M. A. ROSS.

METHOD OF HANDLING ABRASIVE MATERIAL.

APPLICATION FILED MAY 15, 1920.

1,396,286.

Patented Nov. 8, 1921.

2 SHEETS—SHEET 1.

Fig. 1

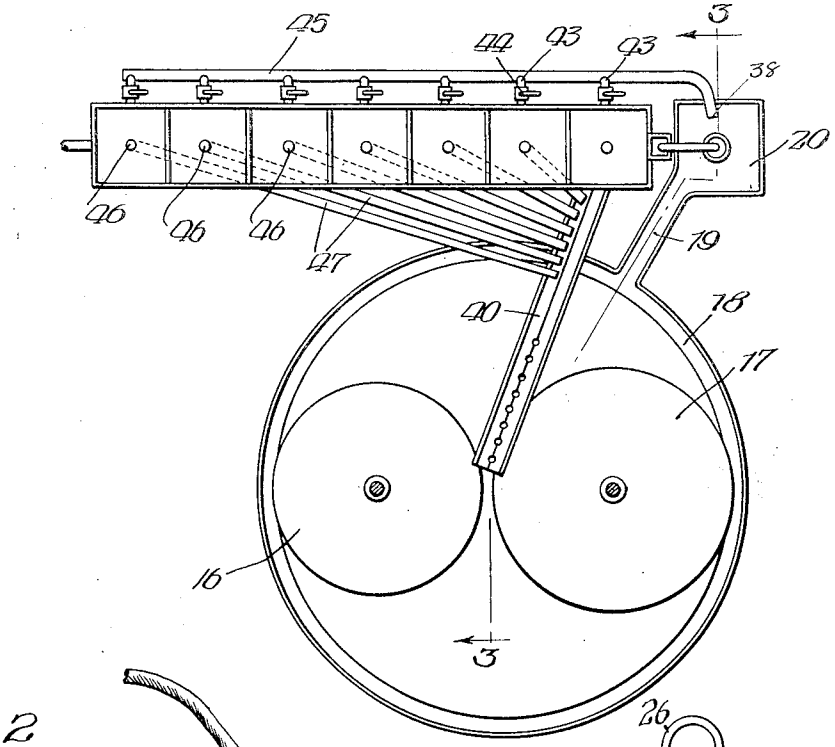
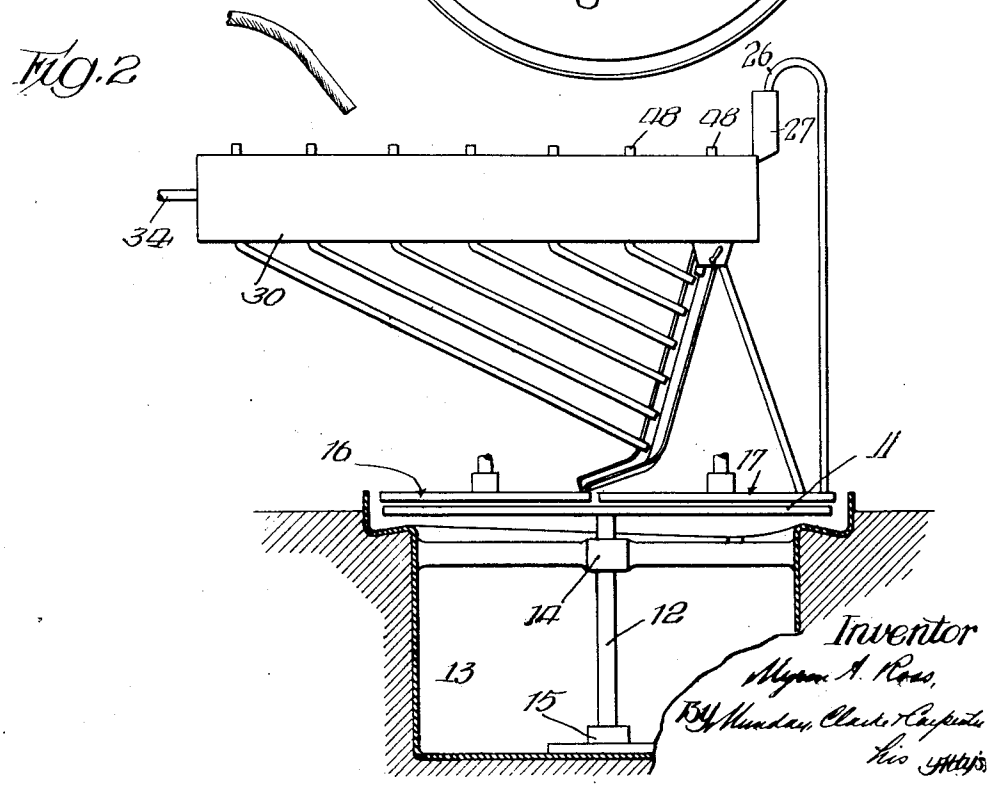


Fig. 2



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2 SHEETS—SHEET 2.

