

H. K. HITCHCOCK.
GRINDING APPARATUS.

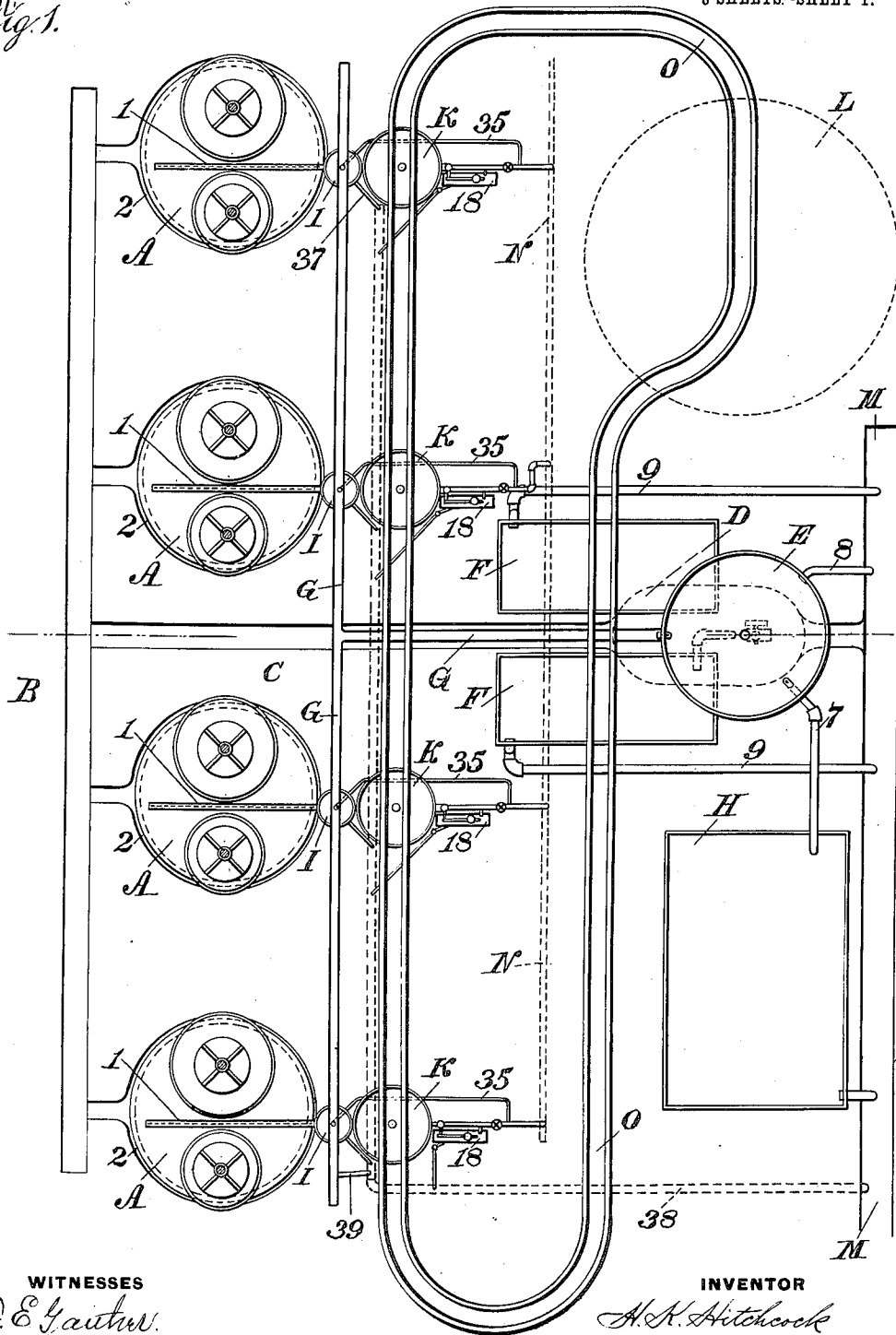
APPLICATION FILED JULY 19, 1907. RENEWED JULY 12, 1909.

934,612.

Patented Sept. 21, 1909.

3 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

D. E. Gauthier.
J. C. Bradley

INVENTOR

H. K. Hitchcock
by atty Paul Synnestvedt

H. K. HITCHCOCK.
GRINDING APPARATUS.

APPLICATION FILED JULY 19, 1907. RENEWED JULY 12, 1909.

934,612.

Patented Sept. 21, 1909.

3 SHEETS—SHEET 2.

Fig. 2.

