J. WILLIS.

SAND GRADING APPARATUS FOR GLASS GRINDING MACHINERY.

APPLICATION FILED OCT. 18, 1915. RENEWED AUG. 28, 1916.

1,223,461.

Patented Apr. 24, 1917.

3 SHEETS—SHEET 1.

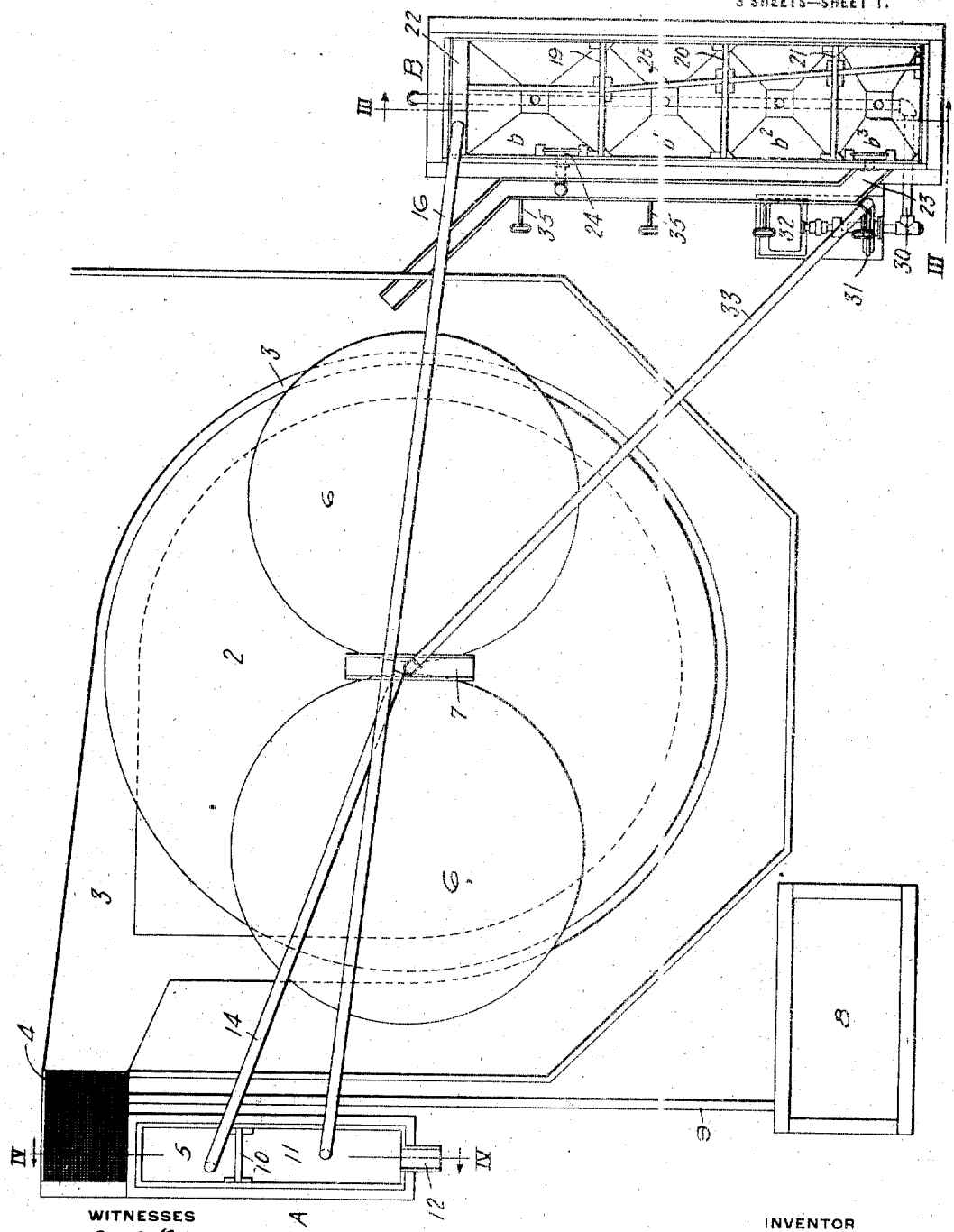

FIG. 1

WITNESSES

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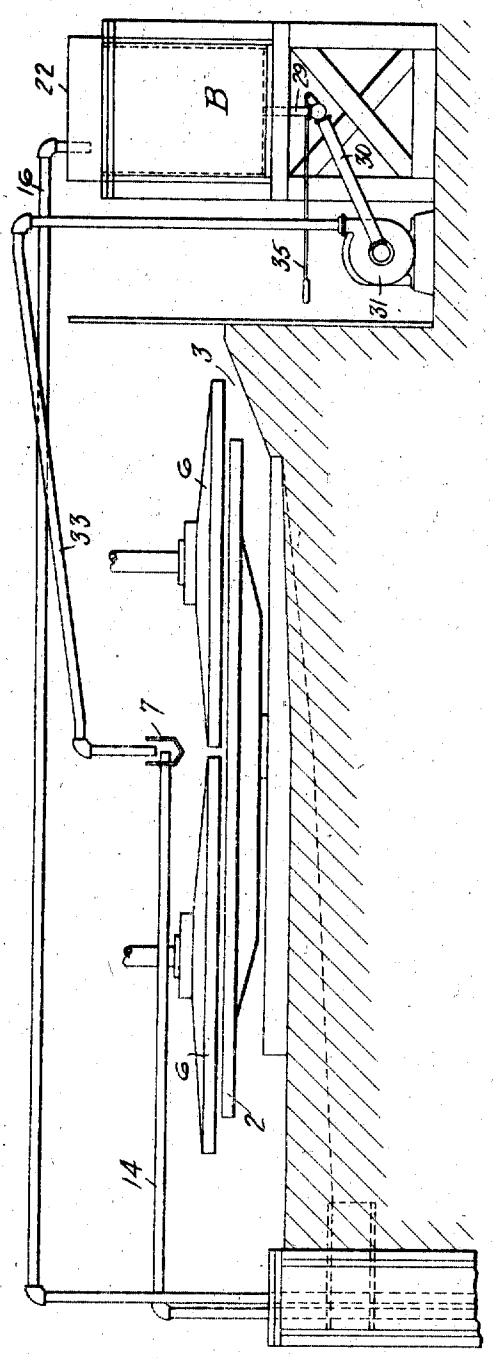

