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ABRASIVE FEEDING SYSTEM FOR GLASS GRINDING MACHINES

Filed Dec. 24, 1923

3 Sheets-Sheet 1

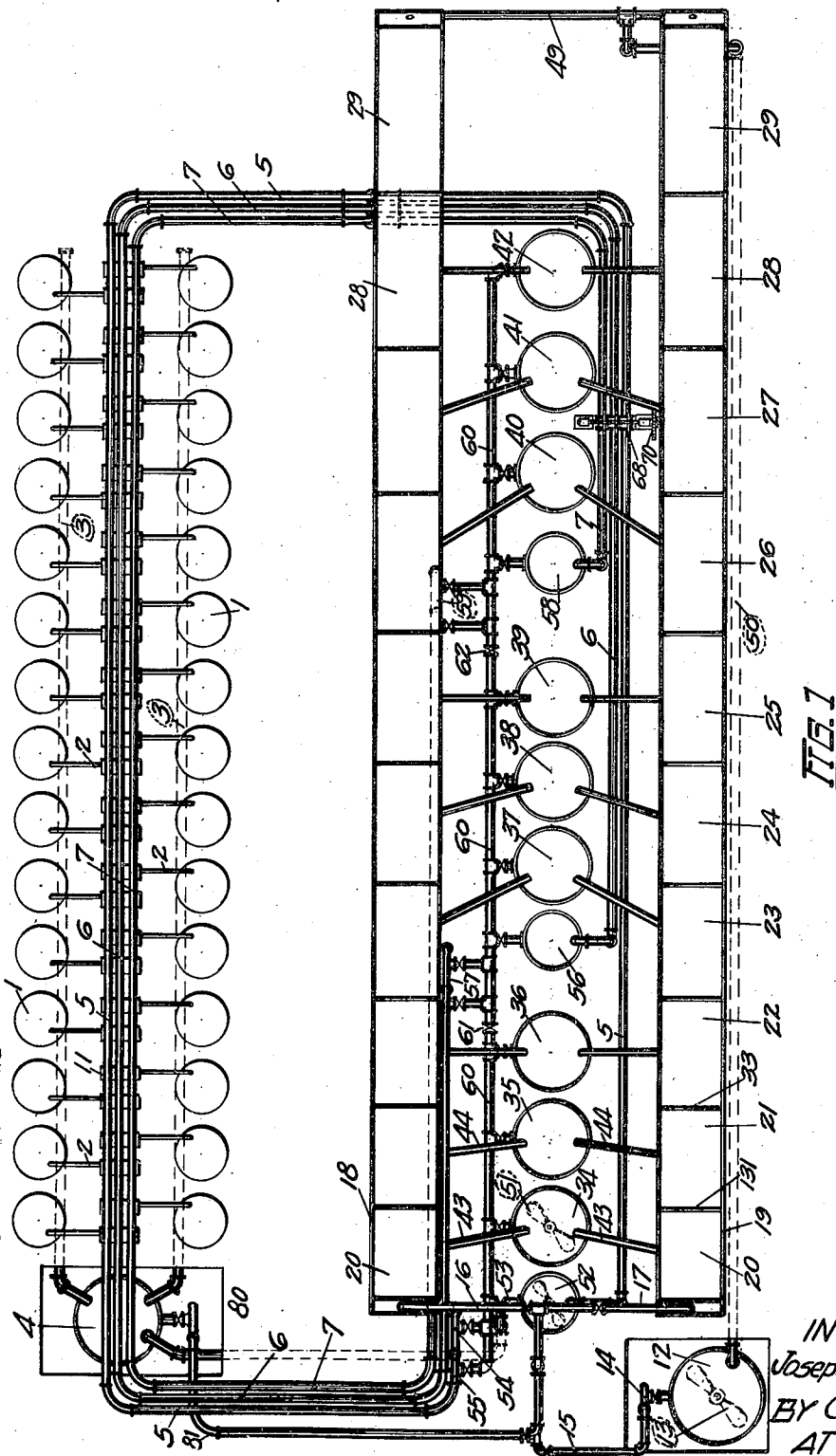


Fig. 1

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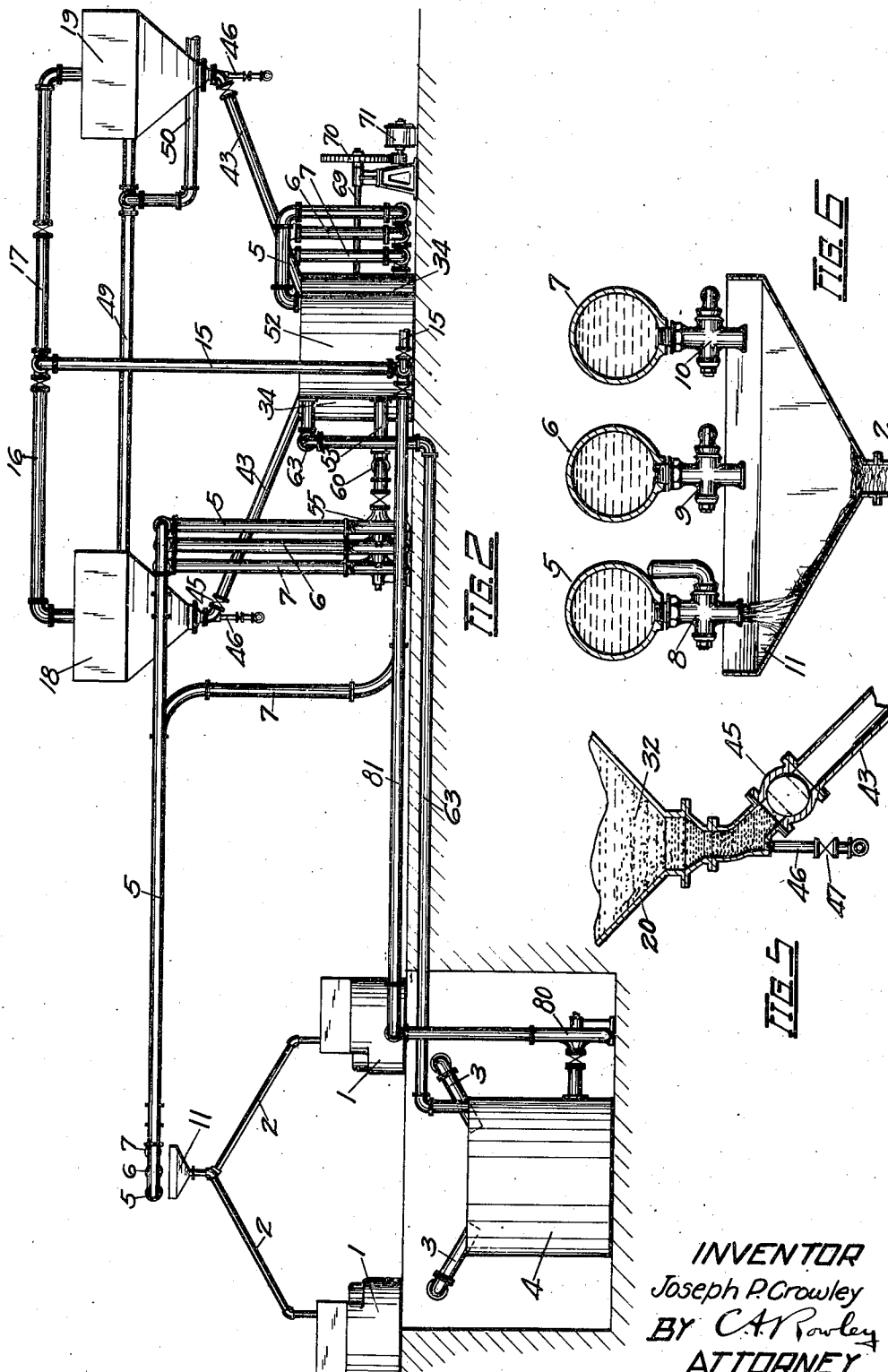
