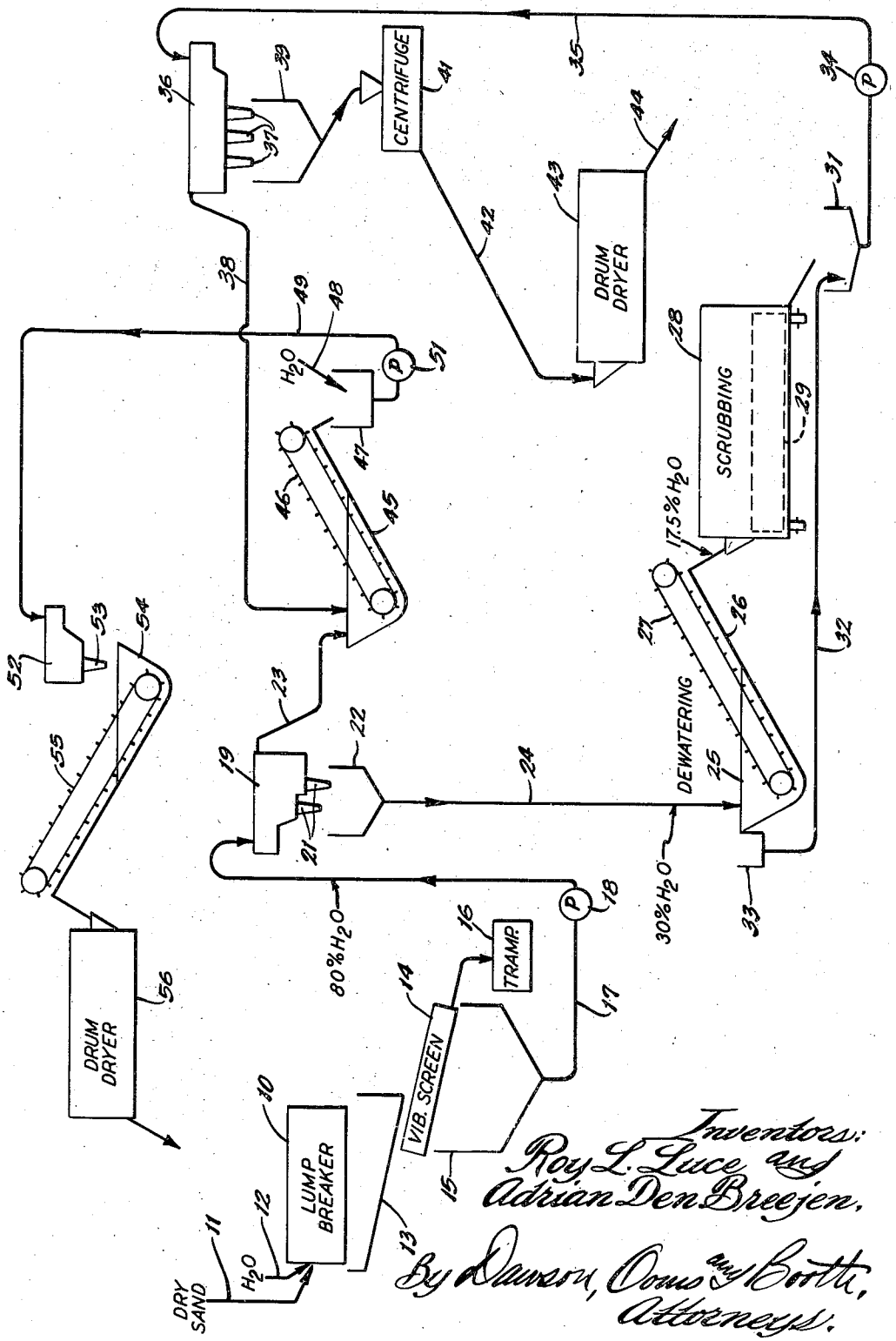
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APPARATUS FOR RECLAIMING USED FOUNDRY SAND

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APPARATUS FOR RECLAIMING USED FOUNDRY SAND

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This invention relates to apparatus for reclaiming used foundry sand and more particularly to the treatment of foundry sands to remove clay, fines, burned binder and other foreign materials to provide clean sand suitable for reuse.