Fig. 3

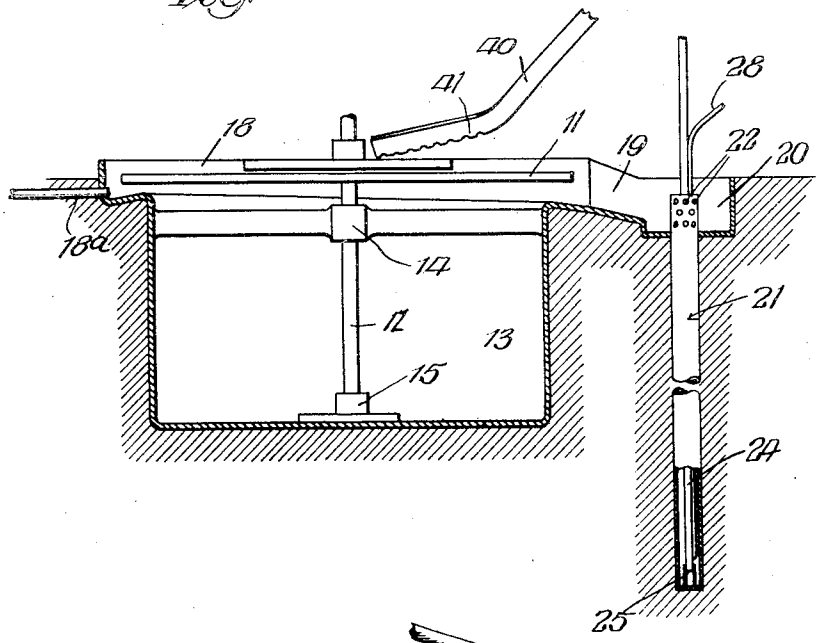


Fig. 4

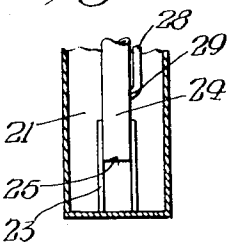
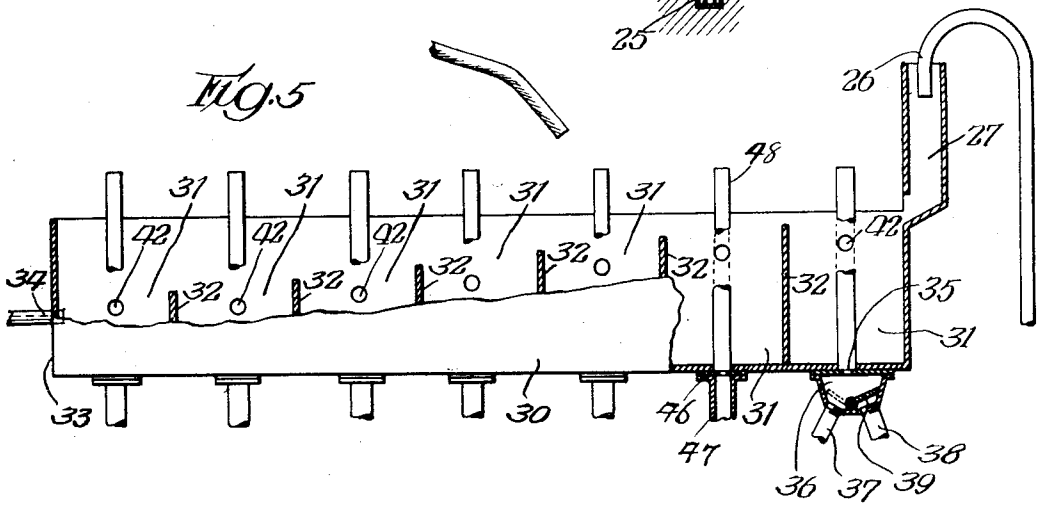


Fig. 5



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METHOD OF HANDLING ABRASIVE MATERIAL.

