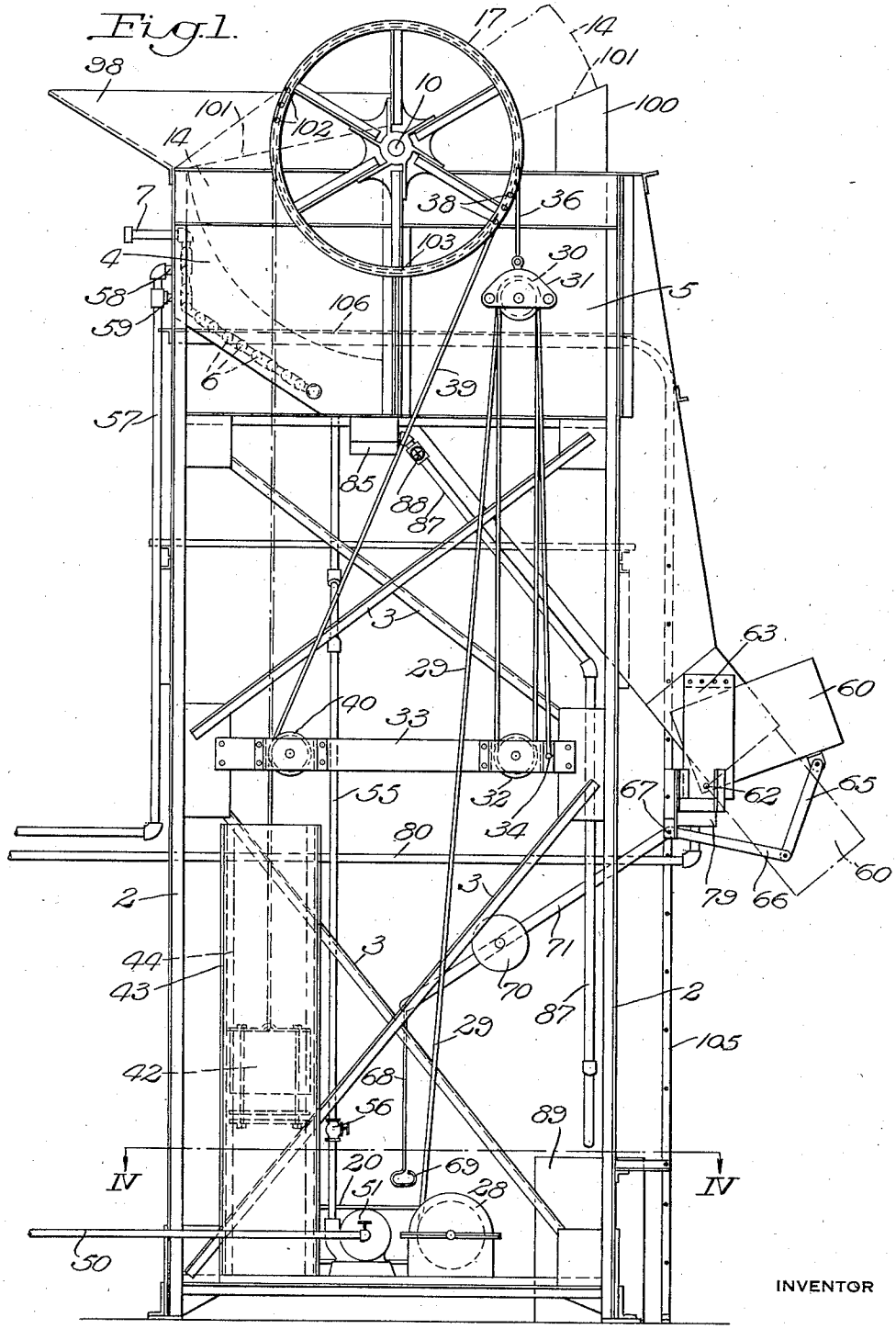
Oct. 1, 1935. G. W. WARMOTH 2,016,159

APPARATUS FOR COATING AGGREGATE WITH BINDING MATERIAL

Filed Dec. 12, 1931 4 Sheets-Sheet 1

Fig. 1.