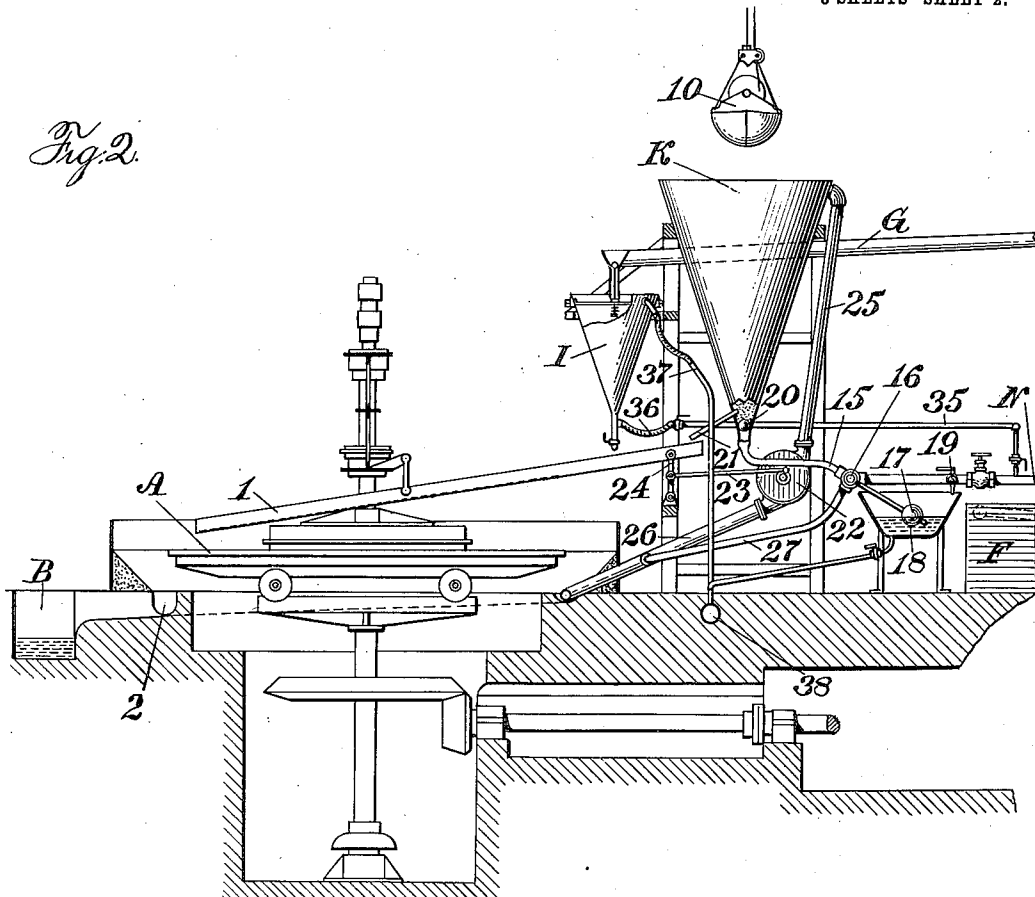
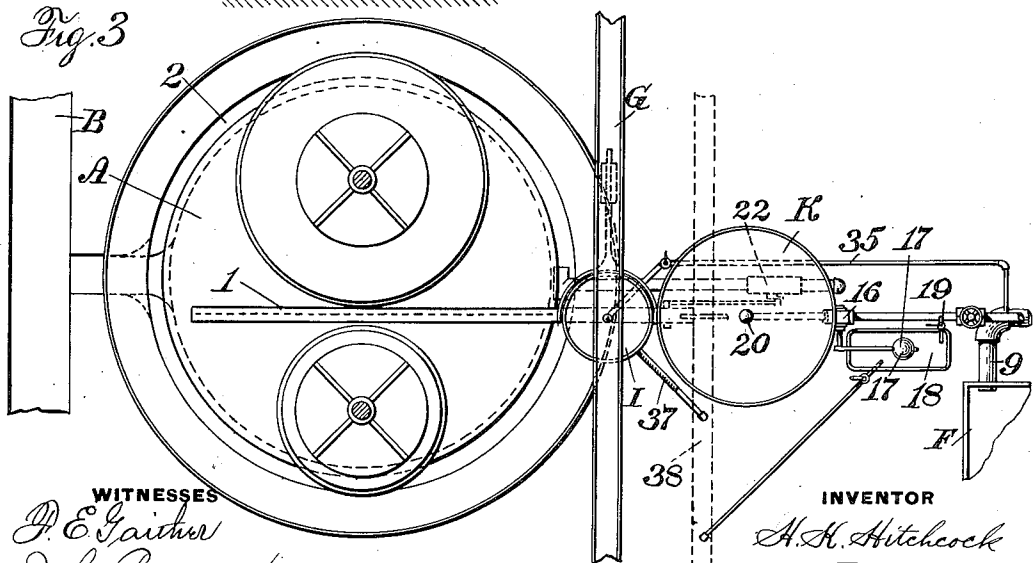


Fig. 3.



