Feb. 27, 1940. C. H. SCOTT 2,191,744

CLASSIFIER MECHANISM

Original Filed Feb. 16, 1938 4 Sheets-Sheet 1

FIG. 1.

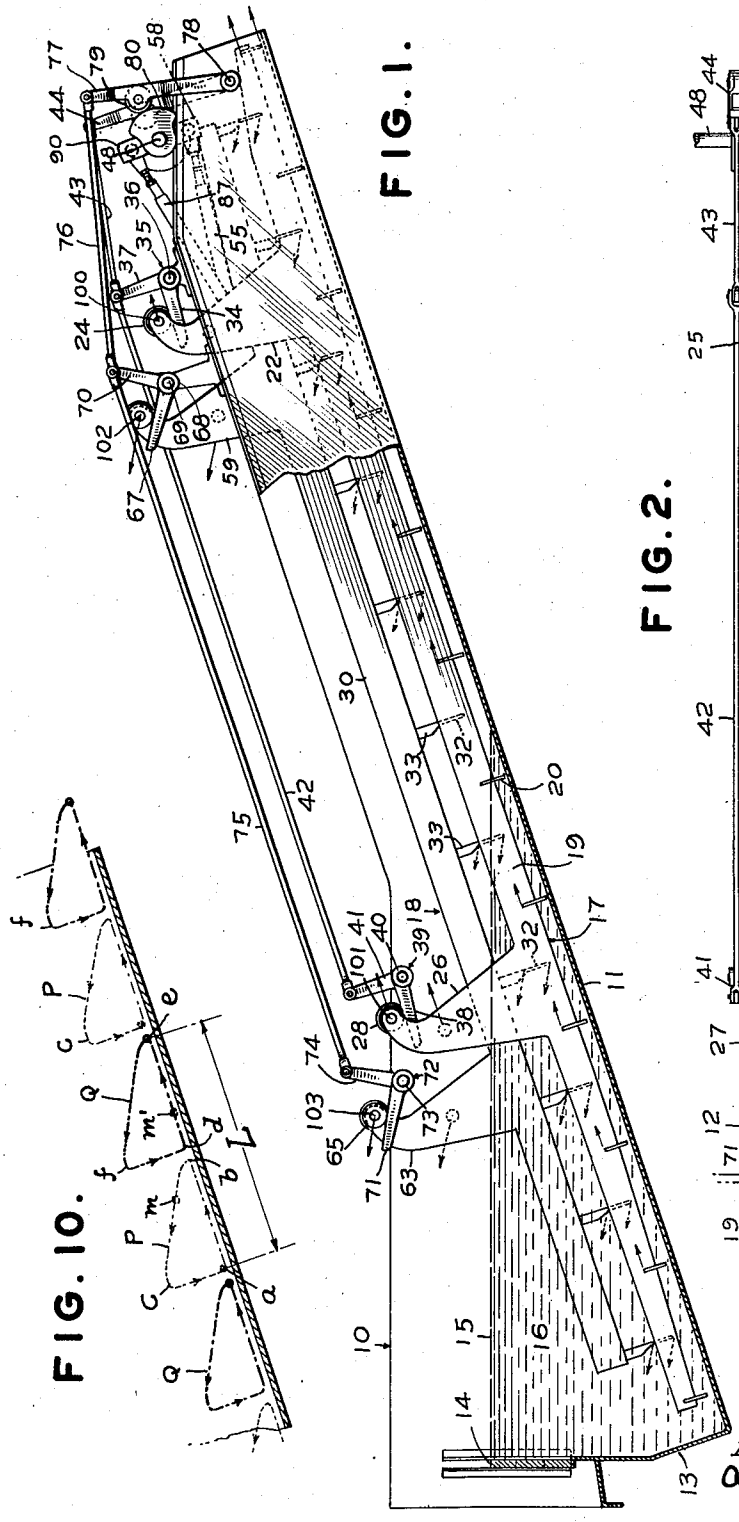


FIG. 2.

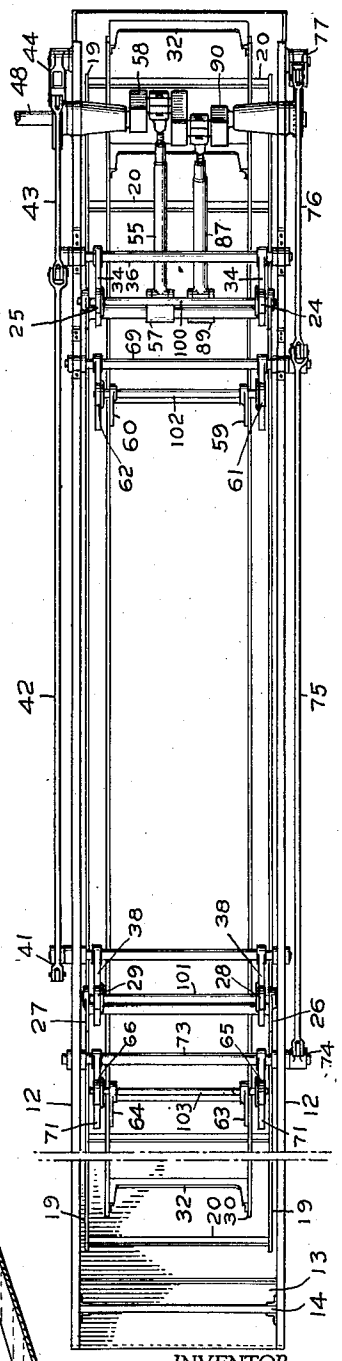


FIG. 10.

INVENTOR.
CHARLES H. SCOTT,
BY
Arthur Nissolson
ATTORNEY.

