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APPARATUS FOR PREPARING SAND MIXTURES

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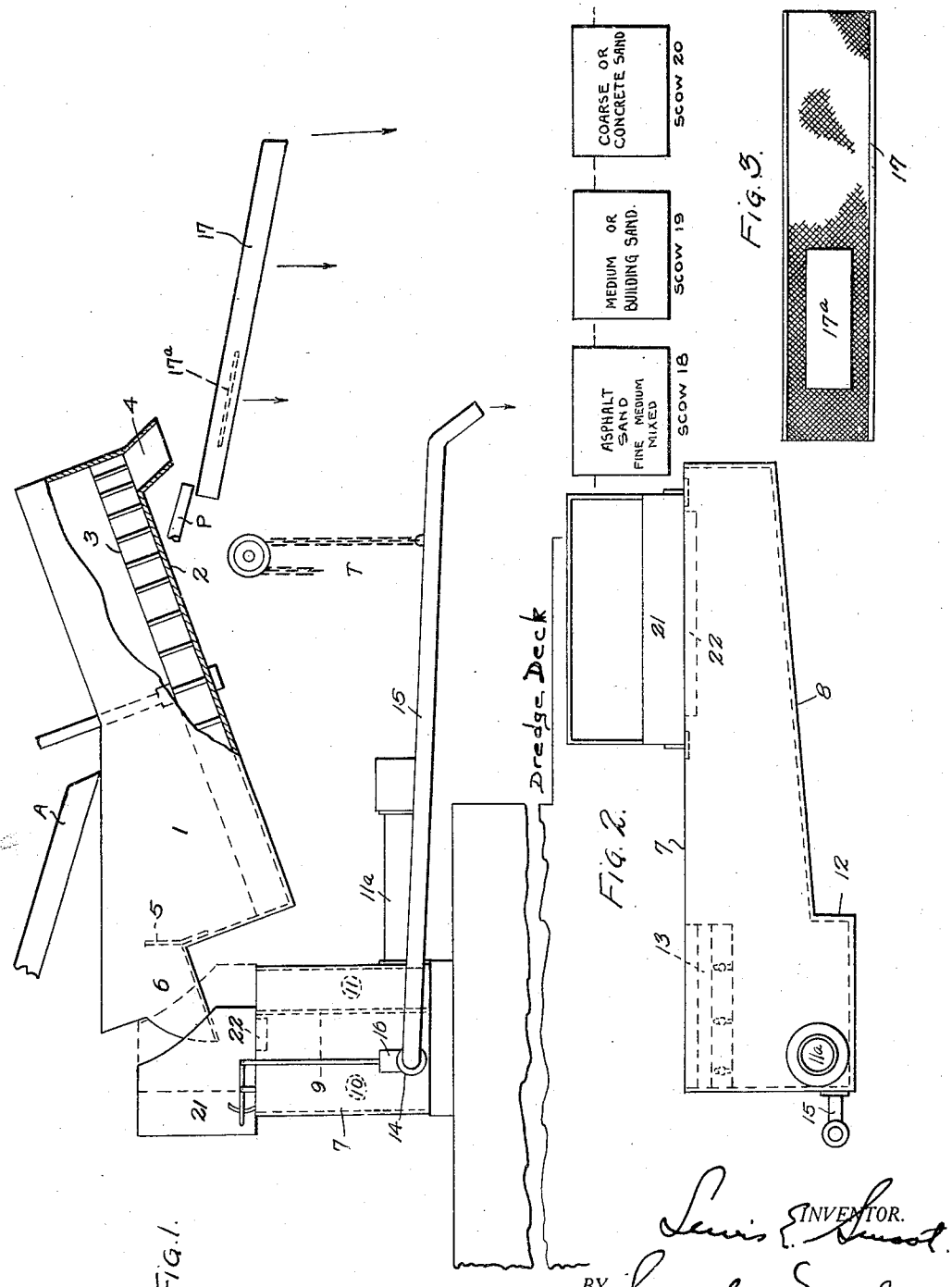

FIG. 1.