WITNESSES

D. E. Gaither
J. C. Bradley

INVENTOR

H. K. Hitchcock
by atty Paul Symmestredt

H. K. HITCHCOCK.
GRINDING APPARATUS.

APPLICATION FILED JULY 19, 1907, RENEWED JULY 12, 1909.

934,612.

Patented Sept. 21, 1909.

3 SHEETS—SHEET 3.

Fig. 2^a

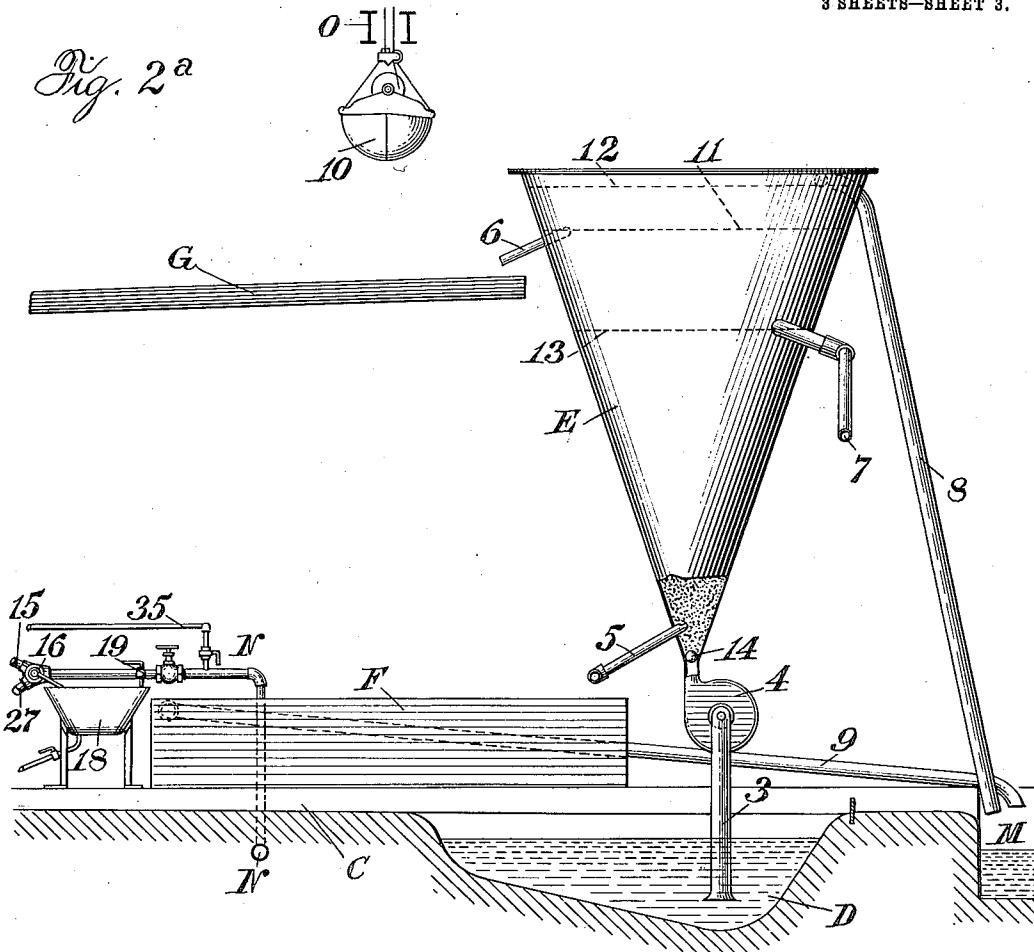


Fig. 4.

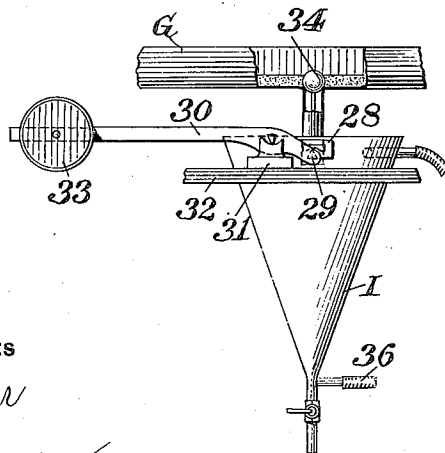
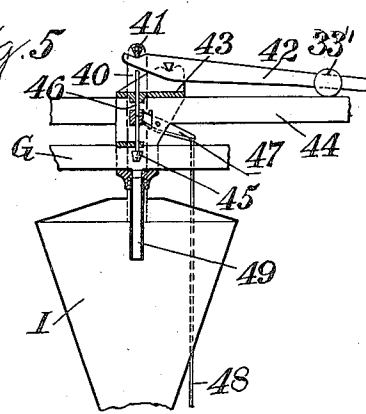


Fig. 5.