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CLASSIFIER MECHANISM

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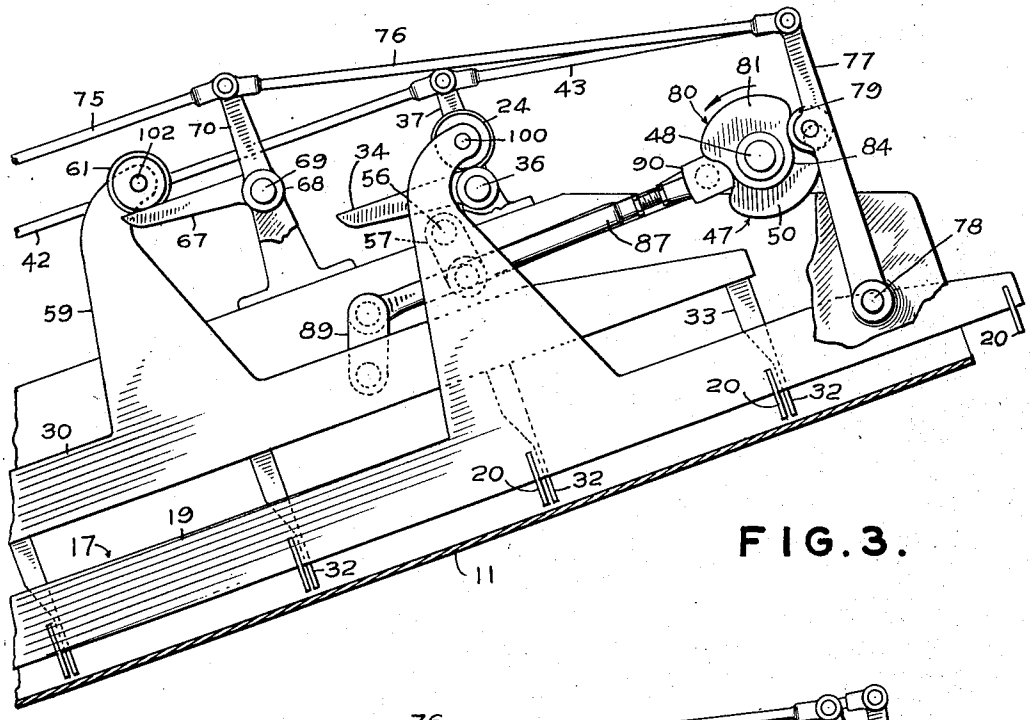


FIG. 3.

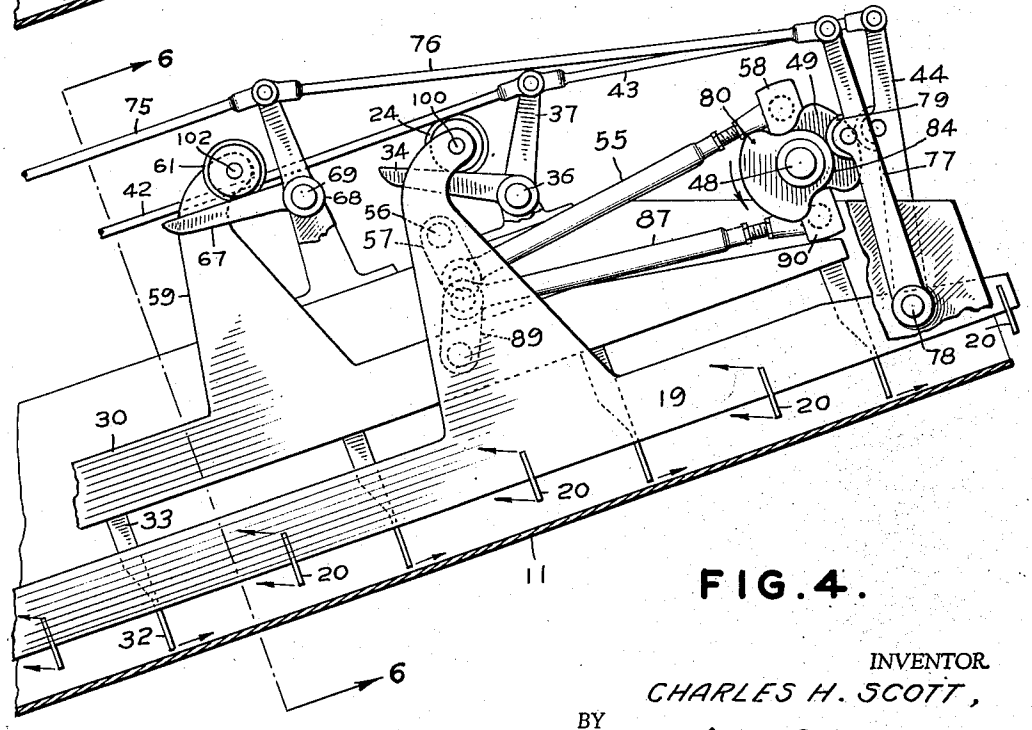


FIG. 4.

INVENTOR.
CHARLES H. SCOTT,
BY
ATTORNEY.

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CLASSIFIER MECHANISM

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FIG. 5.