FIG. 2.

FIG. 3.

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APPARATUS FOR PREPARING SAND MIXTURES

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This invention is an apparatus for preparing sand mixtures, and particularly sand mixtures for use in making asphalt topping for street paving.

Asphalt sand is a mixture of very fine sand with sand of medium coarseness and the relative percentages of each are fixed by specifications within very narrow limits, and in order that the invention may be thoroughly appreciated it may be stated that in dredging sand and gravel the material brought up by the buckets is given a preliminary washing and then roughly separated by one or more screening operations into gravel material and sand material. The sand material is then washed and graded according to the standards of fineness which govern the particular sands being prepared. Usually the washing and grading of the sand includes one or more stratifying and settling operations in which the muddy wash water overflowing from the stratifiers carries with it a considerable percentage of very fine sand grains. In ordinary dredging operations where concrete sand, building sands, and other coarser varieties of sand are being prepared, the presence of this fine sand in the finished product is seriously objectionable. For this reason it is the usual practice to remove as much of this fine sand as possible and to allow it to discharge overboard with the waste water overflowing from the washers and stratifiers.

In preparing asphalt sand, however, it is necessary to save this fine sand since it constitutes the bulk of the asphalt sand mixture. To change the washing, stratifying and grading apparatus on the dredge from an operation involving discarding the fine sand, to one requiring the recovery thereof, has heretofore necessitated shut-down of the entire dredge for at least a half day. Also, even after the change was made there has heretofore been no practical method or apparatus for use on dredges which would enable the preparation of a mixture of the fine and coarse grains with any degree of accuracy, and this necessitated keeping the fine sand separate from the coarse sand and subsequently, usually on short, mixing the two sands in the desired proportions. Obviously, this mode of procedure increases the cost of preparing this particular variety of sand. The relative production costs of asphalt sand and concrete or building sand are reflected in the relative market prices of these products which show asphalt sand prepared by processes now in vogue selling at a figure nearly three times that of the other sands.

In view of these facts and having in mind the necessity of conserving head-room and maintaining a low center of gravity on sand and gravel dredges, the present invention seeks to provide a simple and economical apparatus for preparing sand and sand mixtures of any desired character which is thoroughly practical for use in such instances.

Another object of the invention is to provide an apparatus of the type indicated wherein means are provided to definitely control the relative proportions of fine and coarse sand grains in a given mixture.

A further object is to provide an apparatus of the character indicated which will be continuous in its operation and which will wash, grade, separate and remix sand grains of different sizes in any desired proportion.

This and other objects will become apparent from the following description when read in connection with the accompanying drawings wherein

Figure 1 is a side elevation of the apparatus partly in section;

Figure 2 is a side elevation of the weir box;

Figure 3 is a plan view of chute 17 with the screen blanking plate in position.

As hereinbefore stated, the material being dredged is given a preliminary washing and screening to separate the gravel forming material from the sand forming material. This latter is conveyed, along with a sufficient quantity of water, to a sand washer and stratifier of any conventional type which is designed to cause the heavy or coarser sand grains to settle to the bottom while the fine grains along with the mud and water flow over a suitable weir or gate.

In the accompanying drawings I have shown by way of example the sand forming material being delivered from chute A to a

washer and stratifier comprising a circular tank 1, having an inclined bottom 2. The coarse and medium grains of sand settle out of the washing water and collect at the lowermost point of the tank. Rotatably mounted within the tank 1 and on an axis perpendicular to the inclined bottom 2, is an elevating wheel or scraper 3 which functions to lift the sand from the lowermost point of the tank 1 to a point above the surface of the liquid in the tank and to discharge it through an orifice 4. The wash water flows over the weir 5 and discharges into the spout 6. The water flowing over the weir 5 carries with it the mud and dirt washed from the sand and also the very fine sand grains which, due to their fineness, do not settle out in the tank 1. As is usual in operations of this character the apparatus is arranged to operate continuously, there being a continuous flow of material into the tank 1, from the chute A, the coarse sand being discharged continuously at the point 4, and the mud, water and fine sand flowing over the weir 5, in a continuous stream.