FIG. 2

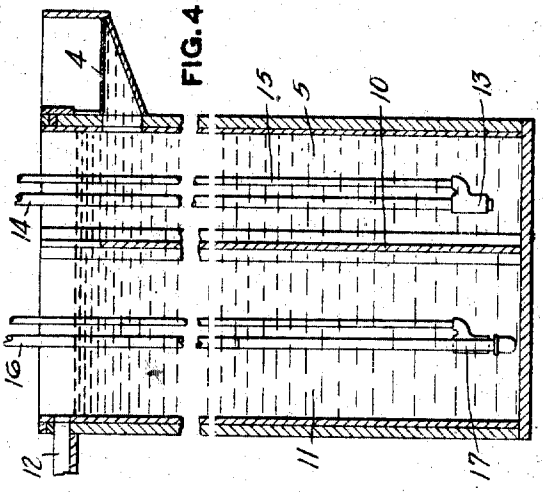

FIG. 4

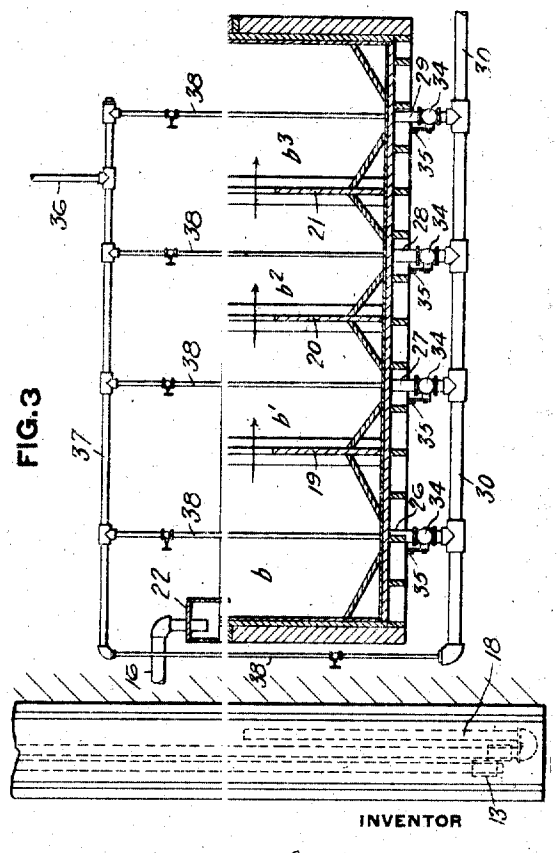

FIG. 3

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3 SHEETS—SHEET 3.

