Sept. 10, 1929. F. H. FLORY 1,727,340

ASPHALT MIXING PLANT

Filed Oct. 18, 1926 3 Sheets-Sheet 1

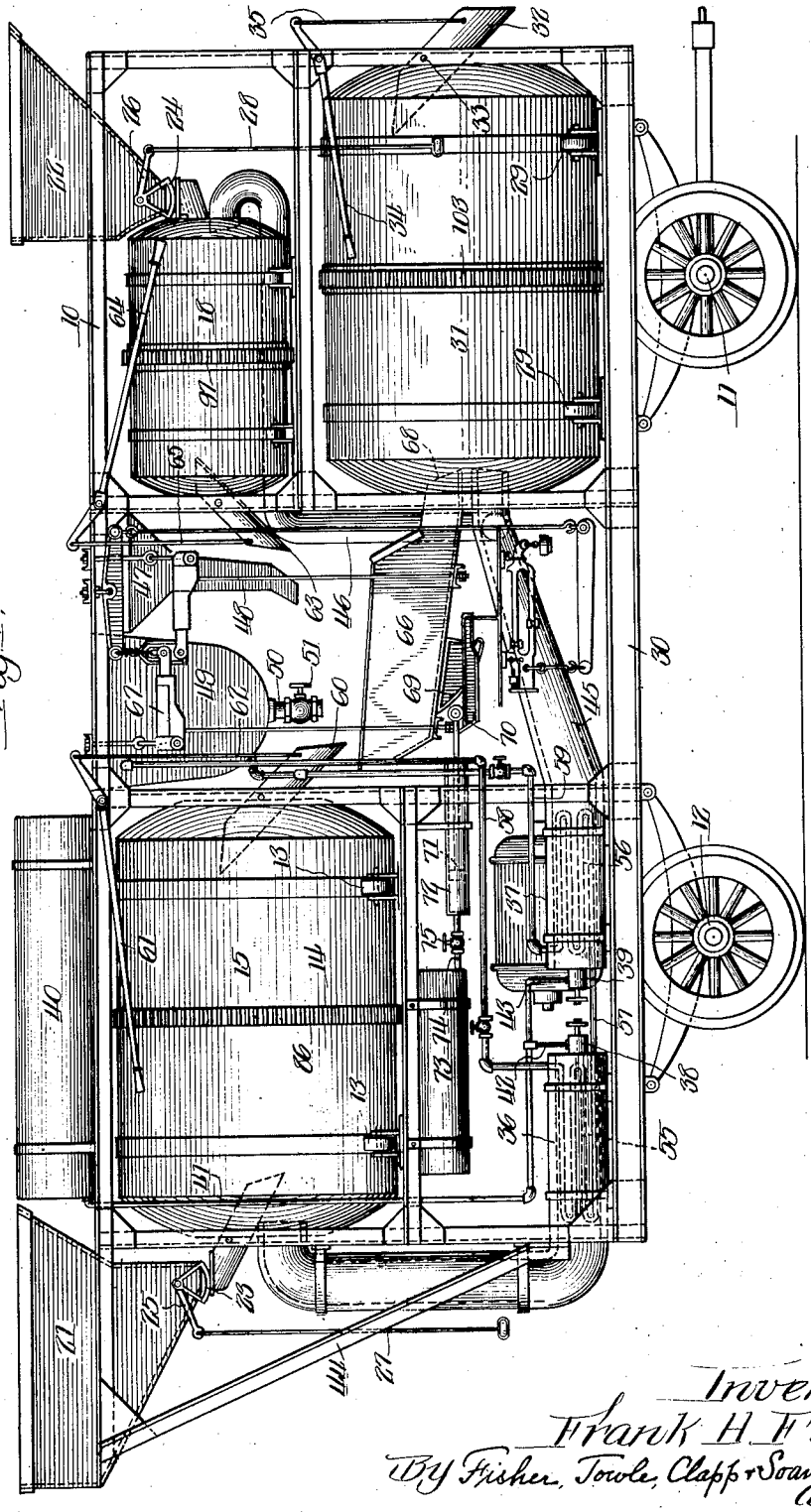


Fig. 1.