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APPARATUS FOR COATING AGGREGATE WITH BINDING MATERIAL

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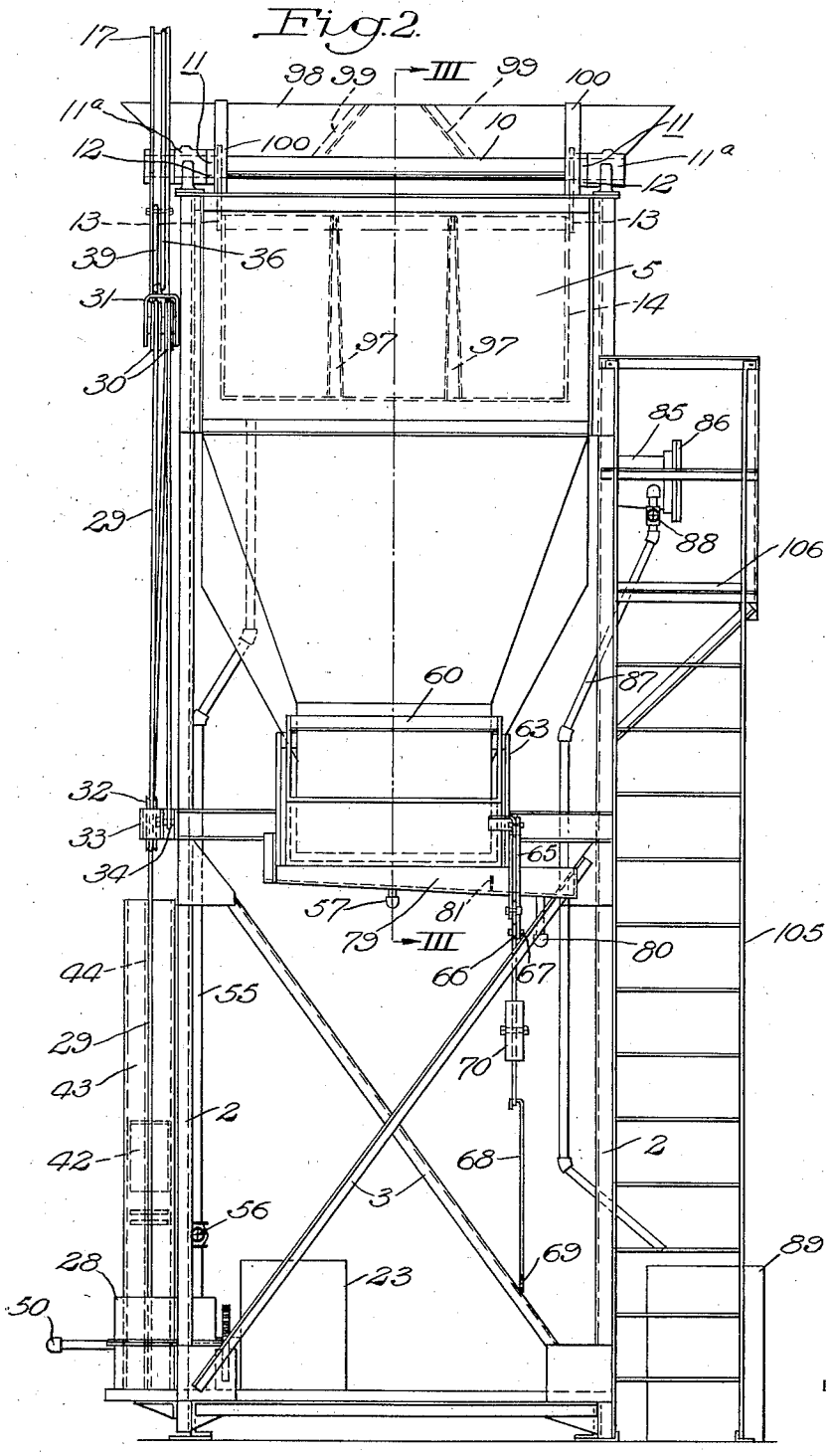
Fig. 2.



