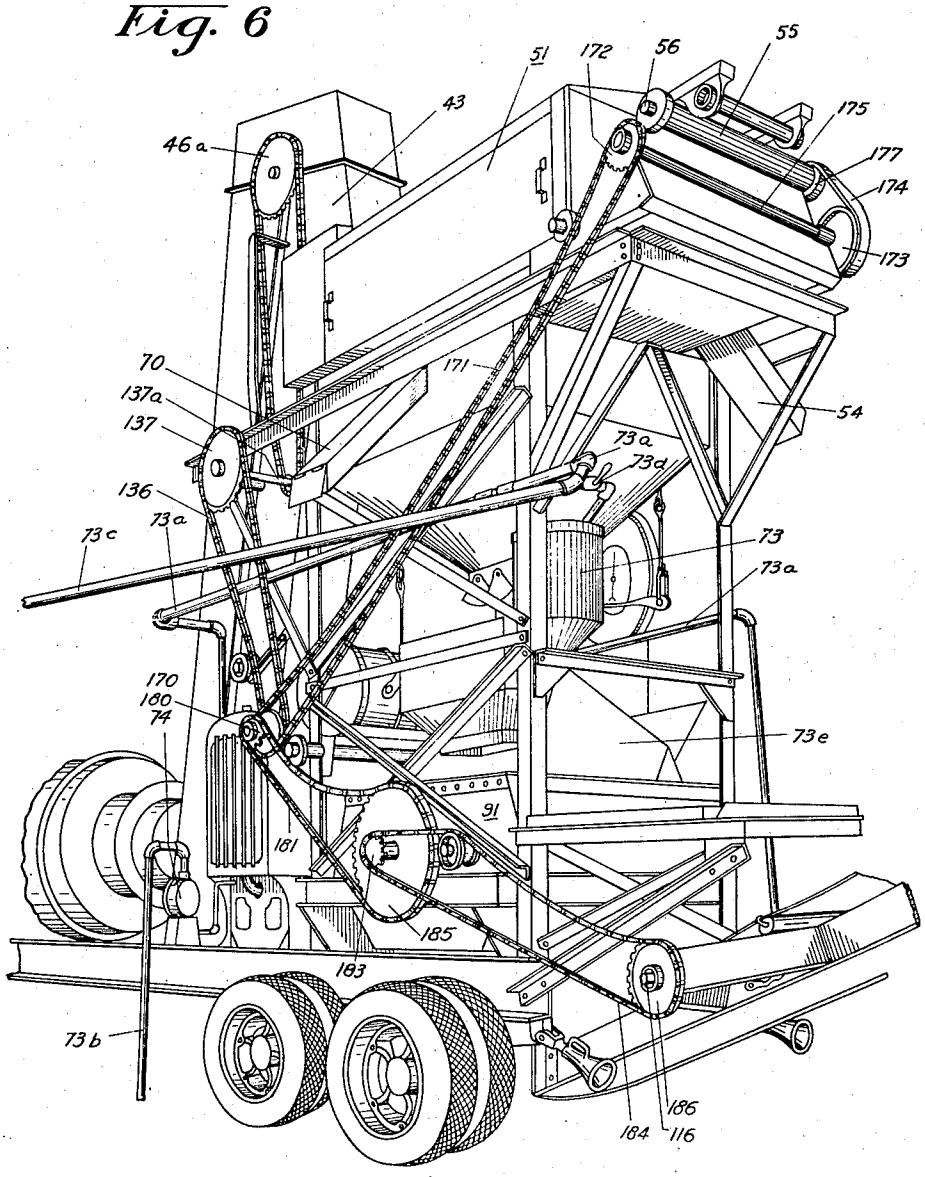
Fig. 6



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Patented Feb. 13, 1940 2,190,044

UNITED STATES PATENT OFFICE

2,190,044

MIXING PLANT

Harold C. Pollitz, Cedar Rapids, Iowa, assignor to Iowa Manufacturing Company, Cedar Rapids, Iowa, a corporation of Iowa

Application March 14, 1938, Serial No. 195,845

3 Claims. (Cl. 259—153)

This invention relates to mixing plants and has particular relation to a method of and machine for mixing asphalt, tar, oil and the like with crushed rock, gravel or other aggregate.

It is a general object of my invention to provide a machine for mixing materials with liquid and for proportioning the fine materials, course materials and liquid in any desired proportion.

It is another very important object of my invention to provide a rapid line-production mechanism for picking up, drying, proportioning, mixing, and discharging materials in which the various devices for these purposes are so constructed, aligned, mounted and integrated that they may be mounted in relatively small space on a common chassis.