1,396,286. Specification of Letters Patent. Patented Nov. 8, 1921.

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To all whom it may concern:

Be it known that I, MYRON A. ROSS, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Methods of Handling Abrasive Material, of which the following is a specification.

This invention relates to a method of handling and grading abrasive material in liquid suspension, such as sand mixed with water, and applying the same to a grinding apparatus; the invention has for an object the provision of a method of handling such material in a continuous uninterrupted cycle, which will effect separation of the coarser particles of the material from the finer particles into several grades while the material flows continuously through the system, and permit individual delivery, at will, of any grade of the separated material to the grinding apparatus, without interrupting the continuous flow of the material and without the necessity of regrading previously graded material. In addition to the general object recited above, the invention has for further objects such other improvements and advantages in operation and results as are found to obtain in the methods or processes hereinafter described or claimed.

The method of the invention is of particular utility for supplying in proper sequence grades of abrasive material to grinding apparatus, such as is commonly utilized for grinding and finishing plate glass, and the like. For convenience the present description will be confined to this particular use of the invention; it will be understood, however, that the invention is capable of other applications; hence the scope of the invention is by no means limited to the particular application or specific use herein described as an illustrative example.

In the accompanying drawings, forming a part of this specification, and showing, for purposes of exemplification a diagrammatic representation of an apparatus, by which the method of the apparatus may be practised, but without limiting the claimed invention specifically to such illustrative instance or instances:

Figure 1 is a plan view of an apparatus utilized in practising the present improved method;

Fig. 2 is a vertical sectional elevation of the apparatus illustrated in Fig. 1;

Fig. 3 is a vertical sectional elevation taken on the line 3—3 of Fig. 1;

Fig. 4 is an enlarged detailed sectional elevation of the bottom of the sump; and

Fig. 5 is an enlarged detailed sectional elevation of the grading tank.

The same characters of reference indicate the same parts throughout the several views.

In its illustrated embodiment and application, the method of the present invention is employed in connection with a grinding apparatus, such as is commonly utilized for grinding plate glass and like materials. Such grinding apparatus embodies in its construction a horizontal grinding table 11 mounted on the vertical spindle 12 which is supported within the pit 13 by suitable bearings 14, 15 and is rotated by any preferred drive connection to impart a rotary movement to the before mentioned table 11. Rotatable on vertical axes above the table 11 are the usual runners 16, 17, there commonly being a pair of such runners to each table. These runners are provided with the usual means for maintaining grinding contact of an abrasive material with the surface of a plate of glass supported upon the table 11.

For the purpose of grinding the surface of the plate of glass on the table 11, there is supplied to the table, in proper sequence, abrasive material, such as sand, in progressively finer grades, mixed with a sufficient proportion of water to keep the sand constantly in a fluid state. In the preliminary grinding operation coarse sand is used, but as the grinding progresses and the surface of the plate glass becomes smoother, finer grades of sand are used in progressively increasing degrees of fineness until the surface of the table is smooth enough for being polished. During the grinding operation on the table, more or less of the sand particles suspended in their liquid carrier become more or less finely pulverized, while other particles of sand escape the grinding action. There is thus maintained, by the centrifugal force developed in the table 11 and the runners 16 and 17, a discharge into the gutter

18 surrounding the table 11 which discharge is constituted of a mixture of sand particles of many different grades of fineness and water.

This mixture of variously-ground sand particles and water is washed down around the incline gutter 18 by a constant stream of water supplied from a pipe 18ª which empties into the gutter at the upper end of the incline, as shown in Fig. 3, and the mixture of water and sand flowing down the gutter discharges into a connecting gutter 19, which conveys the mixture to and discharges it in a pit 20. Communicating with the pit 20 is the upper end of a sump or well 21, which may extend vertically into the ground a considerable distance below the bottom of the pit 20 and may be conveniently formed by driving into the ground a pipe of proper bore, with the upper portion of the pipe projecting somewhat above the bottom of the pit and provided with a plurality of inlet holes 22, permitting the mixture of sand and water to pass from the pit into the interior of the pipe, but excluding large particles of foreign matter such as may be deposited in the mixture during the grinding operation.