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APPARATUS FOR COATING AGGREGATE WITH BINDING MATERIAL

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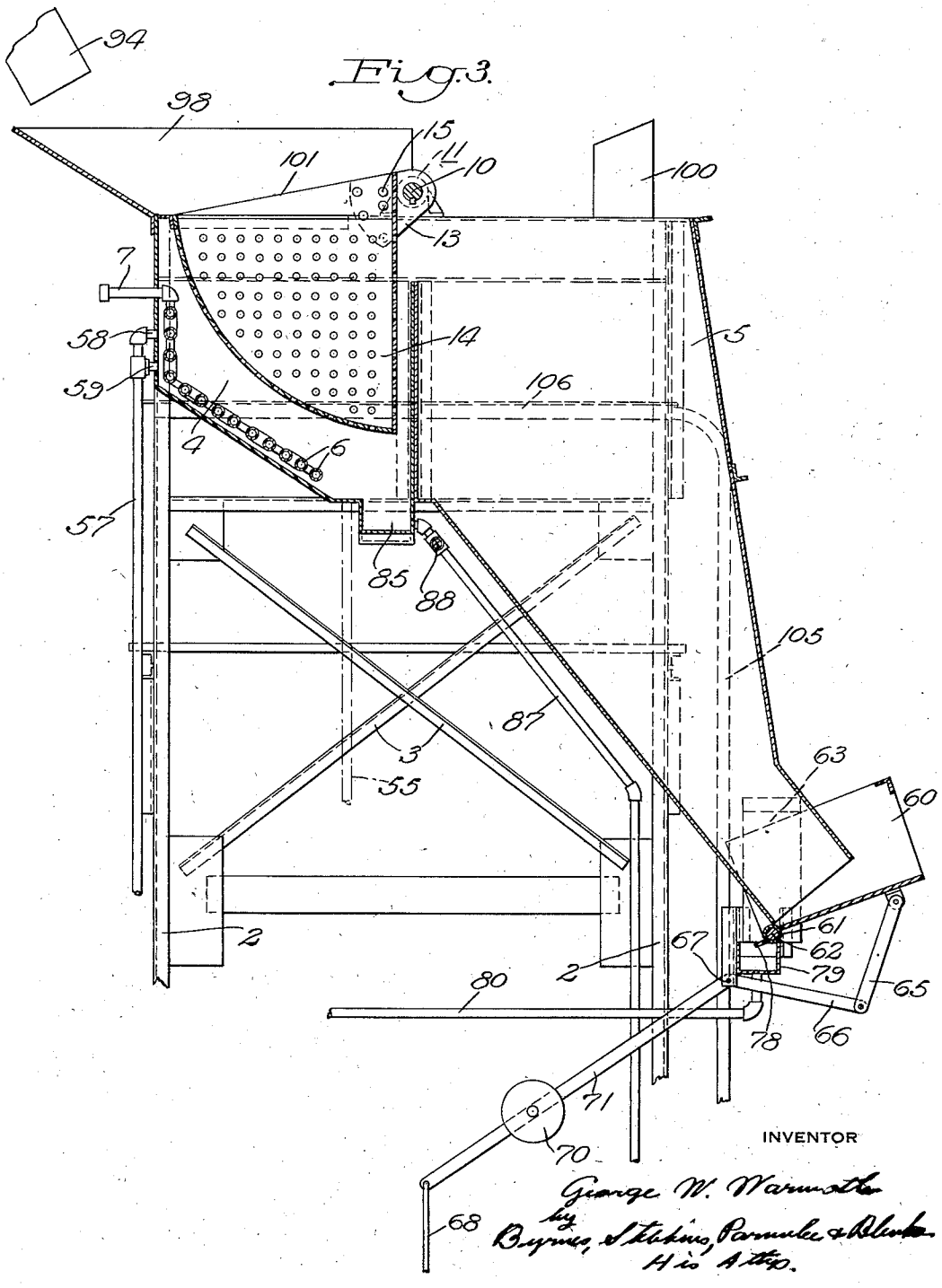
Fig. 3.