Various proposals have heretofore been made for reclaiming foundry sands for reuse by removal of clays, fines, binding material and the like therefrom. In one proposed system the used sand has been scrubbed to loosen the undesired material from the sand and has thereafter been classified to separate the sand from the loosened material. For many types of sands systems of this type have been found entirely satisfactory but other types of sands have not been adequately cleaned by such systems.

We have found that those sands which are not properly cleaned by prior scrubbing systems generally contain relatively large quantities of clay, fines and the like and that the presence of such materials cushions the sand grains during scrubbing so that burned binder, clay and fines adhering to the grains are not loosened during the scrubbing operation. It is accordingly one of the objects of the present invention to provide apparatus for reclaiming used foundry sand and the like in which free clay, fines and other foreign materials are removed from the sand prior to scrubbing so that effectiveness of the scrubbing operation will be increased.

Another object is to provide apparatus for reclaiming sand in which the sand is subjected to a preliminary wet classification before scrubbing to remove free clay and fines which might interfere with scrubbing.

A further object is to provide apparatus in which the silica fines removed from the sand may be separated from the clay and the like and recovered when desired.

The above and other objects and advantages of the invention will be more readily apparent from the following description when read in connection with the accompanying drawing, in which—

The single figure is a diagrammatic view of a sand reclaiming apparatus embodying the invention.

In the apparatus, as shown, used foundry sand which usually contains clay, silica fines, burned binder material and other foreign materials is fed into a lump breaker 10 through a supply conduit indicated at 11. Simultaneously, water is supplied to the lump breaker through a pipe 12. The lump breaker may be a conventional type device and may normally include a rotatable drum in which the sand and water are tumbled to mix them and

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to break up any sand lumps, such as pieces of cores and the like. The lump breaker forms a flowable mixture of the sand and water which is collected in a trough 13 and fed to a vibrating screen 14. Any unbroken lumps, pieces of tramp metal and the like are separated from the sand and water mixture by the screen. The sand mixture is collected from the screen in a storage bin or container 15 while the lumps and other material which will not pass the screen are delivered to a bin 16.

From the storage bin 15, the flowable mixture of sand and water is pumped through a conduit 17 by a pump 18 into a liquid type classifier 19. The classifier as shown is of the type in which an upflow of water through cones 21 carries upward material which is lighter or smaller than the sand grains while permitting the sand grains to flow down through the upward current of water into a hopper 22. The light material carried up through the cones including the free clay, fines and other light or small foreign particles in the mixture is discharged over the top of the classifier through a pipe 23.

From the hopper 22, the sand and water mixture which is still of flowable consistency containing about 30% water is delivered through a conduit 24 into a dewatering tank 25. The dewatering tank, as shown, has an angular bottom 26 along which a conveyer 27 moves the sand so that water will drain from the sand and the sand will be discharged at the top of the conveyer with a water content of approximately 17.5%.

This sand from which all of the free clay and fines have been removed is delivered to a scrubber 28 which may be of the type more particularly described and claimed in the co-pending application of Den Breejen, Serial No. 436,760, filed March 30, 1942, now matured into Patent No. 2,383,045, granted August 21, 1945. This scrubber, as illustrated, comprises a rotating barrel in which an elongated weight 29 is loosely supported to cause the sand grains to scrub against each other as the barrel is rotated. Due to the fact that all free clay and fines have been removed from the sand by the classifier 19 before it is delivered to the scrubber, a very efficient scrubbing action is produced which will loosen from the sand grains clay fines, burned binder and light material which adheres thereto. Thus, by the time the material is discharged from the scrubber, the sand grains are cleaned and the discharged mixture contains only clean sand grains and free clay fines, burned binder and the like,

As explained above, we have found that initial removal of the free clay and fines substantially improves the effectiveness of the scrubber shortening the time required to clean the sand grains and producing a more complete cleaning operation.