Extending downwardly within the sump 21 and supported on its bottom by feet 23 is a siphon tube 24, the lower end of which is open to constitute an inlet 25. Above the sump 21, the siphon tube 24 extends vertically beyond the top of a grading tank hereinafter described and the upper open discharge end 26 of said siphon tube is bent over and into a feed spout 27 mounted above one end of said grading tank. An air tube 28 supplied with compressed air from any suitable source also extends downwardly within the sump 21 and discharges its air into the siphon tube 21 at a point 29 located above the inlet 25 of the siphon tube. There is thus provided a pump, the action of which is constantly to lift the mixture of sand and water discharged into the sump 21, from the grinding apparatus, and force such mixture upwardly through the siphon tube 24 and discharge it into the feed spout 27.

Discharging from the bottom of the feed spout 27, the mixture of sand particles of various sizes and water flows into the grading tank 30. As shown in Figs. 2 and 5, this grading tank 30 is constituted essentially of an elongated trough suspended above and located to one side of the table 11. The interior of the tank 30 is divided into a plurality of compartments 31 by transverse baffles 32 which progressively decrease in height intheir order of remotness from the feed spout 27 at the inlet end of the tank, as shown more particularly in Fig. 5. As the highest baffle of the series is nearest the inlet end of the tank and the lowest baffle of the series is nearest the remote end 33 of the tank, and as the intermediate baffles progressively decrease in height from the highest to the lowest baffle in the tank the mixture of sand and water discharged through the feed spout 27 overflows over the highest baffle 32 of the first compartment of the tank into the next adjacent compartment thereof, and subsequently overflowing over the baffle of such next adjacent compartment ultimately fills each compartment 31 of the tank. The filling of these compartments 31 takes place in the order of their proximity to the feed spout 27, each compartment being fed by the overflow from its neighbor that is located nearer to such feed spout. In the first compartment of the tank, which receives the mixture of sand and water directly from the feed spout 27, the coarse particles of sand in the mixture drop out, by reason of their greater specific gravity and in each successive compartment 31 relatively finer particles of sand are precipitated, as the mixture flows from compartment to compartment until the compartment at the remote end of the tank is reached, where the finest particles graded out are precipitated. During the grading in the tank 30, the overflow, composed of water and very fine particles of sand of no especial value, discharges through an overflow pipe 34 located at the remote end of the tank and positioned somewhat below the baffle 32 at the inlet end of that compartment.

While the grading operation is being effected in the tank 30, the coarse particles of sand which are precipitated in the first compartment 31 of the tank are continuously returned to the grinding table 11, so long as the coarse grinding operation is maintained on that table. These coarse particles of sand mixed with a part of the water discharged through the spout 27, pass out through the orifice 35 located in the bottom of the first compartment of the tank into a valve box 36. This valve box communicates with a coarse sand discharge pipe 37 and a return pipe 38, one of which is closed while the other is open by means of a flap valve 39 located in the bottom of the valve box. Assuming that the valve 39 is positioned to close the return pipe 38 the mixture of coarse sand and water passes through the coarse sand discharge pipe 37 to the feed trough 40 which extends to and over the table 11 and is provided at its discharge end with feed holes 41 through which such mixture discharges onto the table. After performing its work on the table, the mixture of coarse sand is again discharged into the gutter 18, thence through the gutter 19 into the sump, from which it is returned by the pump to the grading tank 30, the coarse particles again separated out in the first compartment of the tank and returned to the table and the finer particles carried over

into the grading compartments beyond the first compartment of the tank. There is thus accomplished a continuous separation of the coarse particles of material from the mixture and return of the same in a continuous flow to the grinding apparatus, coupled with a continuous grading out and separation of the finer particles of sand of various grades which are reserved for the subsequent finer grinding operation on the table, as will hereinafter appear. In other words—the grading of the sand into several grades of fineness is effected while the material flows continuously and the coarse particles are separated out of the mixture and returned for regrinding, without interruption in the flow of the material and without the necessity for returning the entire volume of material to the grinding apparatus, which would necessitate a regrading of the entire flow throughout the system. As the material flows through the apparatus the combined volume of the flow at the discharge pipe 34 and the discharge orifice 35 is approximately equivalent to the volume of the flow through the discharge end of the siphon tube 24. Should it be desired to discontinue the return of water and sand to the table 11, the flap valve 39 may be operated to close the coarse sand pipe 37 and open the return pipe 38, this return pipe leading to the sump and permitting the coarse sand and water to be returned to the sump and pump back into the grading tank, without any interruption of the flow. Additional sand may be added to the flow from time to time by shoveling such sand into the pit 20 at the inlet of the sump. In starting the grinding operation, it is usual to shovel a quantity of dry sand on the table 11, the dry sand being discharged into the gutter by centrifugal force and washed down the gutter by the water flowing from the pipe 18^a. The water head in the pipe 18^a is regulated to approximately equal the head of flow in the discharge pipe 34.