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APPARATUS FOR COATING AGGREGATE WITH BINDING MATERIAL

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Fig. 4.

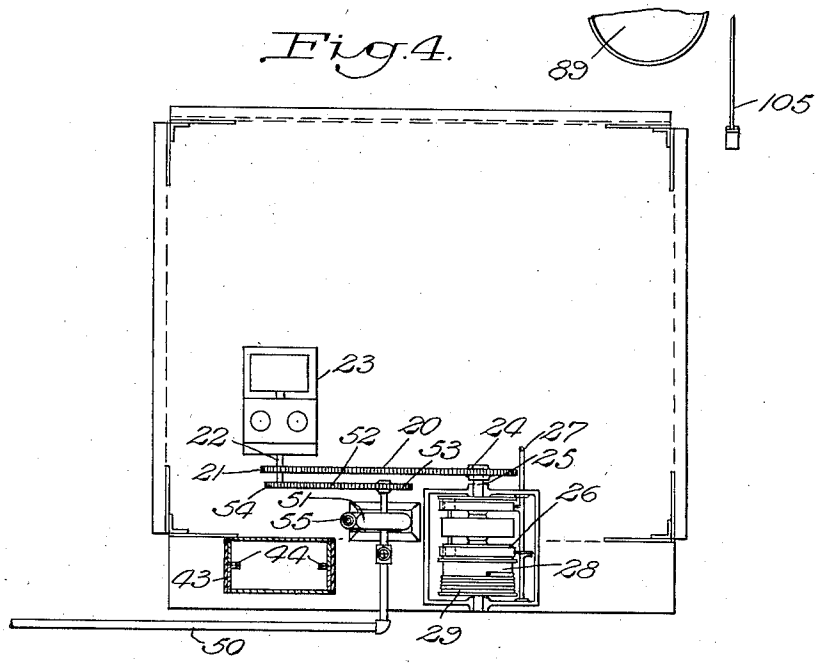


Fig. 5.

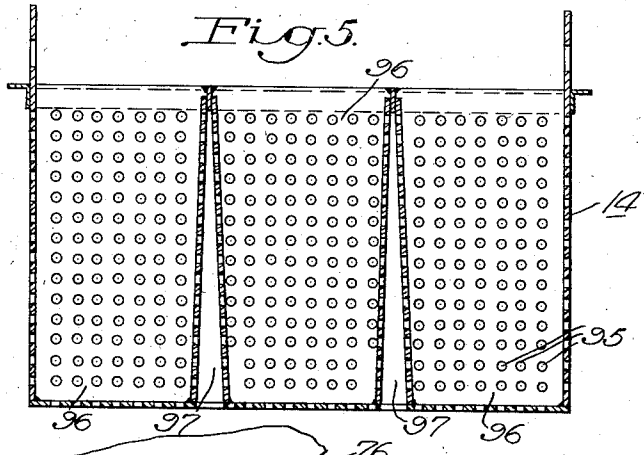
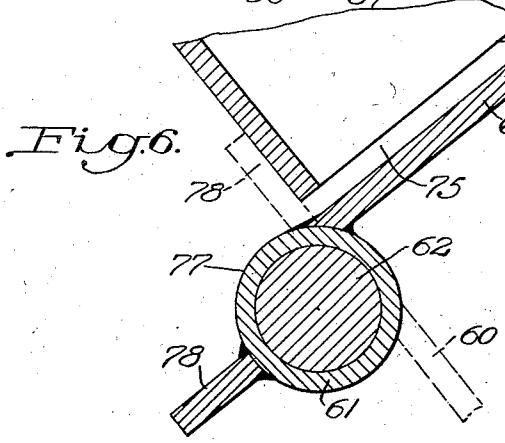


Fig. 6.