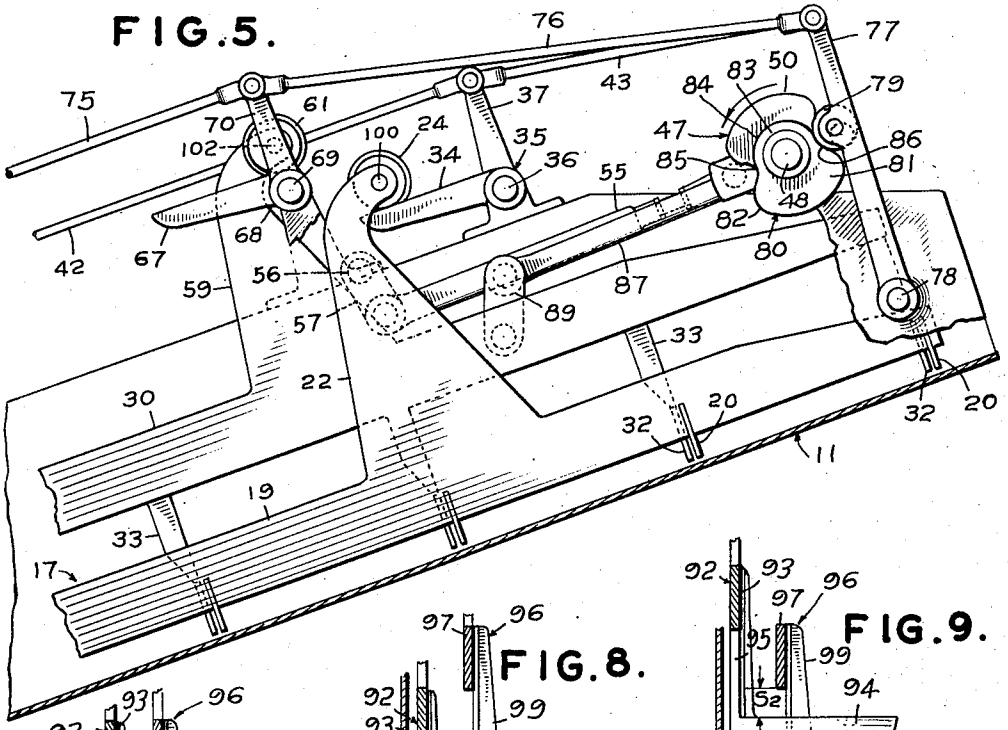


FIG. 8.

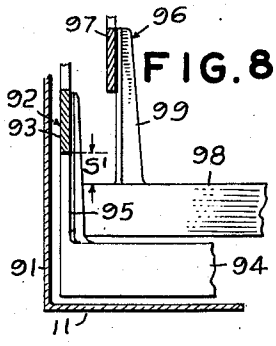


FIG. 9.

FIG. 7.

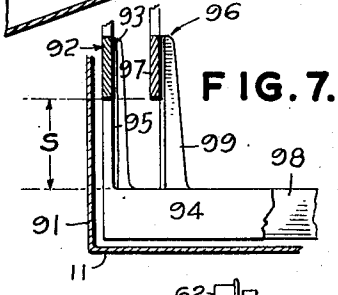
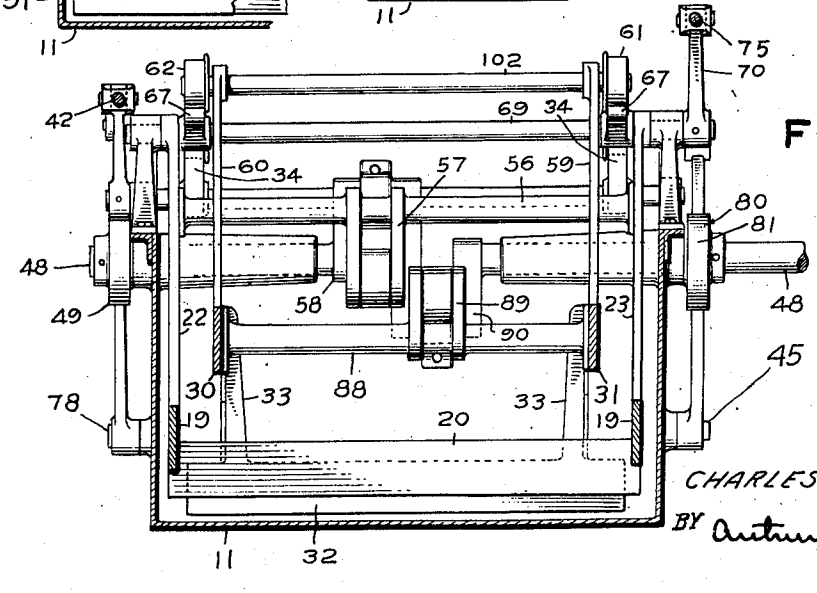


FIG. 6.