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Filed Oct. 18, 1926 3 Sheets-Sheet 2

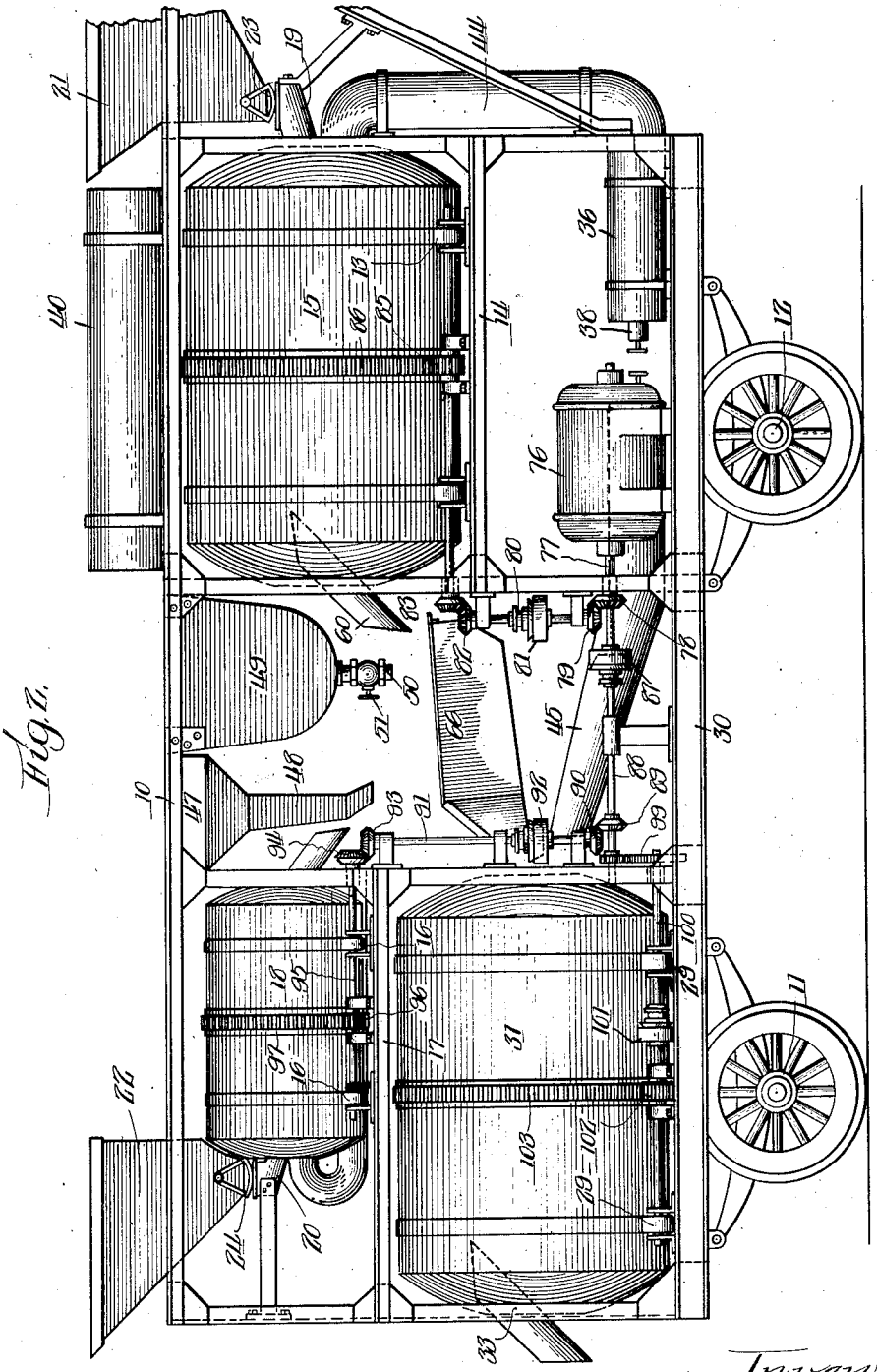


Fig. 2.