The scrubbed mixture is discharged from the scrubber into a hopper 31 which is supplied with water through a pipe 32. Conveniently, the pipe 32 may connect to a trough 33 which catches the overflow water from the dewatering trough 25. The addition of water returns the mixture to flowable consistency so that it can be pumped by a pump 34 through a pipe 35 into a second classifier 36 which may be similar to the classifier 19. The classifier 36 is so adjusted that only clean sand grains larger than a predetermined size will drop through its cones 37 while all clay and silica fines which are finer than the desired end product will be discharged over the top of the classifier through a pipe 38. The sand flowing down through the cones 37 is collected in a hopper 39 and is discharged into a centrifuge 41 for drying. The centrifuge will remove the major part of the water from the sand leaving the sand with a water content of approximately 5%. When a drier sand than this is required, the sand from the centrifuge may be conducted through a conduit 42 into a drum drier 43 in which it is reduced to any desired state of dryness. From the drum dried 43 the cleaned and dried sand is discharged at 44 and may be collected and reused in any desired manner. We have found that sand treated according to the present invention is clean and sharp and is in a highly desirable state for foundry use.

According to a further feature of the present invention, the silica fines, which are discharged at the tops of the classifiers 19 and 36, may be recovered when desired to be used as silica flour. For this purpose, as shown, the pipes 23 and 38 discharge into a dewatering device 45 similar to the dewatering device 25. The dewatering device 45 includes a conveyer 46 for carrying the solid materials out of the water and for discharging them into a hopper 47. In the hopper 47 additional water is added through a pipe 48 to form a flowable mixture which is pumped through a pipe 49 by a pump 51 into a classifier 52. The classifier 52 may be of the same general type as the classifiers 19 and 36 but so adjusted that it will reject the clay and pass the silica fines through its cone 53 into a dewatering device 54. The silica fines are dragged from the dewatering tank 54 by a conveyer 55 and discharged to a drier 56 in which they can be reduced to any desired state of dryness. The product recovered from this drier will be a fine sand whose fineness depends upon the settings of the several classifiers and which corresponds in general to the silica flour used in foundries. It will be apparent that in cases where recovery of the silica fines is not desired, the material overflowing from the classifiers 19 and 36 can be discharged directly to waste.

While one embodiment of the invention has been shown and described in detail herein, it will be understood that this is illustrative only and is not intended as a definition of the scope of the invention, reference being had for this purpose to the appended claims.

What is claimed is:

1. Apparatus for reclaiming used foundry sands and the like comprising means for mixing the sand with water to form a flowable mixture, a liquid type classifier receiving the flowable mixture, means to supply water to the classifier to flow upward therethrough for separating free clay and fines from the mixture, means for scrubbing the separated portion of the mixture containing the sand to loosen adhering fines and foreign material from the sand grains, a second liquid type classifier receiving the scrubbed material from the scrubbing means to separate the loosened fines and foreign material from the sand, and drying means receiving the sand from the second classifier to dry it.

2. Apparatus for reclaiming used foundry sands and the like comprising means for mixing the sand with water to form a flowable mixture, a liquid type classifier receiving the flowable mixture for separating free clay and fines from the mixture, dewatering means receiving from the classifier the portion of the classified mixture containing the sand to dewater the sand to a substantially mushy consistency, a scrubber receiving the dewatered sand mixture from the dewatering means to loosen adhering fines and foreign material from the sand grains, a second liquid type classifier receiving the scrubbed mixture from the scrubber to separate loosened fines and foreign material from the sand, and drying means receiving the sand from the second classifier to dry it.

3. Apparatus for reclaiming used foundry sands and the like comprising means for mixing the sand with water to form a flowable mixture, a liquid type classifier receiving the flowable mixture for separating free clay and fines from the mixture and for separately discharging the portions of the mixture containing the sand and the clay and fines, a scrubber receiving the portion of the mixture containing the sand to loosen adhering fines and foreign material from the sand grains, a second liquid type classifier receiving the scrubbed material from the scrubber for separating the loosened fines and foreign material from the sand and for separately discharging the portions of the mixture containing the sand and the loosened fines and foreign material, drying means receiving the portion of the mixture containing the sand to dry the sand, and a third classifier receiving from the first two named classifiers the portions of the mixtures containing the clay, fines and foreign material to separate the fines from the clay and foreign material.

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