Devices of this character must be very large in order to secure adequate tonnage of mixed material, but if such plants are too large they cannot be readily transported from one scene of operation to another.

It is, therefore, a general object of my invention to provide, in a large mixing plant, means for rendering the plant readily portable from place to place.

It is another object of my invention to provide means for driving all the various parts of a device of the above character from a common power source.

Another object of my invention is to provide a device which may be quickly set up and dismantled and is highly portable.

It is another object of my invention to provide an extremely accurate means for measuring the quantity of different grades and sizes of materials including liquids going into a mix, and for accurately proportioning the mix in any desired proportion.

Other and further features and objects of the invention will be more apparent to those skilled in the art upon a consideration of the accompanying drawings and following specifications, wherein is disclosed an exemplary embodiment of the invention, with the understanding, however, that such changes may be made therein as fall within the scope of the appended claims, without departing from the spirit of the invention.

In said drawings:

Figure 1 is a view in perspective illustrating a device constructed according to a preferred embodiment of my invention as it appears set up for use.

Figure 2 is a view in schematic diagram of the device shown in Figure 1.

Figure 3 is a view in perspective of the device shown in Figures 1 and 2 as it appears when arranged for transportation from one scene of operation to another.

Figure 4 is a partial view in perspective of a pick-up or "cold" elevator and a portion of the drier drum.

Figure 5 is a partial view in perspective of the elevating, drying, sizing, proportioning, weighing, mixing, discharge, and conveying mechanisms and including the power plant.

Figure 6 is a partial view of the mechanisms shown in Figure 5 as they appear from the opposite side of the machine, and illustrates the drives employed, and

Figure 7 is a fragmentary view in perspective of the fuel oil pumping mechanism for pumping fuel to the nozzles of the drier.

Referring now to the drawings, and more particularly to Figure 1, all of the parts of the device are mounted on a common frame such as the frame indicated generally at **10**, this frame consisting of channel members **10***a* and **10***b*, cranked at **10***c* to provide a pedestal at what may be termed the front or pick-up end of the device. This pedestal may be supported by means of a tractor and trailer and wheels **12**, as illustrated in Figure 3, or by means of a bolster and suitable wheels and a pulling and steering tongue (not shown). The rear or discharge end of the device may be supported by a pair of oscillators or distributors on which wheels **13** are rotatably mounted.

The parts of the preferred device (Figures 1 and 2) consist of a pick-up or "cold" elevator **21**, a drier **31**, a "hot" elevator **41**, a shaker screen **51**, a hopper and chute structure, indicated generally at **61**, an aggregate batcher and weighing bucket indicated generally at **71**, a pugmill indicated generally at **91**, and a discharge conveyor indicated generally at **111**, all of the parts of the device being preferably driven by means of a power plant indicated at **131**.

The pick-up elevator **21** is of conventional type and has a belt or endless chain **22** to which buckets **23** are secured. The chain is supported by sprocket traction wheel **26** and idler **24**. The sprocket and idler are rotatably mounted on the frame **27** and the take-up mechanism **28** is employed for keeping the chain tight. The elevator frame is supported by means of supports indicated at **29** and **30** and is so positioned that the buckets, at their lowermost points, will pick up aggregate such as rock and the like, from the ground. The aggregate discharged from the buckets at the top of their travel is thrown into

a chute 32 which leads into the drier drum 31. A "flop gate" (not shown) is positioned in the chute 32 to prevent the escape of heat and dust from the drier.

The member 33 is a stack adapted to carry off the products of combustion and moisture from the drier drum 31. The stack is hinged, as indicated at 34, in order that it may be folded down, as shown in Figure 3, for transportation from one point to another. The lowermost portion of the frame 27 of the pick-up elevator 21, as indicated at 27a, may likewise be folded up, as indicated in Figure 3, to permit a tractor truck to haul the equipment.

The drier drum 31 is supported by heavy rings 36. These rings are adapted to rotate on pairs of oppositely disposed flanged wheels 37, and a sprocket ring 38 is provided in order to drive the drier drum, as will be hereinafter more particularly explained. The drier drum 31 is provided with paddles (not shown) on the interior thereof, for mixing of material, in accordance with the usual construction.

The aggregate, such as rock and the like, is discharged from the drier drum through the discharge chute 39. The material within the drier drum is heated by means of oil burners the nozzles of which are indicated at 40. Obviously the drier drum, being supported for rotation on an inclined axis, will slowly carry material through the drum and discharge it from the discharge chute 39 into the hot elevator 41, the material being dried during its passage through the drum. The mechanism indicated generally at 40a is a fuel oil pump and heater set for pumping the fuel oil to the drier heater nozzle 40.