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Filed Oct. 18, 1926 3 Sheets-Sheet 3

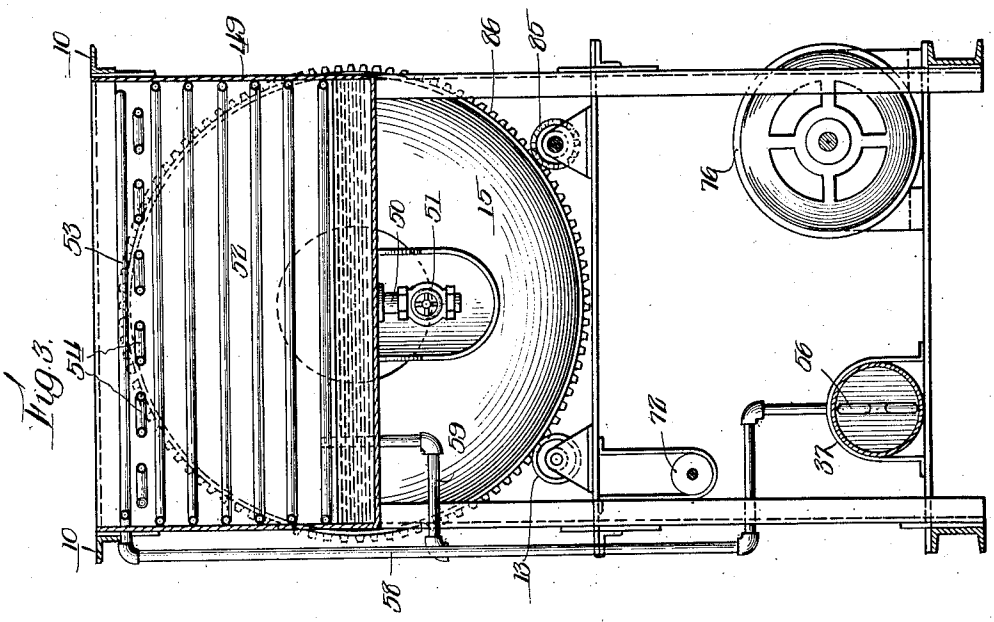



Fig. 3.

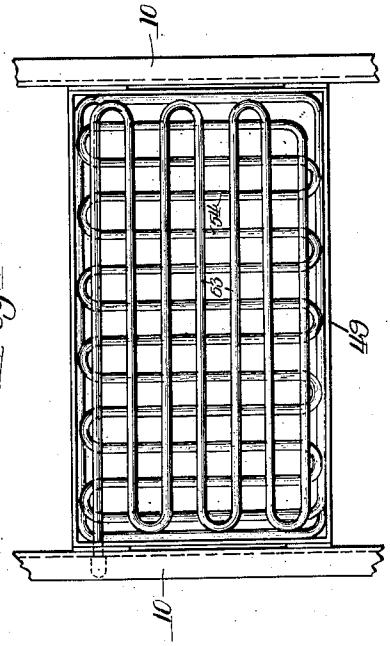



Fig. 4.

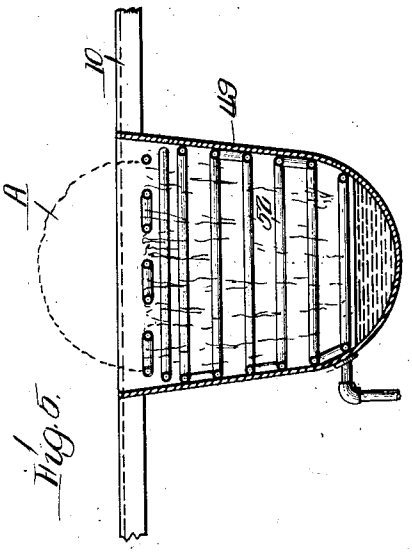



Fig. 5.

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# UNITED STATES PATENT OFFICE.

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## ASPHALT-MIXING PLANT.

Application filed October 18, 1926. Serial No. 142,261.

This invention relates to the art of road paving apparatus, and has reference more particularly to apparatus for preparing the paving mix ready to be spread and rolled on the bed of the roadway. In its preferred form, it is made portable to facilitate the production of the mix at a point as close as possible to the point of use of the latter.