FIG. 5

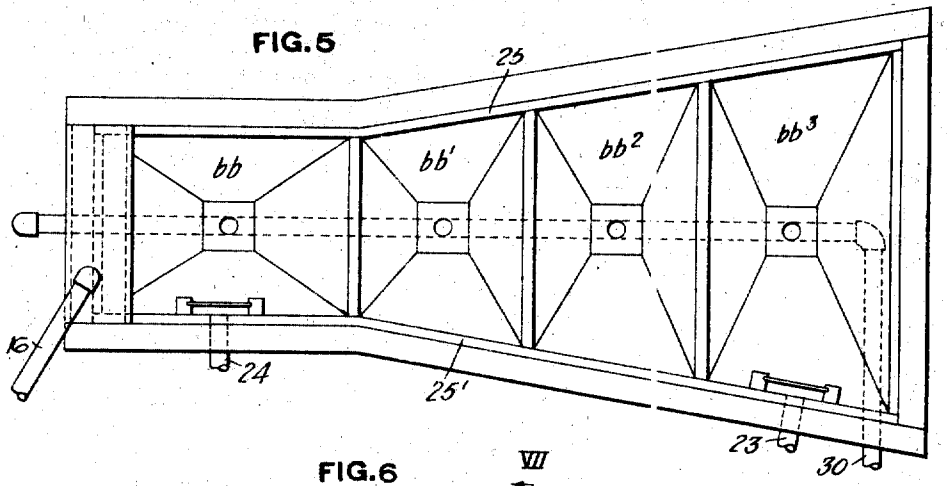


FIG. 6

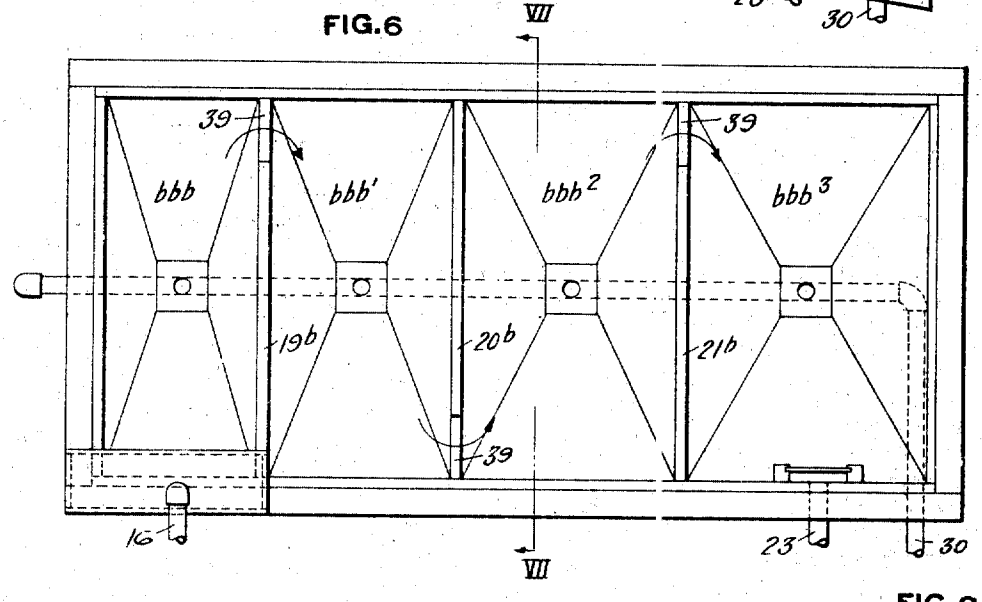


FIG. 7

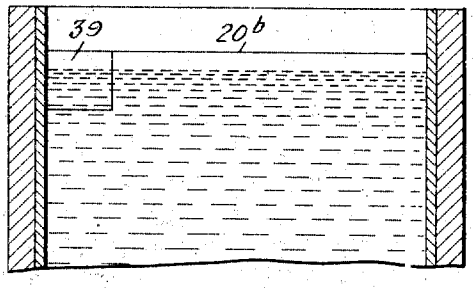
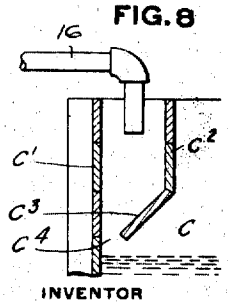


FIG. 8



WITNESSES

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JOHN WILLIS, OF KANE, PENNSYLVANIA, ASSIGNOR TO AMERICAN PLATE GLASS COMPANY, OF KANE, PENNSYLVANIA, A CORPORATION OF NEW JERSEY.

SAND-GRADING APPARATUS FOR GLASS-GRINDING MACHINERY.

1,223,461. Specification of Letters Patent. Patented Apr. 24, 1917.

Application filed October 18, 1915, Serial No. 56,348. Renewed August 28, 1916. Serial No. 117,383.

To all whom it may concern:

Be it known that I, JOHN WILLIS, a citizen of the United States, residing at Kane, in the county of McKean and State of Pennsylvania, have invented certain new and useful Improvements in Sand-Grading Apparatus for Glass-Grinding Machinery, of which the following is a specification.

My invention relates to improvements in apparatus for grinding plate glass, and particularly refers to means for classifying the sand or other abrasive used, collecting it in separate receptacles, transferring it with water to the table for the grinding operation, collecting and returning the sand and water to the classifying apparatus, adding new abrasive to the circulation from time to time, and eliminating the waste material.

A preferred embodiment of the invention is illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of an apparatus utilizing my invention, and showing it in connection with the usual plate glass grinding table.

Fig. 2 is a sectional elevation of Fig. 1, showing the relative position of the sand grading mechanism to the table and its parts.

Fig. 3 is a longitudinal sectional view through the series of secondary classifying chambers, indicated by the line III. III. of Fig. 1.

Fig. 4 is a similar view partly broken away, indicated by the line IV. IV. of Fig. 1.

Fig. 5 is a plan view showing a series of classifying chambers having diverging walls, somewhat similar to the classifying chambers shown in Fig. 1.

Fig. 6 is a similar view showing a modified arrangement of classifying chambers.

Fig. 7 is a transverse sectional view, indicated by the line VII. VII. of Fig. 6.

Fig. 8 is a sectional detail view showing a modification.

Various processes have been utilized in connection with the art of grinding plate glass and other material, for the classifying or separation of the abrasive used, which is usually sand, into various grades of coarseness.

It is desirable in the grinding operation to supply the coarsest sand for the first rough grinding operation, usually requiring the longest treatment. The successive finer grades are then furnished, with water, finishing the grinding operation prior to the emery treatment.