WITNESSES

P. E. Gaither
J. L. Bradley

INVENTOR

H. K. Hitchcock
by atty Paul Symonds

UNITED STATES PATENT OFFICE.

HALBERT K. HITCHCOCK, OF TARENTUM, PENNSYLVANIA.

GRINDING APPARATUS.

934,612.

Specification of Letters Patent. Patented Sept. 21, 1909.

Application filed July 19, 1907, Serial No. 384,640. Renewed July 12, 1909. Serial No. 507,260.

To all whom it may concern:

Be it known that I, HALBERT K. HITCHCOCK, a citizen of the United States, residing at Tarentum, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Grinding Apparatus, of which the following is a specification.

My invention relates to grinding apparatus and particularly to the apparatus for grading and supplying the abrading material used in glass grinding operations. The invention has for its principal objects: to provide an arrangement of apparatus wherein in an accurate grading of the abrading material is secured and one wherein those portions of the material inefficient for abrasives or more valuable for other purposes are eliminated; to provide an apparatus wherein the abrading material is supplied directly from the grading means to the grinding apparatus, and wherein all of the material supplied at any time is of substantially the same degree of fineness and adapted to suit the kind of grinding then being done, is supplied in conjunction with the proper amount of water necessary for each operation, to the end that a maximum economy in the use of abrasive is attained and the time necessary to treat the glass reduced to a minimum, and finally; to provide a compact arrangement of apparatus requiring little attention and wherein the amount of labor is reduced to a minimum. One embodiment of my invention is shown in the accompanying drawings, wherein:—

Figure 1 is a diagrammatic plan view of the general arrangement of the assembled apparatus,

Figure 2 is a side elevation of the front portion of the apparatus,

Figure 2^a is a side elevation of the rear portion of the apparatus, on the scale somewhat enlarged over that of Figure 2,

Figure 3 is a plan view of the apparatus as shown in Figure 2,

Figure 4 is a side elevation partly in cross-section of the smallest grading tank, and

Figure 5 is a sectional view showing a modified means for suspending the tank of Figure 4.

In my co-pending applications Serial Nos. 384,637, 384,638, and 384,639, all filed on July 19, 1907, I have illustrated and de-

scribed in detail the method and apparatus employed in securing the grading of material and one application of such apparatus to glass grinding operations. The present invention involves a new and different application of the grading apparatus of the general type disclosed in such co-pending applications to use in conjunction with plate glass grinding and smoothing mechanism. Briefly stated the apparatus in its preferred form comprises a plurality of grinding tables, each provided with a pair of grading tanks and a main grading tank for serving all of the pairs of tanks, which grading tank separates the ungraded abrading material into three grades, the first or coarsest grade going to one of each of the pairs of tanks for the facing operation, the second or finest grade going to the other one of each of the pairs of tanks for the finishing operation, and the third or intermediate grade which is too fine for facing economically and too coarse for finishing or being more valuable as a by-product going to a tank for use as a by-product in some other art or is thrown away. When this sand is sufficiently pure it is advantageously used for the batch from which the glass is made. The apparatus also includes means for transferring the material from the main tank to the pairs of tanks, means for carrying the drainage from the tables to the main tank for regrading of the mixture in such main tank, and means for controlling the discharge from the pairs of tanks to the grinding mechanism.

Referring first to the general arrangement shown in Figure 1; A are the grinding tables preferably arranged in line as shown, and provided with the usual pair of runners, and all draining into the common trough or canal B, which has a rearward portion C leading to the pit D indicated in dotted lines; E is the preliminary grading tank with its lower end communicating with the pit D, which tank is adapted to separate the sand to be graded into three grades, the coarsest of which is discharged into one of the tanks F to be used subsequently for the facing operation, the finest grades discharging into the trough G for the finishing operation, and the intermediate grade which is too fine for facing economically, and too coarse for finishing discharging into the tank H; I and K are pairs of grading tanks in position to discharge to the grinding

tables A, the smallest tanks I receiving the fine sand from the trough G for the finishing operation, and the largest tanks K receiving the sand from the sand pile L and tanks F for the facing operation; O is an overhead track adapted to carry a trolley or conveyer, by means of which the sand from the sand pile L and tank F is carried to the four grading tanks K; M is the sewer to which the overflow from the various tanks and troughs is conducted by means of the pipes shown, and N is the water main for supplying water to the grading tanks I, K.