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Patented Oct. 1, 1935 2,016,159

UNITED STATES PATENT OFFICE

2,016,159

APPARATUS FOR COATING AGGREGATE WITH BINDING MATERIAL

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Application December 12, 1931, Serial No. 580,532

13 Claims. (Cl. 94—43)

This invention relates generally to a method and apparatus for coating aggregate with binding material. It relates more particularly to a method and apparatus for coating aggregate such as crushed stone or slag with asphalt, tar or other binding material.

My invention provides a method and apparatus whereby the aggregate may be coated and stored in a storage bin or hopper in which the excess binding material is allowed to drain from the coated aggregate and is returned to a storage tank. A gate is provided at the delivery end of the storage bin so that delivery of the coated aggregate to a truck may be interrupted.

In the accompanying drawings, which illustrate the present preferred form of my invention,

Figure 1 is a side elevation of the whole apparatus;

Figure 2 is a front elevation;

Figure 3 is a vertical section on the line III—III of Figure 2;

Figure 4 is a horizontal section taken in a plane corresponding to the line IV—IV of Figure 1;

Figure 5 is a sectional view illustrating the basket used for coating the aggregate, and

Figure 6 is a detail sectional view of the gate used for controlling flow of coated aggregate from the storage bin.

Referring more particularly to the accompanying drawings, there is provided a framework of general rectangular shape formed by angle corner posts 2 and cross brace angles 3. A coating tank 4, and a bin 5 in which the aggregate is further coated, drained, and stored are mounted adjacent the upper end of the framework, the coating tank being provided with steam coils 6 supplied with steam through a pipe 7 connected to a suitable source of steam supply.

A shaft 10 extends transversely of the coating tank and storage bin and is disposed slightly above these elements. As shown in Figure 2, adjacent each end of the shaft is a bearing 11 having a sleeve portion 12 keyed to the shaft, and an arm 13. Next to the bearing 11 is a bearing 11a secured to the framework. A perforated basket 14 is secured to the arms 13 by fastening means 15, shown in Figure 3, the shaft in this manner supporting the basket so that when the shaft is rotated the basket is raised from or lowered into the coating tank.

The shaft 10 carries at one end a bull wheel 17 which is keyed to the shaft. The bull wheel is rotated by means of a drum and rope in the following manner:

The power unit for rotating the bull wheel 17 and which is, therefore, operative to withdraw the basket 14 from the coating tank, is shown in Figures 1 and 4. A sprocket chain 20 passes around a sprocket 21 secured to a shaft 22 of a gasoline engine 23, and also over a sprocket 24 secured to a shaft 25 of a friction clutch indicated generally by the reference numeral 26. The friction clutch is operated by a handle 27 for rotating a drum 28 about which a rope 29 is wound and unwound in order to rotate the bull wheel 17. The friction clutch is not described in greater detail since any suitable type of friction clutch may be employed. It is preferred, however, to employ a clutch of the general type shown in Patent No. 1,352,653, granted September 14, 1920, to Herbert V. Brown, since this type of clutch has been found particularly adapted to the present use.

The rope 29 passes over one of the two sheaves 30 mounted in a block 31, and then downwardly and around a sheave 32 trunnioned in a brace 33. The rope 29 then passes upwardly and around the other sheave 30 of the double sheave and then downwardly and is fixed, as indicated by the reference numeral 34, to the brace 33 secured to the framework of the apparatus. The block 31 is suspended by a rope 36 which passes around the bull wheel 17 and is adjustably secured to the bull wheel in any of the positions indicated by the reference numeral 38. Another rope 39, which may if desired be simply a continuation of the rope 36, is secured to the bull wheel 17 at one of the points 38 and passes downwardly around a sheave 40 mounted in the brace 33. The lower end of the rope 39 carries a counterweight 42 which is guided in a housing 43 by providing flanges 44 which cooperate with corresponding grooves in the counterweight.