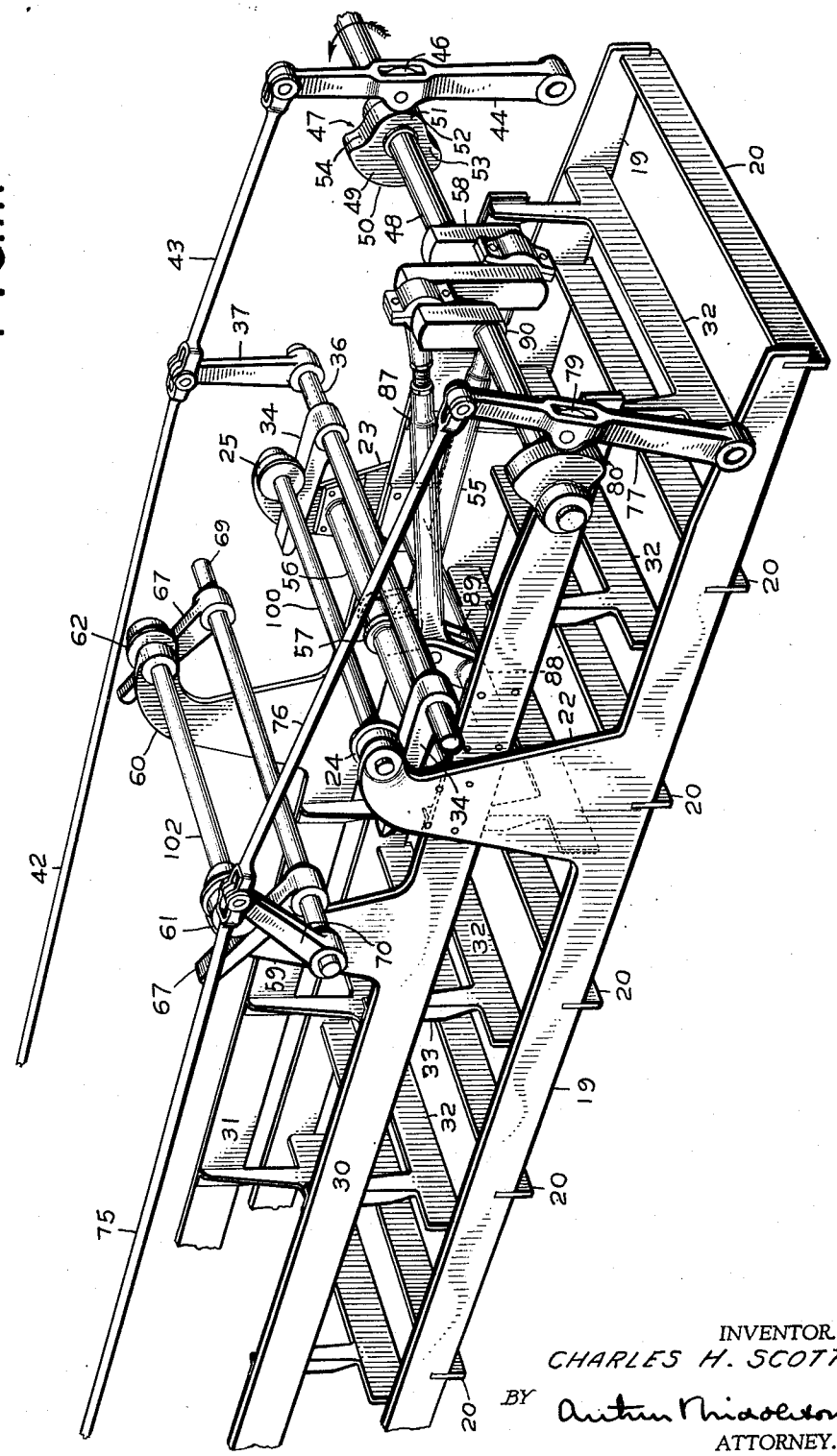
INVENTOR.
CHARLES H. SCOTT,
BY Arthur Nissolson
ATTORNEY.

Feb. 27, 1940. C. H. SCOTT 2,191,744

CLASSIFIER MECHANISM

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FIG. 11.



INVENTOR.
CHARLES H. SCOTT,
BY Arthur Middleton
ATTORNEY.

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UNITED STATES PATENT OFFICE

2,191,744

CLASSIFIER MECHANISM

Charles H. Scott, Westport, Conn., assignor to The Dorr Company, Inc., New York, N. Y., a corporation of Delaware

Application February 16, 1938, Serial No. 190,731
Renewed December 19, 1939

7 Claims. (Cl. 198—224)

This invention relates to classifiers or stratifiers wherein a bath of a liquid-solids mixture, usually called a pulp, is separated into an emerged fraction of coarse solids and an overflowed fraction of suspended fines. More particularly, this relates to improvements in arrangements of mechanism whereby a plurality of reciprocating rakes or blades convey settled solids stepwise to emergence up the partially submerged sloping bottom or deck of the classifier tank.

In present-day classifiers, the maximum depth of bath is fixed by the closeness of size-selectivity desired to be attained by the classification treatment, and the deeper the bath the more accurate the selectivity; but the deeper the bath, the longer must be the inclined deck or tank bottom up which the settled solids are raked to emergence. This deck is long because blade loads or burdens tend to slide back when the blades finish the raking stroke of their cyclic movement and start their elevated backward stroke to their initial raking position. If the deck is too steep, the solids slide back too far. Therefore, the maximum slope of the deck is controlled by the extent to which this back-slippage can be permitted. So the depth of bath is limited in present-day classifiers, because of the undue length of the inclined deck required.

Accordingly, this invention contemplates the design of a deep bath classifier with means for raking settled solids up a steep slope of deck, namely, a steep-slope classifier in which the degree of slope of the deck may be chosen without regard to back-flow or slippage of the material; in which maximum raking and conveying efficiency is attained within a minimum of classifier length; and in which the raked product is elevated to a desired point of delivery within a restricted space and without impairing the selectivity of separation intended to be obtained by the classifier.

This objective of an efficient steep-slope classifier is attained by causing what is in effect positive stepwise progressive impelling of loads of the settled solids up the sloped bottom or deck of the classifier tank, and it is attained by way of coordinated action or interaction between a plurality of companion rake or blade members or sets of raking blades, whereby a load or burden of settled solids is continually relayed from one rake member to the other in alternating fashion.

According to one manifestation, this object is realized in that each rake member moves along a substantially triangularly-shaped cyclic path characterized by a rectilinear forward-moving phase parallel to the slope of the tank bottom, referred to herein as the raking stroke; an ascending phase comprising the upward portion of the elevated return stroke of the rake member; and a steep descent phase of the elevated return stroke that is perpendicular to the tank bottom and is completed by the downward progress of the rake member to its initial raking position at the end of the elevated return stroke, from whence it is ready to re-begin a new raking stroke. So in accordance with the requirement for positive progressive impelling of the solids burden, the coaction of two companion rake members is such that as a blade of the one set reaches the initial raking portion of its stroke it meets a preceding blade of the companion set that is about to start on its elevated return movement.

One feature of the invention resides in so disposing one set of reciprocating raking blades with respect to the second set that the blades of the one set function to rake burdens in alternation with the blades of the other set; that is the second set of blades picks up the burdens directly from the first set as the latter reach the end of their raking stroke as the second set, in effect, continues the raking action of the other, namely, the second set of blades picks up the loads of burdens when and where the first set leaves them.