Heretofore mixing outfits have been known carrying mixing drums mounted on a portable frame, a hopper mounted upon the frame formed with spouts adapted to discharge into either of the mixing drums through end openings in the latter, and a furnace for heating both the hopper and the mixing drums. My present invention belongs to this general type of mixing plant, but contemplates, as its chief intended object, the provision of a complete equipment for preliminarily heating one or more ingredients, a mixing drum, a hopper for receiving the ingredients of the mix, a scale by which the hopper is supported and by the use of which the proper relative weights of the several ingredients may be accurately determined, means by which an accurately weighed batch of ingredients in the hopper may be discharged into the mixing drum, and means for readily discharging the prepared mix from the mixing drum; the whole being so assembled on a supporting frame as to afford a gravity feed of the material throughout, and avoid the necessity of conveyors. Other more specific objects of the invention are, to provide a novel and improved relative mounting of the parts specified which well adapts them for mutual co-operation, to provide improved means for heating both the mineral aggregates and the mix, to provide improved means for melting the asphalt, and to provide an improved operating mechanism for the several parts whereby they may be operated as required without unnecesary waste of power through the driving of idle parts.

Still other objects and attendant advantages of the invention will be apparent to persons skilled in the art as the same becomes better understood by reference to the following detailed description, taken in connection with the accompanying drawings in which I have illustrated, somewhat diagrammatically, one practical and efficient embodiment of the invention, and in which—

Fig. 1 is a side elevation of the complete plant;

Fig. 2 is also a side elevation, viewed from the side opposite that of Fig. 1;

Fig. 3 is a vertical transverse section in the plane of the line 3—3 of Fig. 1, with parts omitted for the sake of clearness;

Fig. 4 is a top plan view of the asphalt melting pot;

Fig. 5 is a transverse vertical section through the asphalt mixing pot.

Referring to the drawings, 10 designates as an entirety a rectangular skeleton steel frame that, in practice, is preferably made portable by being mounted on front and rear trucks 11 and 12, respectively. Supported on rollers 13 mounted on horizontal side bars 14 of the main frame 10 is a heating drum 15 designed for the preliminary heating up of a body of coarse mineral aggregate; said drum 15 being located adjacent one end of the frame. Similarly mounted on rollers 16 carried by a side frame bar 17 is a second heating drum 18 located adjacent to the opposite end of the main frame and designed for the preliminary heating up of a relatively fine mineral aggregate. The drums 15 and 18 have openings in the central portions of their ends, and the outer end openings of said drums are served by stationary feed chutes 19 and 20, respectively, that are suitably supported from the main frame. Co-operating with the feed chutes 19 and 20 are delivery hoppers 21 and 22 respectively mounted on the opposite ends of the main frame; the delivery mouths of said hoppers overlying the open upper ends of the chutes 19 and 20 being guarded by pivot valves 23 and 24 respectively operable by crank arms 25 and 26 and depending pull rods 27 and 28, all as clearly shown in Fig. 1.

Similarly supported on rollers 29 carried by the lower longitudinal frame bars 30 of the main frame is a mixing drum 31 de-

signed to receive and effect the thorough mixing of the previously weighed and heated ingredients of the mix. The opposite ends of the drum 31 are likewise formed with central openings, the outer end opening of the said drum being served by a discharge chute 32 mounted on pivots 33 in the end members of the main frame and capable of being manipulated between horizontal and inclined positions by a hand lever 34 and a connecting pull rod 35, as clearly shown in Fig. 1.

By the means thus far described, the heating drums 15 and 18 may be charged to the desired extent with relatively coarse and fine mineral aggregates previously delivered into the hoppers 21 and 22.