Referring now to Figures 2 and 2^a which show in side elevation one of the grinding tables and one each of the tanks I, K, the tank E and the operating mechanism therefor, it will be seen that the table A which is of any approved type, has supported thereover a distributing trough 1, provided on its under side with perforations for supplying a mixture of abrasive and water from the grading tanks I and K, and is surrounded by a ditch or gutter 2 for receiving the drainage from the table, and conducting the mixture to the canal B from which point the mixture drains to the canal C and thence to the pit D as shown in Figures 1 and 2^a. As indicated in Figure 2^a, the grading tank E is located over the pit D and is provided with an admission pipe 3 for conducting the mixture of abrasive and water from the pit D to the tank, and this pipe is provided with a lifting pump 4 preferably of the centrifugal type indicated. The grading tank E is made of conical form in order to provide for a change of velocity in the water passing up there-through and thus secure grading of the material in grades of constantly decreasing coarseness from the bottom of the tank to the top, and has preferably four outlet members 5, 6, 7 and 8 as shown. The outlet member 5 is adapted to discharge to either one of the two tanks F in which the abrasive is stored for future use, and the overflow from such tank is delivered to the sewer M by means of the pipe 9. This grade includes operation, and this material is conveyed as needed to the tank K by means of the conveyer 10 carried by the track O. The discharge pipe 6 leads from the tank to the trough G those portions of the sand suitable for the finishing operation, which trough G branches laterally as shown in Figure 1, in order to carry the mixture over the four tanks I. That portion of the tank containing those particles of abrasive which are too fine for facing economically and too coarse for finishing is conducted by means of the pipe 7 to the tank H, and may be subsequently used as a by-product or disposed of in any manner desired. The surplus water and those portions of the material too fine

for use are discharged through the overflow pipe 8 to the sewer M. In order to prevent any backflow from the tank when the pump 4 is not in operation, a ball valve 14 is provided. The tank E is of the type shown in Figure 3 of my co-pending applications Serial Nos. 384,637, 384,638, 384,639, and there described, and secures an accurate grading of the material regardless of its character because of the large proportion of fluid to abrading material, and the slight relative area occupied by the abrading material at any level, which renders any change in interstitial area and velocity due to the material negligible.

The tanks K one of which is shown in Figure 2 grade the coarser abrading material carried from the sand pile L and tanks F on the conveyer 10 for use in the facing operation, and will now be described. Such tank K has connections with the water-main N by means of the pipe 15 leading into the lower end of the tank and the flow is preferably controlled by the automatic valve 16, which valve 16 has a float 17 carried in the conical vessel 18 shown, and a small pet cock 19 is provided for gradually filling the chamber 18 and thus closing the valve as the operation progresses. Any backflow into the pipe 15 is prevented by means of the ball valve 20. The tank is provided at its bottom with the discharge tube 21 leading to the distribution trough 1, which distribution trough is supported as shown, for rocking movement, and such rocking is given by means of a water motor 22. This water motor is connected by means of the rod 23 with the lever 24, which carries the end of the trough 1, and such motor is operated by the overflow from the tank passing down through the pipe 25. The outflow from the motor 22 passes through the pipe 26 to the trough or gutter 2, and serves to wash the abrading material therefrom. The main N is connected to the pipe 26 by means of the pipe 27 which is also controlled by the automatic valve 16 in such manner that as the flow of water in the pipe 15 decreases, the flow through the pipe 27 increases, thus keeping the flow in the ditches 2 practically constant until the glass is faced and the ditches 2 washed out.

The tank I for grading the fine material for the finishing operation and its automatic controlling mechanism constitutes another feature of my invention. As shown in Figure 2, this tank is placed in a position to discharge into the distributing trough 1, so that the single trough serves to carry the mixture from both the tanks I and K. As before stated, the tanks I are fed from the trough G, and in order to reduce the attention necessary to the operation of these tanks automatic means are pro-