According to a more particular feature of this invention in this pair of co-operatively related rake structures, each has at least a set of adjacent longitudinally spaced transversely-extending raking blades between which there is continuously interpositioned a corresponding transversely extending raking blade of the other rake structure.

Another feature is that the interaction of the respective sets of blades is such as to require the longitudinal spacing between any set of adjacent transversely extending raking blades of either rake structure.

A still further feature is that between the blades of one rake structure there is continuously interpositioned a transversely extending raking blade of the other rake structure, with a relationship that the spacing between the blades of the first structure is somewhat greater than the sum of the longitudinal thickness of the interpositioned transversely extending raking blades plus twice the length of the stroke of the rake structure.

According to another feature, the two com-

panion rake members are so designed with respect to one another as to permit the raking blades of both to be of equal width and the width thereof to be so related to the measurements of the tank as to prevent any appreciable slippage of solids burden through clearances between the lateral ends of the blades and the adjoining side walls of the tank.

In one of a number of possible embodiments, each reciprocable raking member is actuated through the use of certain rake-supporting swingable track members to effect up-and-down positioning movement of the rake member during its travel in a cyclic path. Each rake member for the longitudinal components of its cyclic movement is actuated by a connecting rod effective to impart longitudinal reciprocatory movement of the rake. The up-and-down positioning movements and the longitudinal reciprocatory movement of both rake members are coordinated by a common main drive shaft which carries the motivating means for causing both components of the cyclic movements.

More specifically, the motivating means comprise cam members to effect the up-and-down positioning movements, and crank portions to effect the longitudinal reciprocatory movement of both rake members.

The invention possesses other objects and features of advantage, some of which with the foregoing will be set forth in the following description. In the following description and in the claims, parts will be identified by specific names for convenience, but they are intended to be as generic in their application to similar parts as the art will permit. In the accompanying drawings there has been illustrated the best embodiment of the invention known to me, but such embodiment is to be regarded as typical only of many possible embodiments, and the invention is not to be limited thereto.

The novel features considered characteristic of my invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of a specific embodiment when read in connection with the accompanying drawings, in which:

Figure 1 is a longitudinal part-sectional view of a classifier equipped with companion rake members interacting in a peculiar manner.

Figure 2 is a plan view of the classifier shown in Figure 1.

Figures 3, 4 and 5 are enlarged views of Figure 1, showing the head portion of the classifier, and showing the main drive elements and rakes respectively in diverse operating positions.

Figure 6 is an end view upon the upper part of the classifier.

Figures 7, 8 and 9 are detailed views representing various operating positions of the raking blades relative to one another, the rakes being designed with respect to operating clearances desired between the transversely-extending raking blades of one member and the longitudinally-overlying stringers of the other raking member.

Figure 10 is a raking diagram for the companion rakes.

Figure 11 is a perspective view of the companion rakes and actuating mechanism therefor.

A tank 10 of the classifier has a sloping bottom 11, side walls 12, an end wall 13, and an adjustable overflow weir 14 defining the water level 15 of the body of liquid or pulp 16 in the tank.

The settled solids or burden conveying mechanism in the tank comprises a pair of interacting or companion rake members 17 and 18 which are cooperatively associated in a peculiar manner to effect a positive progressive, although stepwise accentuated manner the impelling of the solids burden up the slope, as will hereinafter be more clearly described.

The rake member 17 comprises a pair of longitudinal beams or stringers 19 to which are fixed a series of transversely extending raking blades 20. The stringers 19 of the raking member 17 have a pair of upper hanger portions 22 and 23 provided with track rollers 24 and 25, and they have a pair of lower hanger portions 26 and 27 having similar track rollers 28 and 29.

The other rake member 18 is constructed similar to the first mentioned rake member 17, although designed to be embraced by and to operate within the bounds of the construction and substantially within the operating range of the first mentioned rake member 17. Accordingly, the rake member 18 comprises a pair of longitudinal beams or stringers 30 and 31, a set of transversely-extending raking blades 32 connected with the stringers by way of bracket portions 33 designed as of a minimum length dictated by conditions herein described.

The actuating mechanism for the companion rake members 17 and 18 will now be described:

The upper hanger portions 22 and 23 of the rake member or rake structure 17 are operatively supported by way of their track rollers 24 and 25 upon swingable track members 34. A track member 34 can be said to constitute a part of a bell crank-like element 35 which has a fulcrum portion or rocker shaft 36 journaled upon the side walls of the tank, the track member 34 constituting the one and substantially horizontally extending arm of that bell crank-like element, while the other arm of the bell crank-like element is indicated by the numeral 37 extending substantially upward, and which is the one by which the bell crank-like element is to be rocked.

The lower hanger portions 26 and 27 of the rake member 17 by way of their track rollers 28 and 29 are operatively supported by swingable track members 38. A track member 38 again constitutes a substantially horizontally extending arm of a bell crank-like element 39 which has a fulcrum portion or rocker shaft 40 journaled upon the side walls of the tank, which bell crank-like element has another and substantially upwardly extending arm 41 by which the bell crank-like element 39 is to be rocked.

A reach rod 42 interconnects the arms 37 and 41 of the respective bell crank-like element 35 and 39, and they in turn are rocked in unison by way of an actuating rod or link 43 which connects the arm 37 with a rocker arm 44 pivotally mounted upon the classifier tank at 45. The rocker arm 44 is provided intermediate its ends with a cam roller 46 cooperatively associated with and controlled by a cam member 47 which is fixed upon a main drive shaft 48 extending transversely of and journaled upon the classifier tank.