Aggregate discharged from the chute 39 into the elevator 41, is carried upwardly by the buckets 42 of the elevator and discharged down the chute 43 and into the screening device indicated at 51. The elevator chain 44 is supported on sprocket 46 and idler 45 which are rotatably mounted on the frame 47. The upper portion of the frame 47, indicated at 47a, is pivotally engaged to the lower portion by the pivot 47b and may be folded down, as illustrated in Figure 3, for transportation of the unit.

Material discharged from the chute 43 is deposited on the upper screen 52 of the shaker 51. This upper screen has a large coarse mesh having large openings equal in area to the area of the largest material to be received in the bins of the hopper. It is constructed of heavy materials of large cross section and acts as a buffer screen for screening out oversize aggregate and protecting the lower screens 53 and 53a. The coarser or oversize material remains on the top of the upper screen 52, and the finer material falls through onto the lower screens 53 and 53a. The screen 53a will pass the finest material and permit it to be discharged into the bin 63 of the hopper 61. The coarse material, which will not pass through the screen 52, is discharged from the shaker through the discharge chute 54 onto the ground at the side of the machine. The coarse material, which has passed through the upper screen 52 but will not pass through the screen 53a, travels over to the screen 53 and passes down through this screen into the section 62 of bin 61. The shaker 51, of conventional construction, is driven by means of an eccentric mounted at 55, and this eccentric is driven by means of the belt sheave 177.

The aggregate is deposited in the hopper 61, with the coarse material falling into the bin 62 and the fine material into the bin 63. The coarse material may be discharged from the hopper by opening the gate 64 and the finer material by means of opening the gate 65. These gates are controlled by levers 64a and 65a respectively. Material may be discharged from the chute 54 by opening the gate 54a.

The material discharged from the hopper 61 falls into the aggregate batcher and weighing hopper 71 and is weighed by means of the scale 72, the linkage 72a, 72b and 72c, being employed for conveying the proportionate part of the load to the scale 72. Any overflow of material from the weighing hopper 71 is discharged down the overflow chute 70.

The liquid, such as oil or the like, is discharged into the bucket 73 from the supply line 73a. A pump 74 is provided and this pump is driven by means of a sprocket 74a, as hereinafter more particularly described. The fluid is furnished to the pump by means of the supply line 73b and the surplus is by-passed to the storage or supply tank (not shown) by means of the return line 73c. The discharge of fluid into the bucket 73 is controlled by means of the valve 73d. The bucket 73 is supported on scale beam 75 which is operatively connected to the scale 75a, so that the weight of the oil or other liquid in the bucket may be determined.

The discharge of oil from the bucket 73 is controlled by means of a gate valve in the bottom of the bucket, the control handle and crank of which are indicated at 76, and oil discharged from this bucket falls into the oil spreader pan 73e which spreads and discharges the oil onto the aggregate in the pugmill 91, which aggregate is the aggregate discharged from the aggregate batcher 71 into the pugmill. In weighing the materials the gate 65 is opened and the fine aggregate allowed to fall into the weighing batcher 71 until a certain weight of material, as predetermined by the requirements for the mix, has been deposited in the batcher, as indicated by the scale 72. Then coarse material is added by opening the gate 64 until a certain greater weight value, also predetermined, has been reached.

When the weight of the aggregate has been properly determined in this manner, a gate 77 in the bottom of the batcher is opened by means of the lever 77a and the mixed material is permitted to fall into the pugmill 91.

Asphalt, oil or the like, as desired, is permitted to flow into the bucket 73 until the weight of the liquid in the bucket reaches a certain value, as indicated by the scale 75a. The supply valve 73d is then closed and the gate valve in the bottom of bucket 73 opened to permit the liquid to flow into the spreader pan 73e and pugmill 91.

When the material falls into the pugmill 91 it is thoroughly mixed by means of paddles (not shown) within the mill. The materials are mixed in the pugmill for a period of time determined by the specifications for the mix. When the material has been thoroughly mixed by the pugmill, a gate (not shown) in the bottom of the pugmill is opened by means of a ram, the cylinder of which is indicated at 92, and the materials are deposited on a traveling belt 112 and carried upwardly on this belt to be discharged from the upper end thereof at 112a into a truck or other carrying means. The ram 92 may be operated by steam or compressed air. The belt 112 is driven by means of sprocket 113 and this sprocket in turn is driven by means of sprocket

chain 114 from a sprocket 115 on a cross shaft indicated at 116, the conveyor being started and stopped by means of the clutch, indicated at 117, controlled by a lever 117a.