The connections for supplying the coating tank 4 with binding material and for withdrawing surplus binding material from the coated aggregate are as follows: Binding material is withdrawn from a storage tank (not shown) through a pipe 50, shown in Figure 1, by a pump 51. The pump is operated through a sprocket chain 52 which passes around sprockets 53 and 54 secured, respectively, to the pump shaft and the engine shaft. After passing through the pump 51, the binding material flows through an inlet pipe 55 controlled by a valve 56 and is delivered adjacent the bottom of the coating tank 4. An overflow pipe 57 which has a plurality of connections 58 and 59 to the coating tank 4, is provided for taking care of the overflow of binding material, an excess of the binding material being supplied by the pump 51 in order to maintain the desired level in the coating tank at all times. The overflow passes through the pipe 57 and is returned to a storage tank (not shown). One of the connections 58 or 59 may be plugged up in order to vary the level of the binding material in the coating tank.

As will be described more fully hereinafter, rotation of the bull wheel 17 raises the basket 14 containing coated aggregate from the coating tank 4 and deposits it in the storage bin 5. The

coated aggregate flows down the storage bin and is delivered to trucks which carry the coated aggregate to the point of use. The flow of coated aggregate from the storage bin 5 is controlled by a gate 60, shown more particularly in Figures 1, 3 and 6. The gate 60 is secured at one edge to a pipe 61 mounted for rotation on a shaft 62 secured to plates 63 on the storage bin, and is opened and closed manually by the operator. A link 65 is pivotally connected at its upper end to the gate 60 and at its lower end to a bell crank lever 66 which is pivoted to the framework of the apparatus, as indicated by the reference numeral 67. The bell crank 66 is actuated by the operator through a rod 68 provided with a handle 69. A counterweight 70 is adjustably mounted on the arm 71 of the bell crank 66 in order to render the opening and closing of the gate easy. The gate is closed by the operator pulling downwardly on the handle 69, which lowers the arm 71 and raises the link 65, thereby moving the gate 60 from its chain-line to its full-line position of Figure 1. The gate is shown in closed position in Figure 3 and also in Figure 6, from which it will be seen that even when the gate is closed so as to prevent delivery of coated aggregate from the bin 5, there is a space 75 between the gate 60 and the lower edge 76 of the storage bin 5 which allows excess binding material to drain through the space 75 and flow over the portion 77 of the pipe 61. The binding material thus drained from the coated aggregate in the storage bin is deflected by a flange 78 into a trough 79 and is returned to the storage tank by a pipe 80. The trough 79 is provided with a weir 81 which prevents sediment from being returned to the storage tank.

The bottom of the coating tank 4 is provided with a settling basin 85 for collecting the sediment formed by immersing the aggregate in the binding material. The settling basin extends outwardly beyond the side of the coating tank 4, as shown in Figure 2, and is provided with a cover 86, by means of which the settling basin may be cleaned out. The binding material collected in the settling basin is delivered through a pipe 87 controlled by a valve 88 to a sediment receptacle 89.

The perforated basket 14 used for coating the aggregate in the coating tank 4 is illustrated in Figure 5. It is provided with perforations 95 which allow the binding material to enter the basket and coat the aggregate. The basket, instead of being continuous throughout its length, is divided into several compartments 96 by pockets 97 between the compartments. The binding material may flow freely into these pockets and then through the perforations 95 so as to insure positive coating of the aggregate irrespective of its position in the basket.