After the preliminary coarse grinding operation has been completed on the table 11, subsequent grinding is effected by the use of successively finer grades of sand which have been graded out in the several compartments 31 of the tank located beyond the first compartment. Each compartment of the tank is provided with an overflow discharge orifice 42 located somewhat below the baffle at the discharge side of the compartment. These orifices 42 respectively communicate with discharge pipes 43 provided with valves 44 and are all leading to a manifold 45 which discharges into the pit 20 at the upper end of the sump. The several compartments 31 located beyond the first compartment are furthermore provided with outlets 46 in their bottoms, said outlets 46 respectively discharging into pipes 47 leading to the feed trough 40. The orifice 35 at the bottoms of the first compartments and the outlets 46 in the bottoms of the other compartments are each adapted to be opened and closed by plugs 48 operable from the upper end of the tank. Assuming that the coarse grinding operation on the table has been completed and it is desired to use the next finer grade of sand, the valve 44 of the first compartment is opened. The flow from the siphon tube discharges out of the first compartment through the outlets 35 and 42 and thence into the manifold 45 and return pipe 38 which returns the flow to the sump. In the next compartment the plug 48 is operated to open the outlet 46 and the finer sand may then be washed by the introduction of fresh water into the top of that compartment out of the outlet 46 and into the pipe 47 which carries such mixture of finer sand and water to the table 11. Subsequently the sand and water discharged from the table enters the sump along with the material discharged through the manifold 45. After the graded sand in the second compartment has been exhausted, the graded sand in the third compartment may be conducted to the grinding table 11 in like manner. When this is done the plug 48 is operated to close the outlet 48 in the bottom of the second compartment whereas the plug 48 is operated to open the outlet 46 in the bottom of the third compartment. The valve 43 of the first compartment may then be closed and the valve 43 of the second compartment opened, permitting a recommencement of the grading operation in the second compartment. Obviously, the same operation may be repeated in all of the compartments of the tank until the very finest sand is exhausted out of the last compartment which is adjacent to the discharge pipe 34. While graded sand is being washed out of any compartment of the tank regrading may be carried on in all of the previously emptied compartments, with the result that the utilization of the finer grades of sand does not interrupt the grading operation nor the continuous flow of the material.

The method of the invention may be practised in various ways, other than the particular embodiment that has been described for purposes of illustration, and still be within the scope and subject matter of the claims hereinafter made.

I claim:

1. The method of applying abrasives to grinding apparatus, which consists in conveying the discharged abrasive material mixed with a liquid to a separation operation while the material flows continuously from the grinding operation, separating such material into different grades of fineness, withdrawing the separated grades of such material in any desired sequence independently

of other grades, concurrently conveying back the discharge from the grinding apparatus and grading such discharge independently of the material being withdrawn from the separation operation, substantially as specified.

2. The method of applying abrasives to grinding apparatus, which consists in discharging the abrasive material mixed with a liquid from the grinding apparatus, pumping the discharged material to a grading tank and therein separating the material into different grades of fineness, while continuously returning a portion of the separated material to the pumping operation, substantially as specified .

3. The method of applying abrasives to grinding apparatus, which consists in discharging the abrasive material mixed with a liquid from the grinding apparatus, pumping the discharged material to a grading tank and therein separating the material into different grades of fineness, withdrawing the separated grades of material in said tank in any desired sequence, while continuously returning another portion of the separated material to the pumping operation, substantially as specified.

4. The method of grinding plate glass which consists in supplying sand and water to the glass, while supported on a grinding apparatus, continuously discharging the mixture of sand and water from the grinding apparatus, separating the discharged mixture into different grades of fineness, while the mixture flows continuously, continuously withdrawing the coarser grading of such material and returning it to the grinding apparatus, while maintaining a continuous flow of discharge from the grinding apparatus to the separating operation and then withdrawing the separated grades of such sand in any desired sequence independently of other grades while concurrently conveying back the discharge from the grinding apparatus and grading such discharge independently of the sand being withdrawn from the separation operation; substantially as specified.

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