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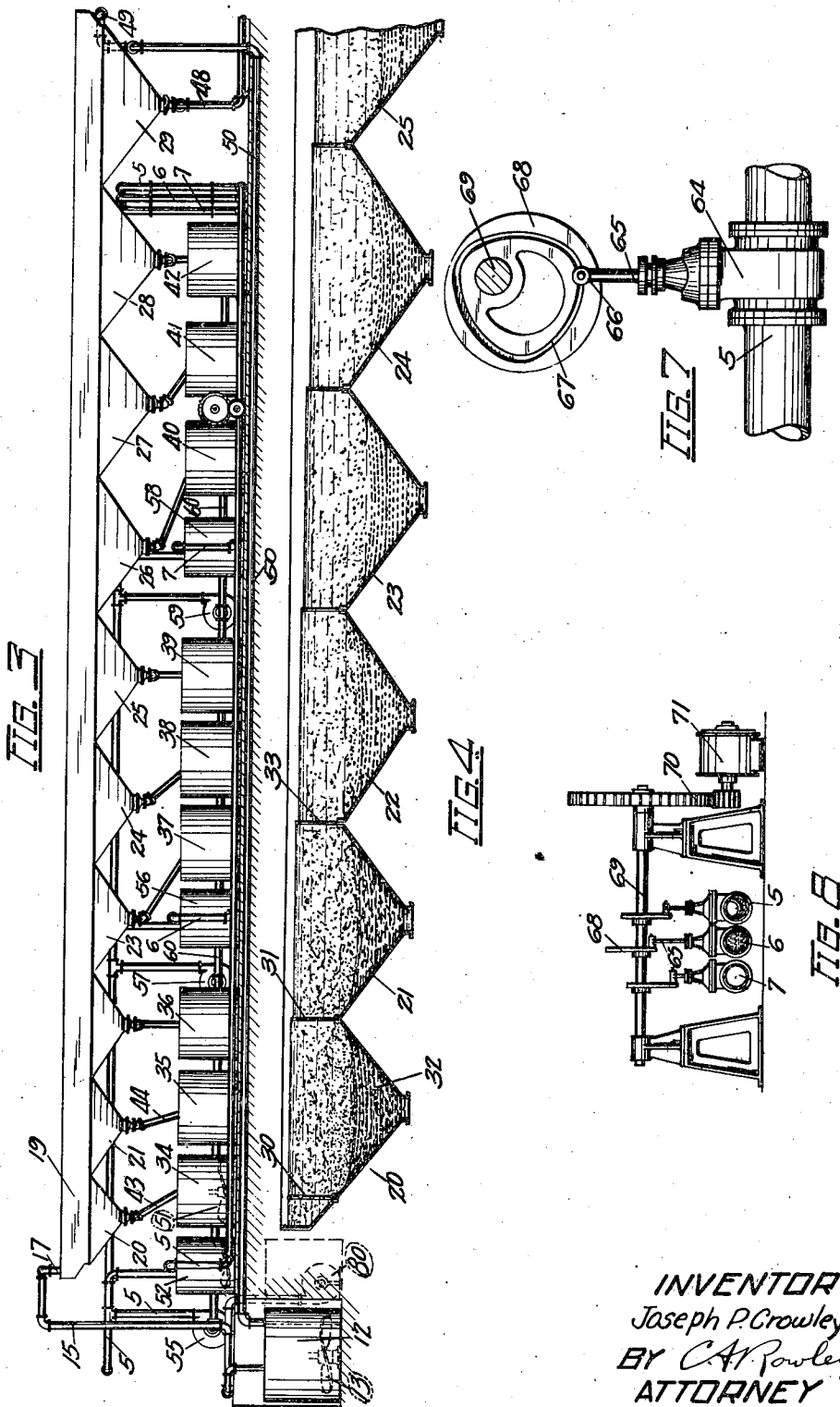
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3 Sheets-Sheet 3