The aggregate to be coated is delivered to the coating tank 4 by any desired means, for example, through a chute 94 or from a bucket, the aggregate being guided into the coating tank by a hopper 98 arranged at the top of the tank and provided with ribs or guide plates 99 which act to evenly distribute the aggregate in the basket 14. The aggregate is delivered to the coating tank 4 while the basket is immersed in the binding material. Each of the particles of aggregate, therefore, has to pass through binding material before it reaches the basket and in this manner all parts of the aggregate are thoroughly coated with the binding material. The basket is then raised by operating the clutch mechanism 26, which, because of the rope connections between the drum 28 and the bull wheel 17, causes the bull wheel to be rotated and the basket to be lifted from the tank 4. As the basket is raised, the bull wheel rotates in a clockwise direction, as viewed in Figure 1, the rotation of the basket being limited by stops 100 with which the leading edges 101 of the basket contact. While the basket is being rotated into its chain-line position shown in Figure 1 in order to dump the coated aggregate into the storage bin 5, the point of connection 38 of the rope 39, to which the counterweight 42 is attached, rotates clockwise until it assumes the position indicated by the reference numeral 102. In this position, the counterweight acts to return the basket to the coating tank so that after the aggregate has been delivered to the storage bin 5 and the operator releases the brake, the counterweight causes the bull wheel 17 and the basket 14 to rotate counter-clockwise, thereby lowering the basket into the coating tank. As the basket passes from its upper position outside of the tank to its lower position within the tank, the point of connection of the rope 39 to the bull wheel 17 moves counter-clockwise from the point 102 to the point 38. As the point 102 moves downwardly to a position 103 directly under the shaft 10, the action of the counterweight is to aid in returning the basket to the coating tank. However, as the point of attachment of the rope 39 to the bull wheel passes the point 103, the effect of the counterweight is to retard the lowering of the basket. The action of the counterweight acts to cushion the lowering of the basket into the immersion tank, thereby decreasing splashing and danger of overflow.

The coated aggregate dumped from the basket 14 tumbles about as it is delivered to the storage bin 5 and as it flows downwardly toward the gate 60 so that positive coating of the aggregate is insured. The excess aggregate is returned to the storage tank from the trough 79 by the pipe 80, as previously described, so that when the gate is opened and the coated aggregate is delivered to a truck, there is no excess of binding material on the aggregate.

The amount of coating applied to the aggregate can be varied by varying the speed at which the basket is raised from the coating tank. Thus, if the basket is raised quickly, a relatively large amount of binding material is trapped in the aggregate and dumped therewith into the bin 5. Although some of the excess of binding material will separate from the aggregate in the storage bin, the coating of the aggregate will be somewhat heavier than if less binding material had been trapped with the aggregate delivered to the storage bin. On the other hand, if the basket is raised slowly, most of the excess binding material has an opportunity to drain from the basket before the aggregate is delivered to the storage bin and the coating will, accordingly, be relatively thin.

The apparatus and method are adapted for use either with emulsions of binding material, or with "cut-backs" in which a solid binder such as asphalt or coal tar is at least partially dissolved by a solvent to form the liquid binding material. The heating coils 6 in the coating tank are provided so that "cut-backs", as well as emulsions, may be used. Steam or other heating means may be applied to the coils to impart the desired fluidity to the binding material, but this is usually necessary only in the use of "cut-backs", and not with emulsions.

A ladder 105 is provided for gaining access to

an inspection platform 106 so that the operation of the device may be seen and the settling basin 85 may be cleaned.

I have illustrated and described the present preferred embodiment of my invention. It is to be understood, however, that the invention may be otherwise embodied or practiced within the scope of the following claims.

I claim:

1. In apparatus for coating aggregate with binding material, a coating, drainage and storage bin for the coated aggregate, a gate controlling delivery of the aggregate from the bin, and means for operating the gate, said gate providing means for draining excess binding material from the coated aggregate in said bin.

2. Apparatus for coating aggregate with binding material, comprising a coating tank adapted to receive binding material, a perforated basket mounted for immersion in and withdrawal from the binding material in the coating tank, said basket being secured to a shaft, and means for rotating the shaft to raise and lower the basket.

3. Apparatus for coating aggregate with binding material, comprising a coating tank adapted to receive binding material, a perforated basket mounted for immersion in and withdrawal from the binding material in the coating tank, said basket being secured to a shaft, a wheel secured to the shaft, and power means operatively connected to the wheel for raising and lowering the basket.