The cam member 47 comprises a protruding or outlying portion 49 having a circularly and convexly arcuate cam face 50, and it has a receding or inlying portion 51 having a circularly and convexly arcuate cam face 52. As will hereinafter be more clearly described, the outlying cam

face 50 corresponds to the elevated return stroke of an associated rake member, while the inlying cam face 52 corresponds to the solids raking structure of the associated rake member. The cam member 47 accordingly also has between the active arcuate cam faces transitional or shoulder portions 53 and 54. The rotation of the cam member 47 will effect up and down transverse positioning movement of the associated rake member 17.

Longitudinal reciprocatory movement of the rake member 17 is effected by way of a connecting rod 55 which has one end pivotally connected with the upper rake hanger portions 22 and 23 through a transverse bracing rod 56 which interconnects the hanger portions and through bracket portions 57 which are rigid with the rod 56. The other end of the connecting rod 55 engages upon and is driven by a crank portion 58 of the main drive shaft 48. The face relationship between the crank portion 58 and the associated cam member 47 is such that the rotation of the main drive shaft will effect a cyclic movement of the rake member 17 comprising a reciprocatory raking stroke and an elevated return stroke of a raking diagram which may be of the type shown in Fig. 10 and as indicated by the letter P.

The companion rake member 18 is herein shown to be actuated substantially in the same fashion as the first mentioned rake member 17, the respective operating phases of the two rake members being controlled from the main drive shaft 48 although staggered approximately 180 degrees and operated to effect the positive progressive, although stepwise accentuated raking movement as desired to be obtained from this mechanism.

The stringers 30 and 31 of the companion rake member 18 have upper hanger portions 59 and 60 provided with respective track rollers 61 and 62, and they have lower hanger portions 63 and 64 provided with respective track rollers 65 and 66. The upper hanger portions 59 and 60 of rake member 18 are operatively supported upon swingable track members 67. A track member 67 constitutes the one and substantially horizontally extending arm of a bell crank-like element 68 having a fulcrum portion or rocker shaft 69 journaled upon the side walls of the tank, the bell crank-like member having another substantially upwardly extending arm 70 by which the bell crank-like member is to be rocked.

The lower hanger portions 63 and 64 of the rake member 18 by way of their track rollers 65 and 66 are operatively supported by swingable track members 71. A track member 71 again constitutes the one and substantially horizontally extending arm of a bell crank-like element 72 having a fulcrum portion or rocked shaft 73 journaled upon the side walls of the tank, the bell crank-like member having another and substantially upwardly extending arm 74 by which the bell crank-like member is to be rocked.

A reach rod 75 interconnects the upwardly-extending arms 70 and 74 of the respective bell crank-like members 68 and 72, which in turn are rocked in unison by way of an actuating rod or link 76 which constitutes an operating connection between the arm 74 and a rocker arm 77 which latter is pivotally mounted upon the classifier tank as at 78. The rocker arm 78 is provided intermediate its ends with a cam roller 79 engaging upon and controlled by a cam member 80 which is fixed upon the aforementioned main drive shaft 48. This cam member 80 is similar to the aforementioned cam member 47, although it is staggered in phase approximately 180 degrees with respect thereto. Accordingly, the second cam member 80 has an outlying or protruding cam portion 81 having a circularly and convexly arcuate cam face 82, and it has an inlying or receding cam portion 83 having a relatively recessed or circularly and convexly arcuate cam face 84. Between the respective protruding and recessed cam faces 82 and 84 there are transitional cam faces or shoulder portions 85 and 86. The rotation of the cam member 80 effects the up and down transverse positioning movement of the associated rake member 18, whereas the longitudinal reciprocatory movement is imparted thereto by way of a connecting rod 87, one end of which is pivotally connected with the stringers 30 and the rake member 18 as by way of a transverse bracing rod 88 that interconnects the stringers and by way of bracket portions 89 fixed to the bracing rod 88. The other end of the connecting rod 87 operatively engages upon and is driven by a second crank portion 90 of the main drive shaft 48, and it is staggered 180 degrees as against the first mentioned crank portion 58. Again, the same as in the case of the first described rake member 17, the phase relation between the crank portion 90 and the associated cam member 18 is such that the rotation of the main crank shaft will effect a cyclic rake movement of the rake member, which comprises a rectilinear solids raking stroke and an elevated return stroke as in a raking diagram Q of the type shown in Fig. 10. Diagram Q is similar to the aforementioned diagram P executed by the first mentioned rake member 17.

From Fig. 10 it will be noted that a series of diagrams P of the first mentioned rake member 17 alternates with a series of similar diagrams Q executed by the second mentioned rake member 18. It should furthermore be noted that for the proper functioning of the raking mechanism as herein contemplated, and theoretically speaking, the aggregate length of a pair of mutually adjoining diagrams P and Q should substantially equal the spacing of the raking blades of either rake member 17 or 18, as will be more clearly understood from the following discussion of the operation of the mechanism.

In Fig. 6 it appears that the transverse raking blades 20 of the rake element 17 extend closer to the side walls of the tank than do the blades 32 of the companion rake member 18, for the structural reason that the ends of the blades 32 must pass clear of the longitudinal stringers 19 of rake member 17. On the other hand, it is also noted that the bracket portions 33 of the rake member 17 must be long enough to permit the top edges of the blades 20 of the other rake member 18 to move clear of the longitudinal stringers 30 and 31 of the rake member 18 during certain phases of the respective raking cycles of both rake members.

Figs. 7, 8 and 9 are semi-diagrammatic fractional detail views of the cross-section of the classifier illustrating a refinement according to which the rake blades 17 and 18 are made of equal size with respect to the width of the tank, so that slippage between their extreme outer edges and the side walls of the tank is reduced to a practical minimum.