Sand has been customarily used for this work for many years; the fine sands were collected in sand pits, into which they were deposited from a stream flowing from the table over barriers, similar to the well known sluice box method. Other apparatus has been designed and processes have been used utilizing upward flow of water for the purpose of separating the sand into various grades or strata in suspension, the sand then being taken off from the various levels, and used on the table, or stored for future use as needed.

Sand by its nature, tends to settle into compact masses by gravitation through a quiescent mass or body of water, or to remain in suspension in the presence of an opposing upward current. It may be carried along in a horizontal stream, from which it will precipitate by gravity, depending on the rate of flow of the current, depth of fall, etc. The latter is merely an illustration of well-known phenomena of nature, in connection with the beds of streams or rivers.

In my invention, I utilize the gravitating tendency of sand in a quiescent body of water, or in a horizontally flowing stream, tending to first deposit the heavier and larger grains, and successively those of smaller and lighter size and weight, by precipitation. I have utilized for such purpose a series of compartments or chambers through which a stream of water carrying the sands in suspension is caused to circulate in its course from the grinding table and eventually back thereto, and I employ means for positively removing and supplying the sand as needed from the various collecting agencies to the glass grinding table. I have also utilized, in connection with the classifying chambers and the horizontally traveling stream therethrough and therefrom, a diverging wall construction whereby to gradually increase the width of the stream in its horizontal travel, thereby correspondingly and proportionately decreasing its speed of movement and thus proportionately effecting more rapid precipitation of the suspended sands as the horizontal

stream passes over the several collecting chambers.

Referring to the accompanying drawings, showing preferred embodiments of the invention, 2 represents the usual glass grinding table rotatably mounted upon any suitable support, having the usual surrounding collecting gutter 3 for the centrifugally discharged sands and water, leading backwardly to a screen 4 which is interposed in the course of flow to the preliminary receiving pit or chamber 5.

Superimposed above the rotatable table 2 are the usual grinding runners 6, 6, of well-known construction, underneath which the glass plates are rotated by the table 2, in connection with the supply of abrasive and water, and the customary shoes of the runner.

A distributing trough 7 of any suitable construction is usually located above the table at or about its middle portion, whereby to distribute the sands and water to the table, and between the runners, as it is delivered to the trough by either one of the conveying pipes hereinafter described.

The preliminary receiving chamber 5 is located, as shown in Fig. 1, adjacent to the table and to the circulation channel therefrom, to receive all of the water and sand as it is washed off from the table, and to also receive additional quantities of fresh coarse sand from time to time. For such latter purpose, a coarse sand box or bin 8 is located at any convenient position and elevation, whereby coarse sand may be delivered by conduit 9, in connection with a stream of water from a hose, conduit 9 leading to the screen 4, whereby to deliver fresh sand into the circulation and the primary pit 5 of preliminary grader A. Such sand, with the water from the table, together with the already used sands washed therefrom, are thus all discharged into the preliminary chamber 5, in which the coarsest and heaviest sand will fall to the bottom.

The lighter and finer sands, comprising the various grades to be classified by the later treatment, pass horizontally over an intervening partition 10, into an adjacent chamber 11, from which leads a suitable overflow 12 at any convenient point, so as to avoid flushing of the chambers 5 and 11.

The said chambers, as thus constructed, form a primary grader by which the sands are initially separated into two grades, to-wit, coarse sand; and all finer sands which are sufficiently light and small to be carried over the top of partition 10, by the horizontally moving stream.

The coarse sands thus collected in chamber 5, are removed therefrom by any suitable means, as an air lift pump 13, having a supply pipe 14 leading to the distributing trough 7 at the middle portion of the table. The air lift pump, if used, is provided with the usual air supply line 15 for the purpose of actuating the pump.

All of the finer grades of sand collected in compartment 11, which are intended for use when re-classified into their several subgrades, are in a similar manner carried by pipe 16 and air lift pump 17 over to the secondary grader B.