Heretofore, the overflow from the tank 1, at the weir 5, has been discarded and allowed to flow overboard, due to the fact that any sand it might contain was too fine to be used either as building sand, concrete sand, or the like; or, when it was desired to recover the sand content of this overflow in order to use the same for subsequently compounding asphalt sand or similar sand mixture, the entire overflow was collected in a separate barge or scow of a size sufficient to allow the fine sand to separate out or stratify by gravity. This procedure resulted in an appreciable quantity of the mud and dirt becoming mixed with the fine sand in the scow, and yielded a very inferior product. Also the rearrangement of screens and the alterations in the direction of flow of the material when changing from an operation in which the fine sand is saved to one in which it is discarded, entailed the loss of considerable time.

The present invention seeks to eliminate these difficulties by providing a double compartment weir box 7 designed to receive the overflow from tank 1. The weir box 7, as best shown in Fig. 2, comprises a tank having a sloping bottom 8, and a longitudinal partition 9. The partition 9 divides the box into two longitudinal compartments 10 and 11. The compartment 10 terminates at its lower end in a settling chamber 12, and the overflow from this chamber and the compartment 10, passes over an adjustable weir plate 13, carried by the partition 9. The compartment 11 discharges into pipe 11ª which leads overboard of the dredge, while the fine sand and water from the settling chamber 12, pass out of an orifice 14, into the pipe line 15, to be hereinafter referred to. The extent of opening of the orifice 14 may be adjustably controlled by a suitable gate 16.

The control of the flow of fine sand from the settling chamber 12 also includes means such as a block and tackle indicated at T, for raising and lowering the discharge end of the pipe 15. By thus increasing or decreasing the slope or fall of this pipe the quantity of material flowing through it may be very definitely controlled. It is of course apparent that either the gate 16 or the tackle T may be used individually if desired, or they may be relatively adjusted to provide even greater flexibility of control when necessary.

The medium and coarse sand discharged from the washer at the point 4, drops into an inclined screen-bottom chute 17, down which it is caused to flow by a stream of water introduced at the head of the chute from the pipe P. The chute 17 is arranged to extend beyond the side of the dredge and over one or more scows or barges 18, 19 and 20, being apparent that by so doing the clean sand falls through the interstices of the chute bottom directly into the scows.

As nereinbefore mentioned, the fine sand and mud overflowing from the washer is discarded when the apparatus is arranged to prepare building sand, concrete sand, and the like, whereas when making asphalt sand, this fine sand must be preserved. In order to render the present apparatus adaptable to either mode of operation, I provide means between chute 6 and the box 7 to selectively direct the overflow from the tank 1 into either the compartment 10 or the compartment 11. This means comprises a flow box 21 mounted upon the top of the weir box 7, and beneath the spout 6. The box 21 has a discharge orifice 22 in the bottom thereof and positioned to be selectively placed in communication with either the compartments 10 or 11 by sliding the box 21, transversely of the box 7. As shown in Fig. 1 of the drawings, the spout 6 is arranged to discharge into the box 21 in either of its positions, and the box is dimensioned to permit the orifice 22 being placed over either compartment. By this arrangement I dispense with all valves for controlling the disposition of the washer overflow. This is an important feature of the invention as the cost of valve replacement and repair in a service handling sand and water is absolutely prohibitive.

Assuming it is desired to prepare the coarser grades of sand such as building sand, concrete sand, and the like, the flow box 21 is positioned with the orifice 22 over the compartment 11, as shown in dotted lines in Fig. 1, in which arrangement the overflow is passed overboard through the pipe 11ª. Also in this arrangement the screen chute 17 may be prepared with one or more sections of dif-

ferent size mesh, to deliver different grades of sand in the several barges beneath it.