Referring to the aforementioned Figs. 7, 8 and 9, a portion of the tank in cross-section is designated by the numeral 91. The first of a

pair of rake members is designated by the numeral 92 and it comprises the longitudinal stringers 93 and the raking blades 94 connected to the stringers by way of bracket portions 95. The second of the rake members is designated by the numeral 96 and it comprises longitudinal stringers 97 and raking blades 98 connected to the stringers by way of bracket portions 99. According to the relative positions (see Fig. 7) of the rake members relative to one another and to the tank, it appears that both bracket portions 95 and 99 are shown to have the identical length S.

The bracket portions 95 and 99 respectively are long enough to permit the top edge portions of the respective raking blades of each, one rake member to move clear of the lower edge portions of the stringers of the other rake member during their respective raking cycles. Consequently, Fig. 7 shows both rake members in their lowermost position relative to the tank bottom.

Fig. 8 shows the first mentioned rake member 92 in raking position while the blades of the other rake member 96 are elevated and will clear the stringers as indicated by the distance S^1.

Fig. 9 shows the reverse condition of Fig. 8 in that the second mentioned rake member 96 is now in raking position while the blades of the first mentioned rake member 92 are in an elevated position and will clear the stringers 97 as indicated by the distance S^2.

Axles for the mounting of the respective upper and lower track rollers of the rake member 17 are designated by the numerals 100 and 101 and axles for the mounting of the respective track rollers of the rake member 18 are designated by the numerals 102 and 103.

The function of the present classifying apparatus is best explained on the basis of the raking diagram in Fig. 10 and with the aid of Figs. 3, 4 and 5 showing a series of operating positions incident to the functioning of the mechanism.

In Fig. 3 the rake member 17 has just completed a raking stroke and is about to enter upon its rearward elevated return stroke, and consequently it is positioned corresponding to the point *b* of the raking diagram P. At this time the companion rake member 18 is about to enter upon its oppositely or forwardly directed solids raking stroke and it is thus positioned according to point *d* of the diagram Q. Otherwise expressed, according to Fig. 3 of the mechanism, the blades 32 of rake member 18 have just taken over the solids burden from the blades 20 of the rake member 18 at which time the cam roller 46 engages the shoulder portion or transitional cam face 52 of the cam member 47 prior to its being forced on to the protruding or outlying cam face 50, while the other cam roller 79 engages the shoulder portion or transitional cam face 85 of the cam member 80, prior to its continuing on to and over the recessed or inlying cam face 84.

Accordingly, incident to the rotation of the main drive shaft 48 and of the cam members and crank portions thereof, the respective rake members 17 and 18 move from their Fig. 3 position (or else from points *b* and *d* of Fig. 10 diagram) in countercurrent fashion to the intermediate stroke position of Fig. 4 corresponding to intermediate points *m* and *m'* of the respective diagrams P and Q. The rake member 17 then moves on to the highest point *c* of the diagram as the companion rake member 18 reaches the final phase of its forward raking stroke. At the very conclusion of its stroke, however, the rake member 17 descends substantially abruptly or perpendicularly from point *c* to point *a* of the diagram at the time the rake member 18 reaches the final point *e* of its then raking stroke. Both rake members 17 and 18 are thus positioned as shown in Fig. 5, which means that now the rake member 18 in turn has taken over the solids burden from the rake member 17. Then the raking cycle begins anew as the solids burden is relayed from one rake member to the other in alternating fashion, resulting in what is in effect a positively progressing although stepwise accentuated solids conveyance forwardly and up the slope of the tank bottom. It is also found (see Fig. 10) that the longitudinal spacing of any set of adjacent longitudinally-spaced transversely extending raking blades of either rake structure between which there is continuously interpositioned a transversely extending blade of the other rake structure is somewhat greater than the sum of the longitudinal thickness of the interpositioned transversely extending raking blades plus twice the length of the rake structure stroke. (See dimension L—Fig. 10.)

While the character of the raking diagram or raking path might be modified to meet varying requirements or conditions, it is noted that the peculiar substantially triangular shape of the raking path and particularly the perpendicular drop in the final phase of each rake member elevated return stroke is responsible for the efficient relaying of the solids burden from one rake to the other, to insure the positive progressive character of the solids conveyance.

From the foregoing it is clear that with the rake-actuating mechanism described a cyclic raking path can be and is realized for each rake member according to the diagram of Fig. 10, which cyclic movement has a rectilinear raking stroke phase parallel to the sloping tank bottom, a relatively ascending return stroke phase rearwardly and away from the bottom, and a perpendicular drop from the highest point of the return movement back to the initial point of the forward raking stroke.

A cyclic movement of this character for each rake is realized because the respective swingable track members (track members 34 and 38 supporting the rake member 70, and track members 67 and 71 supporting rake member 18) are held in a lower angular position during the respective forward raking strokes incident to the functioning of the respective controlling cam members 47 and 80; and because the track members are held in an upper angular position incident to the functioning of the respective cam members 47 and 80 during the major portion of the elevated return stroke; the perpendicular drop of each rake member at the end of its return stroke being effected by virtue of and incident to the downward angular movement of the respective swingable track members 34, 38, 67 and 71 respectively from their upper to their lower angular positions.

It will be seen that the rake actuating mechanism in one particular form herein disclosed depends upon the functioning of its swingable track members for transverse up and down positions of the respective rake members, and it depends upon the crank-actuated connecting rods in order to produce the longitudinal reciprocating component movement of the rake members. The principle of function of the actuating

mechanism herein shown and a detailed description of its operation will be found in the co-pending companion application Serial No. 186,-942, that is to say, the present mechanism is in some respects a duplication or duplex arrangement of a corresponding mechanism disclosed and described in the co-pending application. This co-pending application also discloses the construction of a crank-operated connecting rod similar to the connecting rods 55 and 87 of the present mechanism, and which connecting rod is capable of resilient foreshortening in response to obstructions that might be met by a rake member on its rearward stroke.