If desired, the inlet end of air lift pump 17 may be extended in the form of a goose neck 18 upwardly to any desired level above the bottom of chamber 11, of primary grader A, whereby to take the collected sands from above the bottom, and also utilizing the gravitating tendency of the water contents of chamber 11 in facilitating the action of the air lift pump.

The secondary grader B, like primary grader A, is also located in convenient relation to the rotatable table 2 for distribution of the sands thereto, and comprises a series of sluice boxes or collecting chambers b, b', b^2, b^3, preferably arranged in alinement, one beyond the other, separated by intervening partitions 19, 20, and 21 respectively, of substantially the same height, thereby providing for a horizontal flow or current of water thereover, from one end to the other of the entire secondary grader and its series of collecting chambers.

Pipe 16 discharges the sands and water into the first compartment b, a surrounding housing box or cover 22 being preferably employed to prevent splashing, and insuring the depositing of all of the water and sands into the chamber b.

At its other end an overflow passage 23 leads from the last collecting chamber b^3 by a suitable trough back to the space surrounding the table, and eventually, by gutter 3, to the circulation. A similar overflow connection for the first chamber b may be provided, as indicated at 24, such overflows having adjustable gates or shut-off devices, as desired.

For the purpose of facilitating precipitation of the finer sands through the substantially quiescent contents of the several chambers b, b', b^2, b^3, it is desirable that the longitudinal travel therethrough, of the main horizontally traveling stream, shall be as long as possible, and that the speed of the current shall be gradually retarded or lessened.

For such purpose I have gradually widened the channel by diverging one of the said walls 25, of compartments b', b^2, b^3, thereby correspondingly reducing the rate of flow therethrough, while the initial chamber b is of the narrowest width, but somewhat longer. The increased travel through the initial chamber b facilitates the depositing of the sands of the desired fineness, being the coarsest of the assembled fine sands, into

the first compartment b, all of the remaining sands passing over the first barrier or partition 19. Continued travel of the current over the successive compartments b, b', b^2, b^3, and the intervening barriers 19, 20 and 21, through the horizontally widening channel, traveling at successively and relatively slower rates of speed in its passage throughout the entire series of chambers, permits the gravitation of the successively finer and lighter sands through the quiescent lower bodies of water, and effects their collection in the bottoms of the several chambers.

These bottoms, as shown in Fig. 3, are preferably sloped downwardly toward their middle portion, and each chamber is connected with the outlet pipe 26, 27, 28 and 29, respectively, each of which pipes in turn is connected with a manifold 30 leading to pump 31 driven by motor 32. A delivery pipe 33 leads from pump 31 over to the middle portion of the table, where the sand and water drawn from any particular compartment of the secondary grader is positively discharged into the trough 7, and therefrom to the table.

As will be observed, the collecting portions of the various chambers of the secondary grader are located below the level of the table 2, the upper portion of the grader being above the level of said table. It therefore follows that the contents of the chambers must be positively removed from the several collecting chambers and carried upwardly sufficiently high to be discharged upon the table, which function is performed by the motor actuated pump 31.

Each of the connecting pipes, 26, 27, 28, and 29, respectively, leading to manifold 30 is provided with a controlling valve 34, having an actuating lever 35, which may extend outwardly underneath the grader B for easy manipulation by the workman, so as to enable him to open the valve of the particular connection desired, according to the grade of sand to be supplied to the table.

For the purpose of flushing manifold pipe 30 or its branch connections 26, 27, 28, 29, at any time, I provide a water supply system consisting of a main supply pipe 36 and manifold 37, having valve controlled branch connections 38 leading to the several pipes mentioned, whereby either of such branch connections may be opened to supply a flushing flow of water to clear out the pipes if desired.

Ordinarily, the several grades of sand being deposited and gravitated, will collect in the central bottom portion of each compartment and will be pumped therefrom and supplied to the table as needed, the overflow of water and surplus sands being returned to the circulation, in connection with fresh sand from the bin from time to time.