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ABRASIVE-FEEDING SYSTEM FOR GLASS-GRINDING MACHINES

Application filed December 24, 1923. Serial No. 682,495.

This invention relates to an improved process and apparatus for supplying different grades of abrasive material such as sand, mixed in water, to a plurality of plate glass grinding machines.

The invention is not limited for use with any one type of grinding apparatus, but has been designed more particularly for use with the grinding machine disclosed in my copending application, Serial No. 659,435, filed August 27, 1923.

According to the present invention, the new sand, or used sand which has been collected from the several grinding units, is mixed with water and then flowed through a series of grading tanks in which the abrasive is separated into a plurality of distinct grades. Preferably, two similar series of these tanks are provided, and while the abrasive mixture is flowing through one series and being graded, the previously graded abrasive in the other series of tanks may be drained off into a series of storage reservoirs, each reservoir being adapted to hold one grade of abrasive and being provided with a suitable agitator maintaining the abrasive in suspension. This comprises the grading system.

The feeding system consists of a series, here shown as three, of endless pipe circuits extending past the several grinding machines. A certain grade of abrasive is maintained in practically continuous circulation in each pipe circuit, and may be drawn upon when desired to supply the need of any one or more of the grinding units. The abrasive mixture in circulation in each circuit is replenished when necessary from the storage reservoirs, and the abrasive mixture may be selected from any one or a group of these reservoirs to obtain just the desired grade of abrasive for that particular circuit.

When the grinding operation of a machine is started a portion of the heaviest grade of abrasive is delivered from its pipe line to the machine. After a suitable interval this grade may be shut off and the next finer grade fed to the machine, and so on until the grinding operation is completed. A continuous pressure is maintained on the abrasive supply in each pipe line, which serves not only to force

the abrasive material from the pipe line to the selected machines, but also serves to maintain the abrasive in circulation in the circuit and keep the solid material in suspension. The used abrasive and water from the several machines flow to a sump from which the better part of the mixture is pumped back to the grading tanks and regraded.

The invention will be better understood from the following detailed description of one approved form of the apparatus.

In the accompanying drawings:

Fig. 1 is a plan view of the entire abrasive supplying system.

Fig. 2 is an end elevation on an enlarged scale, looking from the right of Fig. 1.

Fig. 3 is an elevation, looking from the left at Fig. 2, showing one of the series of grading tanks and the storage reservoirs.

Fig. 4 is a longitudinal vertical section through a portion of one of the series of grading tanks.

Fig. 5 is an enlarged section through the means for draining the abrasive which has settled out in any single grading tank, into its respective storage reservoir.

Fig. 6 is a section through the series of feed pipes showing the valves for delivering the abrasives to one of the grinding machines.

Fig. 7 is an elevation, on an enlarged scale, of one of the gate valves for intermittently interrupting the flow of abrasive through the pipe line, and the operating cam for this valve.

Fig. 8 is an elevation taken at right angles to Fig. 7 and on a smaller scale, showing a single driving means for the three gate valves.

The grinding machines 1, which are merely shown conventionally in the present drawings, may be of substantially the construction disclosed in my prior application, Serial No. 659,435, referred to above. As is usual in such machines, the glass sheet is supported on a rotary table, and a grinding tool rests freely upon the upper surface of the sheet, the abrasive mixture being fed between the contacting surfaces of the glass sheet and grinding tool. The abrasive is fed to the machine through pipe 2, leading from an overhead source of supply presently to be described,

and the used abrasive and water thrown off from the grinding machine flow into a drain pipe 3 through which they pass to an underground sump 4 at one end of the factory. In the installation shown in the drawings, two opposite rows of grinding machines 1 are provided, and there is a drain pipe 3 for each row of machines, the two drain pipes leading to the same sump 4.

The several grades of abrasive to be used, here shown as three, although any desired number might be used, are maintained in circulation in the three parallel pipe lines 5, 6 and 7, which extend past all of the grinding units. As here illustrated, the three pipe lines extend overhead at a point midway between the two parallel rows of grinding machines 1. The pipe line 5 contains a supply of the heaviest sand, or other abrasive, suitably suspended in water. Pipe line 6 carries an intermediate grade of abrasive and pipe line 7 carries the finest grade. As shown in Fig. 6, a series of similar valves 8, 9 and 10, are provided in the respective pipes 5, 6 and 7, opposite each one of the grinding machines. These three valves are adapted to discharge into a common basin or hopper 11, which guides the abrasive mixture into the feed pipe 2 for that particular grinding machine 1. By suitably manipulating the valves 8, 9 or 10, any grade of abrasive may be fed to the machine when desired. The simple form of valve here shown is adapted to be manually operated, but automatically operated valves may be used, provided with suitable timing mechanism for feeding the different grades of abrasive successively to the machine for any selected period of time. One approved type of mechanism for automatically feeding the abrasives is disclosed and claimed in my copending application, Serial No. 659,436, filed August 27, 1923. The present application discloses an improvement on, and a continuation in part of, the system disclosed in this previously filed application.

The new sand or other abrasive to be used is first delivered into a mixing tank 12 where water is added and the mixture is maintained in suspension by a suitable agitator indicated at 13. This mixture is forced by pump 14 through delivery pipe 15 which has branches 16 and 17 leading respectively to two similar series of grading tanks 18 and 19. The used sand from sump 4 is delivered by pump 80 through pipe 81 to the pipe 15, already described, from which, like the new sand, it is delivered through branches 16 or 17 to either series of grading tanks 18 or 19. Suitable valves are provided in these pipe lines, as conventionally indicated in the drawings, whereby either new sand or used sand, or both, may be delivered as desired to either series of grading tanks.