A relatively large sprocket wheel 118 is provided on one end of the head shaft of the conveyor opposite sprocket 113 and this sprocket is driven by means of the head shaft 119, from the sprocket 113. The sprocket 118 drives a sprocket chain 120 which in turn drives the sprocket 121, and this sprocket drives a cross shaft 122 located beneath the outer end of the belt 112. The cross shaft 122 is provided with rubber fabric strips 123, and these strips are rapidly rotated by the shaft so that the strips strike the belt to shake and beat the belt to remove material clinging to the return belt.

The drive for driving the mixing plant is illustrated to best advantage in Figure 2. The prime mover, such as the internal combustion engine indicated at 131, drives a pulley 132 from the crank shaft of the engine and this pulley drives a main drive pulley 133 through the agency of the belt 134. This main drive pulley is mounted on a main drive shaft 133a. Three sprockets are mounted on the opposite end of this main drive shaft and one of the sprockets drives the loading or hot elevator 41 by means of the chain 135, sprocket 137, shaft 137a, sprocket 138, chain 139, and final head shaft sprocket 46a.

Another of the sprockets on the main drive shaft drives the pick-up or cold elevator and the drier drum through the agency of chain 142, sprocket 141, bevel gearing 143, and longitudinally-extending drier drive shaft 144. The drier drive shaft 144 drives the pump 74 by means of the sprocket 147, sprocket chain 146, and sprocket 74a.

The drier drum 31 is driven by means of a heavy sprocket, indicated at 151, and the heavy chain 152, which drives the sprocket ring 38. The sprocket 151 is mounted on a short shaft 144a which slopes at the same angle as the drier. A universal joint 144b is employed for driving the shaft 144a from the shaft 144.

The cold or pick-up elevator 21 is driven by means of the bevel gearing 153 on shaft 144a, which drives the sprocket 154 to drive a chain 156. The chain 156 drives a cross shaft 157 by means of the sprocket 158, which in turn drives a sprocket 159 to drive another sprocket 161. The sprocket 161 is mounted on the head shaft 162 which drives the pick-up elevator.

A sprocket 170 on the main drive shaft 133a drives the shaker 51 by means of the chain 171, the sprocket 172 on counter shaft 175, the V-belt sheave 173, the V-belts 174, sheave 177, and shaft 56.

Still another sprocket 180 on the main drive shaft 133a drives one shaft of the pugmill by means of the chain 181 and sprocket 185. This shaft of the pugmill drives the other shaft of the pugmill by means of the spur gears 182.

A sprocket 183 on one of the pugmill shafts drives the chain 184, which in turn drives the sprocket 186 which in turn drives the cross shaft 116, to drive the conveyor belt 112.

It may readily be understood that I have provided an extremely compact, mobile, and efficient plant for the mixing of material, such as rock, gravel, oil, asphalt and the like. The materials proceed in a straight line from where the unmixed materials are picked up to the point where they are delivered to a truck or the like in the mixed condition. Gravity is employed in the drying and mixing operations and the entire mechanism is mounted on a single supporting frame. The plant is of high capacity and yet may readily be moved about from one job to the other.

Although I have described a specific embodiment of my invention, it is apparent that modifications thereof may be made by those skilled in the art. Such modifications may be made without departing from the spirit and scope of my invention as set forth in the appended claims.

I claim as my invention:

1. In a mixing plant including a shaker screen, batching and weighing means below the shaker screen, a pug mill below the batching means, means for distributing liquid bitumen over the material being mixed in the pug mill, and means for delivering material from the pug mill located with the receiving end thereof beneath the pug mill, all mounted in vertical relation, a drier drum, a cold elevator in front of the drier drum, a stack for the drier drum, and a hot elevator between the discharge end of the drier drum and the shaker screen, the hot elevator being foldable into the space just to the rear and above the drier drum, the stack being foldable above the drier drum, and the cold elevator being foldable upon itself so that the folded portion is in front of the permanently mounted portion.

2. In a mixing plant including a pick-up elevator, a drier drum, a stack, a hot elevator, a screen, a hopper, weighing and batching mechanism, a pugmill and delivery conveyer, means for rendering the plant portable comprising hinge means in the pick-up elevator for folding the pick-up elevator upwardly, hinge means in the stack for folding it down over the drier drum, hinge means in the hot elevator for folding it down, the screen and delivery conveyer being detachable.

3. In a mixing plant having a shaker screen, batching and weighing means, a pug mill and bitumen distributing means, all mounted in vertical relation in a tower on a portable chassis, and having a drier drum, a stack for same, a cold elevator and a hot elevator, means for rendering the plant portable including means for removably mounting the shaker screen on the tower, means for hinging the lower portion of the cold elevator upwardly, means for folding the stack downwardly and rearwardly above the drier drum, and means for folding the hot elevator downwardly to the rear of and above the drier drum and below the top of the tower.

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