In Fig. 5, I show a modified construction of the sand grader comprising a series of chambers bb, bb', bb^2, bb^3, respectively, having the diverging walls 25', 25', at each side of the central chambered portion of the grader, the several parts otherwise being substantially the same as already described as to the construction disclosed in the principal figures of the drawing, and identified by similar numerals, primed.

It will be readily understood that the degree of slope or divergence of the sides 25' may be varied to suit the conditions of the installation, rate of flow desired, extent of deposit, or various other matters within the control of the designer or builder. Also that the first chamber bb may also have diverging walls instead of parallel walls, as shown, the advantage being in the gradual reduction of flow of the horizontal stream, whereby to drop out of the stream the grades of sand desired to be eliminated from the current into the succeeding compartment.

In Figs. 6 and 7, I show a still further modification of the retarded current utilization idea, comprising a series of chambers bbb, bbb', bbb^2, bbb^3, respectively, having partitions 19^b, 20^b, 21^b, respectively, and overflow passages 39 through the upper end portion of each of said partitions, but alternating in position, whereby to effect a zigzag or alternating flow of the horizontal current, from one of such compartments to the other, throughout the entire series. By this means, and by also spacing the several partitions at successively increasing distances apart, if desired, I insure increasing width of the channel through the upper portions of the compartments, successively, thereby effecting the desired gradual reduction in speed of travel and the resulting precipitation of the sands into the several compartments, in the same manner as already described.

By collecting the several grades of sand by natural precipitation through practically still or quiescent bodies of water, into which they are deposited through and from a superimposed horizontally flowing stream of gradually decreasing speed, I utilize the natural gravitating tendency of the sand, as controlled by its size and weight, and thereby insure the collection of a series of grades of successively reduced size and weight, for utilization in the same order, without the necessity of resorting to any artificial or forced separation, suspension, or precipitation of the several grades, by the use of vertical flow currents, or other devices commonly employed in this art.

In Fig. 8, I show a further modified construction providing means for delivering the sand and water into the first fine sand grading compartment b as it comes over from the chamber 11 of primary grader A by pipe 16. Said pipe delivers the sand

and water between the end wall c' of the secondary grader B and an opposite inner wall c^2 having a lower inwardly inclined ledge c^3, providing a reduced aperture c^4, through which the sand and water pass to the main interior.

By this means I insure an absolutely calm flow of the water from the first to the second compartment, the sand and water being thus thrust toward the straight inner side of the tank and falling quietly into the interior. The construction also avoids the creation of any reverse or upward flow currents, thereby facilitating the quiescence of the contents of the tank.

The advantages of the invention are that it provides a system of sand grading utilizing natural forces, by properly designing the primary and secondary graders, and using the positively acting transporting mechanism and the several other parts as above described.

The invention is comparatively simple in construction and economical to build and maintain in order. It performs its functions to the desired degree, facilitating and cheapening the grinding operations, and is at all times under the control of the operator, while utilizing all of the coarse sand to destruction, and providing for renewal of fresh sand as needed during the grinding operation.

Having thus described my invention, what I claim is:

1. Apparatus for classifying abrasive material for a glass grinding machine comprising, in combination with a glass grinding table, means for collecting the abrasive and water, a partitioned primary tank adapted to receive the abrasive and water from the table and having a plurality of communicating closed bottom chambers, means for delivering coarse abrasive and water from one of said chambers to the table, a secondary grading tank having a series of settling chambers and intervening partitions, means for removing sand and water from the other chamber of the primary grader to the first settling chamber of the secondary grader, a manifold pipe having connections leading from each settling compartment of the secondary grader, a pump connected with said manifold pipe, and a delivery pipe leading from said pump to the table.