Each grading system 18 or 19, as here shown, comprises a longitudinal series of ten

similar compartments, here numbered 20 to 29, respectively. As shown more particularly in Fig. 4, the abrasive mixture is delivered into one end of the first compartment 20, through strainer 30, and after flowing through tank 20 flows over the partition 31 into the next tank or compartment 21. While the abrasive mixture is flowing through tank 20, the heaviest portion of the abrasive will settle to the bottom of the tank, as indicated at 32. The abrasive mixture which has overflowed wall 31 into tank 21 will pass through that tank and overflow the next partition 33 which is somewhat lower than partition 31, into the next tank 22, and so on throughout the series. While the mixture is flowing through each successive tank, the heaviest portion of the abrasive then remaining will settle to the bottom of that particular tank. It will be obvious that the deposit collected in each tank will be successively lighter as the flow continues throughout the series from tank 20 to tank 29. It will also be noted that the tanks increase in length throughout the group from tank 20 to tank 29, since as the abrasive remaining in suspension becomes lighter, a longer time is required for it to settle out. A series of nine storage reservoirs, or "make-up tanks," 34 to 42, respectively, are provided, and these tanks are preferably arranged below and midway between the two series of grading tanks. Delivery pipes 43 lead downwardly from tanks 20, whereby the abrasive collected in either or both of the grading tanks 20 may be delivered to the storage reservoir 34. In a similar manner delivery pipes 44 lead from the two grading tanks 21 to the second storage reservoirs 35, and so on throughout the series, the next to the last grading tanks 28 delivering the abrasive deposited therein to the last storage reservoir 42. As shown more particularly in Fig. 5, a valve 45 is provided at the upper end of delivery pipe 43, and when it is desired to deliver into reservoir 34 the abrasive 32 which has settled out in tank 20, this valve 45 is opened. A connection 46 is provided for injecting water under pressure into the upper end of pipe 43 and lower end of tank 20 directly above the valve 45. This is to break up the caked abrasive which will be deposited at this point and permit a free flow of the abrasive through the valve 45 and pipe 43 to the reservoir. Water pipe 46 is provided with a valve 47 for turning on or off this supply as found necessary. It will be understood that each of the delivery pipes from the respective grading tanks to their respective reservoirs is supplied with a valve system similar to that disclosed in Fig. 5.

The abrasive which settles out in the last grading tank 29 of the series will ordinarily be too fine for further use, and this abrasive

is drained off through pipe 48 to the sewer. The water which overflows from the ends of tanks 29 flows back through pipes 49 and 50 to the mixing tank 12, where it may be reused with new abrasive.

Each of the reservoirs 34 to 42, is provided with a suitably driven agitator, such as indicated at 51 in tank 34, for maintaining the mixture therein in suspension. A water-line will also be provided, (omitted from the drawings for the sake of clearness), leading to each reservoir for supplying the necessary amount of liquid to the mixture therein.

The apparatus as so far disclosed, comprises the grading system, and it will be noted that this system provides a continuously maintained supply of nine different grades of abrasive which may be drawn on as desired to supply the feeding system now to be described.

Adjacent the reservoir 34 is located a smaller supply-tank or service-tank 52, which, together with the pipe circuit 5, contains the heaviest grade of abrasive mixture then in use. The abrasive is drawn out from this service tank through pipe 53 and forced by either one of the alternative pumps 54 or 55, into the pipe line 5. The two parallel pumps 54 and 55 are provided so that either one may be repaired or replaced without necessitating shutting down the operation of the circuit. This heavy grade of abrasive flows through the pipe circuit 5 past all of the grinding units, and such of the abrasive as is not drawn out through the valves 8 and fed to certain of the machines, is returned through the discharge end of pipe 5 back into the service-tank 52, from which it is again pumped through the pipe circuit as before. A similar service-tank 56 for the intermediate grade of abrasive is located between the reservoirs 36 and 37, and this grade of abrasive is drawn from tank 56 by pumps 57, forced through pipe circuit 6 and discharged back into the tank 56 as in the circuit first described. A third service-tank 58 for the finest abrasive is located in the pipe circuit 7, this abrasive being forced through the pipe by the pumps 59.