When it is desired to utilize the fine sand contained in the overflow from the washer, the box 21 is positioned with its opening 22 over the compartment 10, as shown in full lines in Fig. 1. In this position the fine sand settles out in the chamber 12 of the compartment 10, while the water and mud pass off over the weir 13 and discharge through pipe 11a. The sand collecting in the chamber 12 flows through pipe line 15 and is discharged into one of the scows beneath the chute 17, as for instance the scow indicated at 18. By this arrangement the scow 18 receives medium sand falling through the screen chute 17, and fine sand from the settling chamber 12 through pipe 15.

The relative amounts of fine and coarse grains deposited in the scow may be controlled by a conventional gate valve 16 in the chamber 12 and by changing the elevation of the pipe 15 as hereinbefore mentioned, and by blanking out a greater or lesser area of the screen of the chute 17 by means of sheet metal plates 17a of different sizes. These plates are laid over the screen of the chute, and by choosing plates of different sizes, the amount of medium sand percolating through the screen and falling into the scow 18 along with the fine sand from the pipe 15 may be positively controlled. Due to the flexibility of control afforded by this arrangement it is apparent that the percentage of fine and medium grains of sand deposited in the scow 18 may be controlled within very definite limits.

Attention is directed at this point to the fact that even when making asphalt sand mixtures to the most exacting specifications, every grade of sand is saved and completely utilized. For instance in the arrangement shown in Fig. 1 the scow 18 receives a mixture of fine and medium grains in a proportion determined by the size of the plate 17a, and the position of the valve 16 or the elevation of the pipe 15, at the same time medium or building sand is falling into scow 19 and concrete sand into scow 20. It is of course obvious that by proper arrangement of the chute 17, the plates 17a and the pipe 15, that a definite mixture of sand grains of any character may be deposited in either scow.

From the foregoing description it is apparent that I have provided an apparatus practical in every respect for use in marine dredging operations and one that requires only the shifting of the flow-box 21 and the blank plate 17a to change over from preparing one class of sand to another class of sand. Particular attention is invited to the fact that the operation in either case is continuous from the time the material leaves the dredge buckets to the time when the sand is deposited in the sand scows. Also, the sand when so deposited requires no subsequent stratification or compounding to meet any given specifications since the flexible control afforded for both the fine and coarse sand insures the proper percentage of each in the final mixture. It is also to be noted that the only valve in the entire apparatus is the adjustable gate 16, and this gate, due to its location need not seat tight since it is never closed entirely but merely functions to provide a regulatable discharge orifice from the fine sand settling chamber.

In conclusion, it is to be noted that while I have here chosen to describe and illustrate a preferred embodiment of my invention, such description and illustration are for the purposes of example only, and I expressly reserve the right to make such changes therein as fairly fall within the limits of my invention as defined in the appended claims.

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

1. The combination with a sand washer of a weir box arranged to receive the overflow from the washer, said weir box being provided with a partition defining two compartments, a settling chamber in one compartment, a weir between the settling chamber and the other compartment, and means interposed between the washer and the weir box for selectively directing the overflow from the washer into either of the compartments of the weir box.

2. The combination with a sand washer of a weir box arranged to receive the overflow from the washer, said weir box being provided with two compartments, a settling chamber in one of said compartments, a weir carried by the partition and positioned between the settling chamber and the other of said compartments, a waste discharge from said other compartment, a sand discharge from the settling chamber, and a flow-box mounted upon the weir box beneath the overflow from the washer, said flow-box having a discharge opening and being shiftable with respect to the weir box to align the discharge opening with either compartment of the weir box, the shiftable flow-box being of a size to receive the overflow from the washer in either of its positions.

3. The combination with a sand washer and a container to receive the clean sand, of a weir box having two compartments, one of said compartments having a waste water discharge and the other compartment having a settling chamber provided with a sand discharge communicating with the clean sand container, a flow-box positioned to receive the overflow from the washer, said flow-box being shiftable to direct the overflow into either of the weir box compartments.

4. The combination recited in claim 4 wherein means is interposed between the washer and the clean sand container for de-

livering thereto sand grains of a different size from those delivered to the container from the weir box.