4. Apparatus for coating aggregate with binding material, comprising a coating tank adapted to receive binding material, a perforated basket mounted for immersion in and withdrawal from the binding material in the coating tank, said basket being secured to a shaft, a wheel secured to the shaft, and a rope drive operatively connected to the wheel for raising and lowering the basket.

5. Apparatus for coating aggregate with binding material, comprising a coating tank adapted to receive binding material, a perforated basket mounted for immersion in and withdrawal from the binding material in the coating tank, power means for raising the basket from the coating tank, and a counterweight operatively connected to the basket, the counterweight being effective for aiding the initial lowering and for retarding the subsequent lowering of the basket into the coating tank.

6. Apparatus for coating aggregate with binding material, comprising a coating tank adapted to receive binding material, a perforated basket mounted for immersion in and withdrawal from the binding material in the coating tank, said basket being secured to a shaft, a wheel secured to the shaft, means for rotating the wheel to raise and lower the basket, and a counterweight connected to the wheel, the counterweight being effective for aiding the initial lowering and for retarding the subsequent lowering of the basket into the coating tank.

7. Apparatus for coating aggregate with binding material, comprising a coating tank adapted to receive binding material, a perforated basket mounted for immersion in and withdrawal from the binding material in the coating tank, said basket being secured to a shaft, a wheel secured to the shaft, power means operatively connected to the wheel for raising and lowering the basket, and a counterweight connected to the wheel, the point of connection of the counterweight to the wheel being such that as the basket approaches its lowest position within the tank the counterweight acts to retard the lowering of the basket.

8. Apparatus for coating aggregate with binding material, comprising a coating tank adapted to receive binding material, a perforated basket mounted for immersion in and withdrawal from the binding material, a stationary coating, drainage and storage bin adjacent the coating tank, means for delivering coated aggregate from the basket to said bin, means for supplying the coating tank with binding material, and means for draining and removing excess binding material from the coated aggregate in said bin.

9. Apparatus for coating aggregate with binding material, comprising a coating tank adapted to receive binding material, a perforated basket mounted for immersion in and withdrawal from the binding material, a stationary coating, drainage and storage bin adjacent the coating tank, means for delivering coated aggregate from the basket to said bin, a settling basin adjacent the bottom of the coating tank, and means for withdrawing sediment from the settling basin.

10. Apparatus for coating aggregate with binding material, comprising a coating tank adapted to receive binding material, a perforated basket mounted for immersion in and withdrawal from the binding material, a coating, drainage and storage bin adjacent the coating tank, means for delivering coated aggregate from the basket to said bin, a gate for controlling delivery of coated aggregate from the storage bin, a trough adjacent the gate, said gate acting to deflect excess binding material into the trough, and means for returning the collected excess binding material to a storage tank.

11. Apparatus for coating aggregate with binding material, comprising a coating tank, a coating, drainage and storage bin for coated aggregate, a perforated basket mounted for immersion in and withdrawal from the binding material and adapted to deliver coated aggregate to said bin, a pump and means for operating the same, a binding material storage tank, means for pumping binding material from the storage tank to the coating tank, an overflow pipe connecting the coating tank and storage tank, means for operating said basket, and means for removing excess binding material from the coated aggregate in the storage bin and returning it to the storage tank.

12. In apparatus for coating aggregate with binding material, a coating, drainage and storage bin for receiving coated aggregate containing an excess of binding material, a gate adjacent the delivery end of the storage bin for controlling delivery of the aggregate, said gate being rotatably mounted and when in closed position spaced from the end of the bin a distance less than the diameter of the aggregate so as to prevent delivery of aggregate but cause draining of excess binding material from the storage bin.

13. In apparatus for coating aggregate with binding material, a coating, drainage and storage bin for receiving coated aggregate containing an excess of binding material, a gate adjacent the delivery end of the storage bin for controlling delivery of the aggregate, said gate being rotatably mounted and when in closed position spaced from the end of the bin a distance less than the diameter of the aggregate so as to prevent delivery of aggregate but cause draining of excess binding material from the storage bin, a trough adjacent the gate, and means for deflecting the excess binding material into the trough.

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