2. In combination with a glass grinding table, a primary grader adapted to receive the overflow therefrom, means for supplying fresh abrasive and water to said primary grader, means for removing coarse abrasive and water from the primary grader and delivering it to the table, a secondary grader having a series of compartments of gradually increasing width, separating partitions between said compartments adapted to provide for a flow thereover of the water and abrasive in suspension, means for removing finer abrasive and water from the primary grader to the first of said chambers, a pump, a conduit connected with said pump and with the bottom of each of the chambers of the secondary grader, and a delivery pipe leading from the pump to the table.

3. In combination with a glass grinding table, a secondary grader having a series of settling compartments and intervening partitions, the cross area of said compartments increasing from one to the other in the direction of the flow, means for removing abrasive and water from the lower portion of each compartment and delivering it to the table, and means for supplying abrasive and water to the first of said compartments and for preventing splashing therein.

4. In combination with a glass grinding table, a sand grading tank having a series of collecting compartments extending below the level of the table, positively acting means for downwardly withdrawing the contents of each compartment singly and for lifting said contents and delivering the same above the table, means for delivering abrasive and water to the first of said compartments, and overflow means for carrying off surplus water and material.

5. In combination with a glass grinding table, a settling tank having a series of communicating chambers separated by transverse partitions below the normal level of the water, said compartments having gradually diverging side walls whereby to increase the cross area of the several compartments successively and effect a gradual diminution in the progress of the current, means for delivering abrasive and water to the first of the said compartments, means for carrying off surplus water and abrasive, and positively acting means for withdrawing the contents of each compartment individually and for delivering it to the table.

6. In combination with a glass grinding table, preliminary collecting chambers for collecting the overflow therefrom and for separating the contained abrasive into a plurality of grades, a secondary grader having a plurality of settling compartments, a splash wall barrier located at the inlet position of the first of said compartments, and a conduit and actuating means therefor adapted to convey abrasive and water from one of the preliminary collecting chambers and to deliver the same behind said barrier into the first compartment of the secondary grader.

7. In combination with a glass grinding table, a secondary grading tank provided with a plurality of cross partitions and corresponding collecting chambers adapted to receive abrasive from an upper horizon-

tally flowing current in grades of successively decreasing size and fineness, said chambers extending below the level of the grinding table, means for supplying abrasive and water to the first of said compartments above the level of the grinding table, a manifold pipe having valve controlled connections leading to the bottom of each of said compartments, actuating handles for the valves of each of said connections, a pump connected with said manifold pipe, and a delivery pipe leading from said pump to the table.

8. In combination with a glass grinding table, a preliminary plural-chamber collecting tank adapted to receive abrasive and water from the table and to separate the contained abrasive into a plurality of grades, a secondary grading tank provided with a plurality of cross partitions and corresponding collecting chambers, means for removing abrasive and water from one of the chambers of the preliminary tank and delivering it into the first chamber of the secondary grading tank, a manifold pipe having valve controlled connections leading downwardly from the bottom of each compartment of the secondary grading tank, a pump connected with said manifold pipe, and a delivery pipe leading from said pump to the table.

9. In combination with a glass grinding table, a preliminary plural-chamber collecting tank adapted to receive abrasive and water from the table and to separate the contained abrasive into a plurality of grades, means for removing abrasive and water from the first of said chambers to the table, a secondary grading tank provided with a plurality of cross partitions and corresponding collecting chambers, means for removing abrasive and water from the second chamber of the preliminary grading tank and delivering it into the first chamber of the secondary grading tank, a manifold pipe having valve controlled connections leading downwardly from the bottom of each compartment of the secondary grading tank, a pump connected with said manifold pipe, and a delivery pipe leading from said pump to the table.

10. In combination with grinding mechanism using abrasive material, an abrasive grading tank having a series of communicating compartments provided with lower collecting portions, means for collecting abrasive and water from the grinding mechanism and delivering it to the first of said compartments overflow means for carrying off surplus water and material from the last of said compartments, and means for positively removing abrasive and water from the lower collecting portions of each compartment singly and for positively delivering the same to the grinding mechanism.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

JOHN WILLIS.

Witnesses:
C. P. HILEW,
J. J. DALEY.