I claim:

1. A classifier comprising an inclined deck; a pair of cooperatively-related rake structures each having at least a set of adjacent longitudinally-spaced transversely-extending raking blades between which there is continuously interpositioned a corresponding transversely-extending raking blade of the other rake structure; common actuating means for imparting to each of said rake structures guided reciprocative movements along a cyclic path; the longitudinal space between any set of longitudinally-spaced transversely-extending raking blades of either rake structure between which there is continuously interpositioned a transversely-extending raking blade of the other rake structure being somewhat greater than the sum of the longitudinal thickness of the interpositioned transversely-extending raking blade plus twice the length of the rake structure stroke, said cyclic path of each rake structure being composed of a substantially rectilinear forward raking movement and a non-raking return movement having an elevated portion and a final path portion directed substantially normal to said deck and said rectilinear movement, the timed relationship of the respective cyclic movements of the two rake structures furthermore being such that a raking blade of one rake structure is substantially at the end of its rearward stroke at the end of the rectilinear forward stroke of the adjacent blade of the other rake structure.

2. A classifier comprising an inclined deck; a pair of cooperatively-related guided rake structures having continuously interpositioned longitudinally-spaced transversely-extending raking blades operatively-disposed over and with respect to said deck, each rake structure having a pair of longitudinal stringers upon which the blades are mounted, the blades of one rake structure extending substantially over the identical width of said deck as the blades of the other rake structure; and common actuating means for reciprocating each of said structures so as to impart thereto at one period longitudinal upward and forward raking movement along said deck and for imparting thereto at a succeeding period an elevated rearward non-making return movement and for reciprocating said rake structures in timed relationship with respelt to each other so that when the forward raking movement is being imparted to either one of the structures an elevated rearward non-raking movement is being imparted to the other of said structures; the longitudinal spacing between adjacent blades of each rake structure that are located longitudinally ahead of and behind an interpositioned raking blade of a companion rake structure being somewhat greater than the sum of the longitudinal thickness of each interpositioned raking blade plus the length of a cyclic path of raking blade movement.

3. A classifier having an inclined deck and comprising in operative combination therewith a pair of rake structures each comprising a series of longitudinally-spaced raking blades with the longitudinal spacing between adjacent blades of one rake structure being substantially equal to the longitudinal spacing between adjacent blades of the other rake structure and with said rake structures being so disposed relative to each other that each of certain raking blades of one rake structure is continuously positioned within the longitudinal space defined by adjacent blades of the companion rake structure, each rake structure having a pair of longitudinal stringers upon which the blades are mounted, the blades of one rake structure extending substantially over the same width of said deck as the blades of the other rake structure; and means for imparting positionally-controlled reciprocative longitudinal movements to said rake structures whereby each of said rake structures has imparted thereto a raking movement forwardly with respect to said inclined deck and a rearward elevated non-raking return movement but in such timed relationship with respect to each other that when a forward raking movement is being imparted to either one of said rake structures a rearward elevated non-raking return movement is being imparted to the other of said rake structures whereby incident to the coordinated raking movements thereof material is conveyed upwardly along the inclined deck and ultimately to discharge therefrom; the rake structures being disposed relative to each other so that some of the raking blades of one of the rake structures have cyclic movements along forward cyclic paths of longitudinally-spaced series of cyclic paths and so that some of the raking blades of the other rake structure have movements along rearward cyclic paths of the longitudinally-spaced series of cyclic paths.

4. A classifier comprising an inclined deck, a pair of cooperatively related rake structures each adapted to be operated in reciprocating bodily cyclic fashion and having substantially equal length of stroke, said structures being disposed in inter-acting relationship with one another so that one rake structure performs a forward solids raking stroke while the other performs an elevated non-raking return stroke and vice versa, whereby the solids burden is alternately engaged by each of said structures in order to effect progressive step-wise conveyance of settled solids upwardly along said deck, each of said rake structures comprising blades extending transversely of the direction of the rake movement and spaced from one another a distance substantially equal to twice the length of a raking stroke, a blade of one rake structure being continuously interpositioned between a forwardly adjacent and a rearwardly adjacent blade of the other rake structure, to perform its cyclic operating movement within the limits defined substantially by the rearward end position of the forwardly adjacent blade and by the forward end position of the rearwardly adjacent blade of said other rake structure, actuating means associated with said deck for each rake structure to impart thereto said cyclic path of movement composed of a substantially rectilinear solids raking movement extending substantially the length of the stroke, and further composed of a return movement having an elevated portion

and a final path portion directed substantially normal to said deck and said rectilinear movement, and means for operatively interconnecting said actuating means of both rake structures in such timed relationship that a raking blade of one rake structure is substantially at the end of its rearward stroke at the end of the rectilinear forward stroke of the adjacent blade of the other rake structure.

5. A classifier according to claim 4, in which said timed relationship is such as to effect a substantial coincidence of the starting of the rectilinear raking stroke of a blade of one structure with the starting of the rising movement of the rearwardly adjacent blade of the other rake structure.

6. A classifier according to claim 4, in which said timed relationship is such that a blade of one rake structure is detained substantially in its forward raking end position at least until the forwardly adjacent blade of the other rake structure has intercepted the solids burden of the first-mentioned blade.

7. A classifier as defined in and by claim 4, wherein a series of raking blades of one rake structure is interpositioned with respect to a series of raking blades of the other rake structure; wherein the raking blades of one rake structure move in a longitudinally spaced series of forward cyclic paths; and wherein the raking blades of the other rake structure move in a longitudinally spaced series of rearward cyclic paths spacedly interposed between the forward cyclic paths whereby the cyclic paths of the raking blades of one rake structure are not intersected by and do not intersect the cyclic paths of the raking blades of the other rake structure.

CHARLES H. SCOTT.