The invention comprehends means for heating the mineral aggregates in the drums 15 and 18 as well as the mix in the drum 31; and a simple and efficient heating means for this purpose is best shown in Fig. 1 and comprises the following. Mounted on the floor of the main frame beneath the drum 15 are a pair of oil furnaces 36 and 37, each comprising a casing or housing in the inner adjacent ends of which are introduced oil burners conventionally illustrated at 38 and 39. Mounted on the top of the main frame above the drum 15 is a tank 40 adapted to contain fuel oil that is supplied to the burners through a main pipe 41 and branch pipes 42 and 43. From the outer end of the furnace 36 a pipe 44 extends upwardly and projects into the outer end opening of the drum 15 for discharging the heated products of combustion and heated air from the furnace 36 into the interior of the drum 15. From the outer end of the furnace 37 a similar pipe or flue 45 leads into the inner end opening of the mixing drum 31 and conducts the hot products of combustion and heated air from the furnace 37 into the interior of said mixing drum. From the flue 45 a branch flue 46 leads upwardly and outwardly above the mixing drum 31 and is formed with a rearwardly turned end entering the outer end opening of the heating drum 18 and likewise delivering the hot products of combustion and heated air from the furnace 37 into said drum.

Mounted on the top of the main frame is a hopper 47 formed with a depending discharge chute 48, adapted to receive a fine mineral ingredient such as sand, or powdered mineral for use in mixes requiring an ingredient of that character.

Also mounted on and suspended from the top of the main frame is an asphalt melting kettle 49, preferably of the generally trough shaped form illustrated in Figs. 3, 4 and 5, and provided with a discharge nozzle 50 controlled by a hand valve 51. The side and end walls of this kettle 49 are lined with a steam coil 52, and this latter is continuous with an upper horizontal steam coil grid formed by intersecting longitudinal and transverse loops 53 and 54, all as clearly shown in Figs. 3 and 4. Within the furnaces 36 and 37 are coils 55 and 56 respectively the lower ends of which are connected by a pipe 57, while their upper ends communicate with valve-controlled pipes 58 and 59. One of these pipes, such as 58, leads upwardly and communicates with the top grid of the kettle, while the other, such as 59, leads upwardly and communicates with the lower end of the coil 52. Water filling the heating coils 55 and 56 is converted by the heat of the furnaces into steam which flows upwardly in the pipe 58 through the heating coils of the kettle and is condensed therein, the water of condensation returning to the furnaces through the pipe 59. A hunk or cake of asphalt to be melted, such as is indicated at A in Fig. 5, is laid on the top grid and is cut by the hot pipes of the grid into smaller particles which fall into the kettle and are melted to a viscous or semi-liquid condition by the heat furnished by the coil 52.

The above-described construction of melting kettle affords a very efficient and rapid means for reducing relatively large chunks of solid asphalt to the plastic or semi-liquid condition necessary for thorough mixing with the mineral ingredients.

Suitably pivoted on members of the main frame and extending into the inner end opening of the drum 15 is a discharge chute 60 adapted to be swung between a horizontal position and the downwardly inclined position shown in Fig. 1 by a hand lever 61 and connecting link 62. 63 designates a similar chute co-operating with the inner end opening of the drum 18 and operated by a hand lever 64 and connecting link 65. The two chutes 60 and 63 and also the sand chute 48 and the asphalt nozzle 50 all overlie a weighing hopper 66 suspended from the main frame by a weighing mechanism such as the standard Howe scale generally designated by 67. As the structural details of this scale are well known it is unnecessary to describe them herein. The weighing hopper 66 is formed with a discharge mouth-piece 68 that projects into the inner end opening of the mixing drum 31. The hopper may be tilted to discharge its contents into the mixing drum through the agency of a cam 69 on its lower side operated by a roller 70 on the outer end of a plunger 71 working in a fluid pressure cylinder 72. The cylinder 72 may be supplied with fluid pressure from any suitable or convenient source such as a compressed air tank 73 communicating with the cylinder 72 through a pipe 74 equipped with a two-way valve indicated at 75 for alternately supplying and exhausting the cylinder 72.