vided for cutting out the flow of the liquid from the trough to the tanks, when a predetermined density thereof is secured. To this end each of the tanks is suspended as shown in detail in Figure 4 of the drawing. As here shown, the opposite sides of the tank are provided with bearing blocks 28, which bearing blocks cooperate with edges 29 carried by the yoke 30, which yoke is pivoted as shown, upon the bearing blocks 31 mounted on supporting beams 32 at the sides of the tank. The yoke is counterbalanced by means of a weight 33 adjustable longitudinally of the member 30. A rod carrying the ball valve 34 is secured to the top of the tank in position to engage an opening through the bottom of the trough, and by adjusting the weight 33 along the member 30, the tank may be so balanced as to tilt downward closing the valve 34 when a predetermined density of liquid is secured. The material is graded in the tank by means of the pipe 35 leading from the main, which pipe 35 has a flexible connection 36 with the bottom of the tank. Provision is made for the overflow by means of the pipe 37 leading to the drainage pipe 38, which returns the liquid to the sewer M. When all the tanks I have been filled and the valves closed, an overflow takes place from the trough G through pipe 39 (Figure 1) and back to the drainage pipe 38.

Sufficient sand, to face the roughest set possible is taken from the sand pile L and boxes F and placed in the grading tank K. The main N is then permitted to send a flow of water through the pipe 15 to the bottom of the tank K and the material therein is graded. The grinding mechanism is then started and the cock in the pipe 21 is opened, together with the pet cock 19. This permits of a discharge of the coarse sand from the tank to the distributing trough 1, which trough is agitated by the motor 22 in order to distribute the sand over the table. The coarser abrading material at the bottom of the tank K is used first, and the filling of the tank 18 and raising of float 17 gradually close the valve 16, thus reducing the upward velocity in the tank and permitting the finer grades of material to settle to a point at which they may be discharged through the pipe 21, and furthermore, preventing the ratio of water to abrading material from becoming too great. The tank 18 is constructed with the diverging wall shown, so that the closure becomes slower as the end of the operation is approached, at which time the entire flow of water to the tank may be cut off and such flow directed through the pipe 29 to wash out the gutter 2. When the sand being discharged from the tables A has been washed through the gutters 2, b, and C, to the pit D, the pump 4 below the tank E is started, and a mixture

of abrading material and water carried up through the tank and graded, the finer material passing to the space between the dotted lines 11 and 12, and thence discharging through the pipe 6 to the trough G, the coarser material filling the space below the dotted line 13 and discharging through the pipe 5 to the tank L, the material unsuitable for grinding lying between the dotted lines 11 and 13, discharging to the tank H, and the overflow above the dotted line 12 discharging to the sewer M. The flow of liquid through the trough G to the tanks I is continued until a predetermined density is attained in these tanks, at which time the tanks will move downward closing their valves 34. The plate now being ready for finishing, the valve at the bottom of the tank I is opened, permitting the finer abrading material to feed on to the table. As in the other operation, the coarser material in the tank is applied first, followed by finer and finer quality as the finishing progresses, until the finishing operation is concluded. It will be understood that according to the character of the material in the tank I, the flow of water through the pipe 36 may be continued through the entire operation, or it may be stopped at the beginning of the discharge of the material, or it may be shut off prior to the starting of the finishing operation. It will be seen from the foregoing that throughout the operation, the size of the particles of abrading material employed decreases as the glass is reduced, so that at every stage of the procedure a size of abrading material best suited for the work to be done is employed. By employing a sufficiently fine grade of sand in the tank I, a sufficient high finish may be obtained to avoid the additional finishing operation with emery heretofore considered necessary.

In Figure 5 a modified arrangement for supporting the tank I and controlling the flow of liquid is shown. As here illustrated, the tank I is provided with a yoke 40 provided with a bearing edge 41, which bearing edge 41 engages the end of the balancing lever 42 which is in turn supported by means of the supporting frame 43 carried by the longitudinal beams 44 arranged above the trough G. The valve 45 is carried by a rod 46 guided in the frame 43, and its lower end is adapted to fit into the pipe 49, which pipe 49 is carried in the bottom of the trough G and depends into the tank. The valve is closed when the tank descends, by the engagement of the upper end of the rod 46 by the end of the lever 42. In order that the valve 45 may be operated by hand when desired, a lever 47 is secured thereto, which lever is pivoted on the supporting frame 43 and has at its outer end an operating cord 48. The operation is as follows: The operator

having pulled the cord 48, opens the valve 45, allowing the mixture of sand and water to flow into the tank I until the proper amount of abrasive has accumulated there, when the weight of the tank I overbalances the weight 33' and in descending forces the valve 45 into the pipe 49, cutting off the supply. When the tank I empties, the weight 33' raises the tank I, but the friction of the plug 45 prevents any material from entering the tank I until the operator pulls the cord 49. This arrangement prevents an inflow from the trough G when the tank has been only partially emptied.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent is the following:—

1. Apparatus for supplying abrasive to grinding and smoothing mechanism, comprising in combination with a mechanism using an abrasive with water, and having a drainage pit, a preliminary grading tank having an admission passage leading from the pit to the bottom of the tank, means for securing a continuous flow of liquid up through such passage and the tank, discharge passages at different levels in the tank of small capacity as compared with the capacity of the admission passage, receptacles for receiving the flow from the said discharge passages, and means for supplying the abrading material to the said mechanism.