5. The combination with a sand washer and a container to receive the clean sand, of plural sand delivery means between the washer and container, one of said means delivering coarse sand and the other of said means delivering fine sand thereto, the fine sand delivering means including a weir box having plural compartments, a weir separating said compartment, one of said compartments having communication with said clean sand container and the other of said compartments having a waste discharge, said first mentioned compartment also having communication with the second mentioned compartment by way of said weir, and means for selectively delivering the fine sand from the washer to either of the compartments of the weir box for delivery to said clean sand container or to waste as desired.

6. The combination with a sand washer and grader arranged to deliver fine sand at one point and coarse sand at another point, and a container for receiving said sand, of means interposed between the washer and container and arranged to deliver the coarse sand to the latter, said means including a screen-bottom chute overlying the container, and a removable imperforate plate for selectively blanking out a predetermined portion of the screen whereby to control the amount of coarse sand falling into the container.

7. The combination with a sand washer and grader arranged to deliver fine sand at one point and coarse sand at another point, and a container for receiving said sands, of means interposed between the washer and container and arranged to deliver the fine sand to the container, said means including a weir box having a settling chamber and an adjacent waste chamber, said settling chamber communicating with the clean sand container, and having a weir discharging into said waste chamber, a gate for controlling the amount of fine sand discharging from the settling chamber, together with separate means interposed between the washer and said first mentioned means for diverting the entire stream of fine sand from the settling chamber to waste.

8. The combination with a sand washer and grader arranged to deliver fine sand at one point and coarse sand at another point, and a container for receiving said sand, of means interposed between the washer and container and arranged to deliver the coarse sand to the latter, said means including a screen-bottom chute overlying the container, and a removable imperforate plate for selectively blanking out a predetermined portion of the screen whereby to control the amount of coarse sand falling into the container, means interposed between the washer and container and arranged to deliver the fine sand to the container, said means including a weir box having a settling chamber communicating with the clean sand container, a gate for controlling the amount of fine sand delivered to the container, and separate means for diverting the entire stream of fine sand around the settling chamber whereby the percentage of coarse grains to the fine grains in said container may be positivelv controlled.

9. A weir box comprising a plurality of compartments, one of said compartments having a settling chamber, a weir between the settling chamber and said other compartment, a waste discharge from said other compartment, a material discharge from the settling compartment, and means to divert the flow of material to the weir box into either of its compartments.

10. The apparatus described in claim 11 wherein the last-mentioned means comprises an open bottom flow-box slidably mounted upon the weir box and shiftable transversely thereof to align the open bottom with either of the compartments of the weir box.

11. In a dredge, the combination of a sand washer and a scow for receiving the clean sand, of a screen-bottom chute overlying the scow and positioned to receive coarse and medium sand from the washer, whereby to deposit medium sand in the scow, a weir box arranged to receive the fine sand and mud from the washer and including means for separating the fine sand and mud, means for delivering the fine sand to the scow, and means associated with both the fine and medium sand delivery means for controlling the relative proportions of each deposited in the scow.

12. The apparatus described in claim 11 wherein the elements of the apparatus therein described are relatively arranged and positioned to cause both the fine and medium sand to flow continuously from the washer to the scow.

13. The combination with a sand washer and a container to receive the clean sand, of plural sand delivery means between the washer and container, the container being located below the level of the washer and receiving sand therefrom by gravity, a weir box arranged to receive the overflow from the washer, a settling chamber in said box causing separation of the fine sand, a discharge pipe between the chamber and said clean sand container, said pipe being adjustable to raise and lower the discharge end thereof, whereby to regulate the flow of material therethrough.

14. The combination with a sand washer, of a pair of receptacles arranged to receive the overflow from the washer, one of said receptacles including a settling chamber, a weir formed in the wall of said receptacle and discharging into another of said receptacles,

a waste discharge from said second mentioned receptacle, a clean sand discharge from said first-mentioned receptacle, and shiftable means interposed between the washer and receptacles and arranged to receive the overflow from the washer and selectively discharge the same into either of said receptacles.

In testimony whereof I hereunto affix my signature.

LEWIS E. SMOOT.