Any suitable means may be employed, within the purview of the invention, for rotating the heating or drying drums 15 and 18 and the mixing drum 31. A simple mechanism for this purpose, clearly shown in Fig. 2, comprises an electric motor 76 mounted on the bottom member of the main frame with clutch-controlled shaft and pinion connections to the several drums. On the armature shaft 77 of the motor is a bevel gear 78 driving a bevel gear 79 on a vertical shaft 80 controlled by a clutch 81. On the upper end of shaft 80 is a bevel gear 82 which, through a bevel gear 83 drives a shaft 84 on which the rollers 13 are loosely mounted. Keyed on shaft 84 is a pinion 85 driving a large ring gear 86 on the drum 15. Coupled to the armature shaft 77 by a clutch 87 is a shaft 88 which, through bevel gears 89 and 90 drives a vertical shaft 91 controlled by a clutch 92. The shaft 91 through bevel gears 93 and 94 drives a shaft 95 on which the rollers 16 are loosely mounted; and fast on shaft 95 is a pinion 96 driving a ring gear 97 on the drum 18. On the shaft 88 is a pinion 98 driving the gear 99 fast on a shaft 100 controlled by a clutch 101, on which shaft are loosely mounted the rollers 29. Fast on shaft 100, beyond the clutch 101, is a pinion 102 driving a ring gear 103 on the mixing drum 31. Through manipulation of the described clutches, the several drums may be operated independently or simultaneously.

In the practical use of the apparatus, the coarse and fine mineral ingredients are supplied to the hoppers 21 and 22 and by manipulation of the valves 23 and 24, suitable quantities of said ingredients are intermittently supplied to the drums 15 and 18. These drums are slowly rotated, and after the ingredients are thoroughly dried out and heated to a suitable temperature by the hot blasts from the furnaces 36 and 37, the discharge chutes 60 and 63 are tilted to discharging position to deliver the prescribed weights of the materials to the weighing hopper 66. It may here be stated that all of the drums are equipped on their inner peripheries with the usual and well-known baffles by which the material is continually raised and dropped, so that the tilting of the discharge chutes insures a steady and uniform flow of the material into the weighing hopper. The proper amounts of the materials having thus been delivered to the weighing hopper, and also the required amount of fine material from the hopper 47, the valve 51 is opened, and the prescribed amount of asphalt is allowed to flow from the kettle 49 onto the mineral aggregate in the hopper. The weighing hopper is then tilted by the mechanism described, and the batch is discharged into the mixing hopper 31, by which it is rotated and tumbled and further heated until in a condition fit to be spread on the road. The discharge chute 32 is then tilted, and the prepared material flows therefrom either directly onto the roadway or onto wheelbarrows or similar carriers for delivering it to the place of use.

When starting the work, the mixing drum may be cut out by shifting the clutch 101 until the first batch of mineral aggregate is thoroughly dried and heated and a sufficient volume of melted asphalt is obtained in the kettle 49. Thereafter the mixing drum is coupled to the drive, and the subsequent operations are continuous until work is shut down.

It is manifest that the described apparatus enables the exact prescribed amounts of all the ingredients of a given mix to be brought together in the weighing hopper, and then delivered simultaneously by the latter to the mixing drum thus insuring uniform heating in the latter. The entire operation of drying the material, heating it to the required temperatures, assembling the ingredients in the exact prescribed amounts and then delivering the batch to the mixing drum, and finally discharging the prepared material may be performed continuously by simply maintaining the hoppers 21, 22 and 47 supplied with the raw materials, and the kettle 49 supplied with cake asphalt.

I have herein shown and described one compact and convenient arrangement of the several co-operating parts of the apparatus which is well adapted to effect the stated purposes and objects of the invention, but it is manifest that changes in the relative arrangement of the main parts and in structural details may be resorted to without departing from the substance or sacrificing any of the advantages of the invention. Hence I reserve such variations, modifications and mechanical equivalents as fall within the spirit and purview of the appended claims.

I claim—

1. In a unitary mixing plant of the character described, the combination of a substantially rectangular frame, a horizontal drying drum mounted in the upper portion of one end of said frame, a horizontal mixing drum mounted in the lower portion of the other end of said frame, both of said drums having central receiving and delivery openings in their end walls, a weighing pan between said drums formed with a discharge mouthpiece entering the receiving opening of said mixing drum, a feed chute entering the receiving opening of said drying drum, a movable discharge chute operative to deliver material from said drying drum to said weighing pan, an asphalt melting kettle mounted on said frame having a discharge nozzle overhanging said weighing pan, a discharge chute for said mixing drum, means

carried on said frame for heating said drums and said kettle, means mounted on said frame for tilting said weighing pan to discharge position, and means, including a motor on said frame, for rotating said drums independently or simultaneously.