2. Apparatus for supplying abrasive to grinding and smoothing mechanism, comprising in combination with a mechanism using an abrasive with water, and having a drainage pit, a preliminary grading tank having an admission passage leading from the pit to the bottom of the tank, means for securing a flow of liquid up through such passage and the tank, a second grading tank in position to discharge to the said mechanism and a passage for conducting a portion of the liquid from the first tank to the second tank.

3. Apparatus for supplying abrasive to grinding and smoothing mechanism, comprising in combination with a mechanism using an abrasive with water, and having a drainage pit, a preliminary grading tank having an admission passage leading from the pit to the bottom of the tank, means for securing a flow of liquid up through such passage and the tank, a second grading tank in position to discharge to the said mechanism, means for securing an upward flow of liquid therethrough, and a passage for conducting a portion of the liquid from the first tank to the second tank.

4. Apparatus for supplying abrasive to grinding and smoothing mechanism, comprising in combination with a mechanism using an abrasive with water, and having a drainage pit, a preliminary grading tank

having an admission passage leading from the pit to the bottom of the tank, means for securing a flow of liquid up through such passage and the tank, a second grading tank in position to discharge to the said mechanism, and a passage for conducting a portion of the liquid from the first tank to the second tank, a receiving tank and a discharge passage thereto from the lower portion of the preliminary grading tank for receiving the coarser material from the preliminary grading tank.

5. Apparatus for supplying abrasive to grinding and smoothing mechanism, comprising in combination with a mechanism using an abrasive and water and having a drainage pit, a grading tank in position to discharge to said mechanism, a passage for introducing a liquid containing divided material in suspension thereto, and means controlled by the weight of the mixture in the tank for cutting off the flow thereto, when a predetermined density of the mixture in the tank is secured.

6. Apparatus for supplying abrasive to grinding and smoothing mechanism, comprising in combination with a mechanism using an abrasive and water and having a drainage pit, a grading tank in position to discharge to said mechanism, means for securing a flow of liquid upward from the bottom thereof, a passage for introducing a liquid containing divided material in suspension thereto, and means controlled by the weight of the mixture in the tank for cutting off the flow thereto, when a predetermined density of the mixture in the tank is secured.

7. Apparatus for supplying abrasive to grinding and smoothing mechanism, comprising in combination with a mechanism using an abrasive and water and having a drainage pit, a grading tank having an admission passage at its bottom, means for securing a flow of liquid containing in suspension divided material to be graded up through the passage and tank, a second tank in position to discharge to the said mechanism, a passage leading from the first grading tank to the second grading tank, and means for automatically cutting off the flow to such second tank when a predetermined density of the mixture therein is secured.

8. Apparatus for supplying abrasive to grinding and smoothing mechanism, comprising in combination with a mechanism using an abrasive and water and having a drainage pit, a grading tank having an admission passage at its bottom, means for securing a flow of liquid containing in suspension divided material to be graded up through the passage and tank, a second tank in position to discharge to the said mechanism, a passage leading from the first grading tank to the second grading tank, and means

controlled by the weight of the mixture in the second grading tank for cutting off the flow to such second grading tank when a predetermined density of the mixture is secured.

9. Apparatus for supplying abrasive to grinding and smoothing mechanism, comprising in combination with a mechanism using an abrasive with water and having a drainage pit, a grading tank having an admission passage at its bottom, means for securing a flow of liquid containing in suspension divided material to be graded up through the passage and tank, a second tank in position to discharge to the said mechanism, a passage leading from the first grading tank to the second grading tank, means for securing a flow of liquid upward from the bottom thereof, and means controlled by the weight of the mixture in the second grading tank for cutting off the flow to such second grading tank when a predetermined density of the mixture is secured.

10. Apparatus for supplying abrasive to grinding and smoothing mechanism, comprising in combination with a mechanism using an abrasive with water, and having a movable distributing trough thereover, a grading tank in position to discharge to the trough and provided with means for securing an upward flow of liquid from the bottom thereof, a water motor for moving the distributing trough and an overflow passage from the grading tank whereby the motor is operated.