2. In a unitary mixing plant of the character described, the combination of a substantially rectangular frame, horizontal drying drums mounted in the upper end portions of said frame, respectively, a horizontal mixing drum mounted beneath one of said drying drums, all of said drums having central receiving and delivery openings in their end walls, a weighing pan between one of said drying drums and said mixing drum formed with a discharge mouthpiece entering the receiving opening of said mixing drum, feed chutes entering the receiving openings of said drying drums, independently movable discharge chutes operative to deliver material from said drying drums to said weighing pan, an asphalt melting kettle mounted in the upper portion of said frame between said drying drums and having a discharge nozzle overhanging said weighing pan, a discharge chute for said mixing drum, means carried on said frame for internally heating said drums and said kettle, means mounted on said frame for tilting said weighing pan to discharge position, and means, including a motor on said frame, for rotating said drums independently or simultaneously.

3. In a unitary mixing plant of the character described, the combination of a substantially rectangular frame, horizontal drying drums mounted in the upper end portions of said frame, respectively, a horizontal mixing drum mounted beneath one of said drying drums, all of said drums having central receiving and delivery openings in their end walls, a weighing pan between one of said drying drums and said mixing drum formed with a discharge mouthpiece entering the receiving opening of said mixing drum, feed chutes entering the receiving openings of said drying drums, independently tiltable discharge chutes pivoted in said frame with their inner ends entering the delivery openings of said drying drums and their outer ends overhanging said weighing pan, an asphalt melting kettle mounted in the upper portion of said frame between said drying drums and having a discharge nozzle overhanging said weighing pan, a sand hopper mounted in the upper portion of said frame between said drying drums and provided with a discharge spout overhanging said weighing pan, a discharge chute for said mixing drum, means carried on said frame for internally heating said drums and said kettle, means mounted on said frame for tilting said weighing pan to discharge position, and means, including a motor on said frame, for rotating said drums independently or simultaneously.

4. In a unitary mixing plant of the character described, the combination of a substantially rectangular frame, horizontal drying drums mounted in the upper end portions of said frame, respectively, a horizontal mixing drum mounted beneath one of said drying drums, all of said drums having central receiving and delivery openings in their end walls, hoppers mounted on the upper ends of said frame, respectively, valve-controlled means for discharging the contents of said hoppers through the receiving openings of said drying drums, a weighing pan between one of said drying drums and said mixing drum formed with a discharge mouthpiece entering the receiving opening of said mixing drum, independently tiltable discharge chutes pivoted in said frame with their inner ends entering the delivery openings of said drying drums and their outer ends overhanging said weighing pan, an asphalt melting kettle mounted in the upper portion of said frame between said drying drums and having a discharge nozzle overhanging said weighing pan, a sand hopper mounted in the upper portion of said frame between said drying drums and provided with a discharge spout overhanging said weighing pan, a discharge chute for said mixing drum, a furnace mounted on said frame beneath the other of said drying drums, flues for conveying products of combustion from said furnace into said drying and mixing drums, steam coils in said furnace, a coil lining the internal walls of said melting kettle supplied with steam from said furnace coils, means on said frame for tilting said weighing pan to discharge position, and means, including a motor on said frame, for rotating said drums independently or simultaneously.

5. In a mixing plant of the character described, the combination of a generally rectangular skeleton frame, a rotary horizontal drum mounted in said frame and formed with a central receiving opening in one of its end walls, an asphalt melting kettle mounted on said frame, a steam coil within said kettle, an oil furnace mounted on the bottom of said frame, a delivery flue for hot products of combustion leading from said furnace into said drum opening, and a steam coil within said furnace communicating with the heating coil of said kettle.

6. In a mixing plant of the character described, the combination of a generally rectangular skeleton frame, a rotary horizontal mixing drum mounted in said frame and formed with a central receiving opening in one of its end walls, a tiltable weighing pan mounted in said frame and formed with a mouth entering the opening of said drum, and means for tilting said weighing pan

comprising a cam on said pan, and a horizontally movable plunger carrying a roller engaged with said cam.

7. A device for melting asphalt, comprising a kettle, a steam coil lining the internal walls of said kettle, and a grid composed of criss cross steam coils overlying the top of said kettle for cutting a chunk of asphalt laid thereon.

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