11. Apparatus for supplying abrasive to grinding and smoothing mechanism, comprising in combination with a mechanism using an abrasive with water and having a movable distributing trough thereover, a grading tank in position to discharge to the distributing trough and having an admission pipe for securing an upward flow of fluid from the bottom thereof, a pipe secured to the admission pipe and leading to the drainage trough and a valve automatically operated for gradually cutting off the supply of water to the tank as the operation progresses and simultaneously admitting water to the pipe leading to the drainage trough.

12. Apparatus for supplying abrasive to grinding and smoothing mechanism, comprising in combination with a mechanism a pair of grading tanks in position to discharge to the said mechanism, one of which is provided with means for securing an upward flow of liquid, a preliminary grading tank adapted to separate the abrading material into a coarse grade for facing and a fine grade for finishing, means for conveying the coarse material to the one of the said pair of grading tanks having the upward flow of water and means for conveying the fine material to the other of the said pair of grading tanks.

13. Apparatus for supplying abrasive to grinding and smoothing mechanism, comprising in combination with a mechanism a pair of grading tanks in position to discharge to the said mechanism one of which is provided with means for securing an upward flow of liquid, a preliminary grading tank adapted to separate the abrading material into a coarse grade for facing and a fine grade for finishing, means for conveying the coarse material to the one of the said pair of grading tanks having the upward flow of water and means for conveying the fine material to the other of said pair of grading tanks.

14. Apparatus for supplying abrasive to grinding and smoothing mechanism, comprising in combination with a plurality of mechanisms using an abrasive with water, a pair of grading tanks in position to discharge to each mechanism one of which is provided with means for securing an upward flow of liquid, a preliminary grading tank adapted to separate the abrading material into a coarse grade for facing and a fine grade for finishing, means for conveying the coarse material to the one of each of the said pairs of grading tanks having the upward flow of water and means for conveying the fine material to the other of each of the said pairs of grading tanks.

15. Apparatus for supplying abrasive to grinding and smoothing mechanism, comprising in combination with a plurality of mechanisms using an abrasive with water and having receiving troughs leading to a common pit, a pair of grading tanks for each mechanism, in position to discharge thereon, one of which is provided with means for securing an upward flow of liquid, a preliminary grading tank connected at its bottom with the said pit and having means for giving a flow of water therefrom up through the tank, and means for conveying the abrasive from one level of the preliminary grading tank to the one each of the pairs of tanks having the upward flow of water and for conveying the abrasive from a different level of the preliminary grading tank to the other of said pairs of tanks.

16. Apparatus for supplying abrasive to grinding and smoothing mechanism, comprising in combination with a plurality of mechanisms using an abrasive with water and having receiving troughs leading to a common pit, a pair of grading tanks for each mechanism, in position to discharge thereon and each having means for securing an upward flow of liquid, a preliminary grading tank connected at its bottom with the said pit and having means for giving a flow of water therefrom up through the tank, and means for conveying the abrasive from one level of the preliminary grading tank to one each of the pairs of tanks and

for conveying the abrasive from a different level of the preliminary grading tank to the other of said pairs of tanks.

17. Apparatus for supplying abrasive to
5 grinding and smoothing mechanism, comprising in combination with a plurality of mechanisms using an abrasive with water and having receiving troughs leading to a
10 common pit, a pair of grading tanks for each one of which is provided with means for securing an upward flow of liquid, a preliminary grading tank connected at its bottom with the said pit and having means for giving
15 a continuous flow of liquid therefrom up through the tank, passages at different levels of the preliminary grading tank for conducting two grades of the abrasives continuously therefrom, the combined capacity of such
20 passages being small as compared with the flow of liquid from the pit, and means for conveying the abrasives to the pairs of tanks.
18. Apparatus for supplying abrasive to
25 grinding and smoothing mechanism, comprising in combination with a plurality of

mechanisms using an abrasive with water and having receiving troughs leading to a common pit, a pair of grading tanks for each mechanism in position to discharge thereon one of which is provided with means for securing an upward flow of liquid, a preliminary grading tank connected at its bottom with the said pit and having means for giving a continuous flow of liquid therefrom up through the tank, communicating means connecting the upper portion of such preliminary grading tank with one each of the pairs of tanks, means for conducting the coarser abrasive from the bottom of the said preliminary grading tank to a receptacle
40 and means for conveying such abrasive to the other of said pairs of tanks which are provided with the upward flow of liquid.

In testimony whereof I have hereunto signed my name in the presence of the two
45 subscribed witnesses.

HALBERT K. HITCHCOCK.

Witnesses:

F. E. GAITHER,

ARCHWORTH MARTIN.