A continuous pipe 60 extends past all of the reservoirs and service-tanks, as shown particularly in Fig. 1, and branches from this pipe 60 connect with each of the reservoirs 34 to 42, each of the service-tanks 52, 56 and 58, and each of the pumps 54, 55, 57 and 59. By means of a separate valve in each of these branches communication with that respective tank or pump and the pipe 60 may be opened or shut off as desired. Furthermore, there is a valve 61 in the pipe 60 between reservoir 36 and pumps 57, and a second valve 62 in pipe 60 between reservoir 39 and pumps 59. Normally, the valves 61 and 62 will be closed.

The heavier grade of abrasive is drawn

into pipe circuit 5 by means of pumps 54 or 55 through pipe 60 from any one or all of the reservoirs 34, 35 and 36. By suitably manipulating the valved branches leading from these reservoirs into pipe 60, the desired grade of abrasive is drawn into the pipe circuit 5. If it should be desired to use even finer abrasive in this system, the valve 61 may be opened and finer grades of abrasive obtained through pipe 60 from any of the reservoirs 37 to 39. However, the reservoirs 34 to 36 will ordinarily supply the pipe 5, and valve 61 will remain closed. As previously stated, the abrasive in pipe line 5, which is not delivered to any of the grinding machines 1, returns from the outlet end of pipe 5 into the service-tank 52 from which it is again drawn through valve outlet 53 into the supply end of pipe line 5. Of course the supply of abrasive in the pipe line 5 and service-tank 52 will gradually be used up as this supply is drawn upon by the various grinding machines, and the supply may be replenished as often as found necessary by drawing upon any one or all of the reservoirs 34 to 36, as previously described.

In an exactly similar manner the intermediate grade of abrasive which flows through pipe line 6 and supply reservoir 56 is replenished from the abrasive stored in reservoirs 37, 38 and 39. If desired, finer abrasive may be drawn into this system from reservoirs 40, 41 or 42, by opening the normally closed valve 62 in pipe 60. In an exactly similar manner the finest grade of abrasive in pipe line 7 and service-tank 58 is supplied from the abrasive stored in reservoirs 40, 41 and 42.

An overflow pipe 63 (see Fig. 2) extends past all of the reservoirs and service-tanks with branches opening into the upper ends of each of these tanks. This pipe 63 discharges into the sump 4. In this way any excess of abrasive mixture in any of the service-tanks or reservoirs will flow back to the sump. To avoid confusing the drawings this pipe is not shown in Figs. 1 and 3.

At a convenient point in each of the pipe lines 5, 6 and 7, near its discharge end is located a cut-off valve 64, preferably of the gate type as shown in Figs. 7 and 8. The operating stem 65 of each valve has a pin 66 traveling in the cam slot 67 of a large rotary cam 68, keyed on a horizontal drive shaft 69. As shown in Fig. 8, the three cams may all be conveniently mounted on the same drive shaft 69, which is driven through suitable reduction gearing 70 from a motor 71. When pin 66 is in the outer portion of the cam slot 67 the valve is closed, but when the pin is in the inner portion of the cam the valve is open.

These gate valves 64 will be intermittently opened or closed by the mechanism just described. We will describe the operation of

the heavier abrasive in pipe line 5, although an exactly similar cycle of events is simultaneously but independently taking place in each of the pipe lines 6 and 7. Since the pump 54 or 55 is constantly operating, a pressure is being put upon the abrasive mixture in the pipe line, tending to keep a continuous flow through the pipe. When valve 64 is open this flow may proceed through the circuit and back to service-tank 52, although some of it may flow through such of the valves 8 as are open at this time. When valve 64 is closed, the flow through the pipe or conduit back to the service-tank 52 is cut off and the only outlet for the abrasive, now under considerable pressure from the pump, is through the open valves 8. In this way a positive flow of abrasives through all of the valves 8 then open is insured, and there will be sufficient force behind this flow to "blow out" any valve that may tend to become plugged by an accumulation of abrasive. The intermittent flow through the pipe line, during the intervals when the valve 64 is open, will serve to keep the abrasive in suspension in the pipe. Such abrasive as passes by the valve 64 during these intervals flows back to service-tank 52 and is ready for a new journey through the pipe line. As stated above, the same cycle of operations is independently taking place in each of the other pipe lines 6 and 7.

It will be noticed that while a complete installation is disclosed for grading abrasive, feeding the selected grades of abrasive to the grinding machine, and regarding the used abrasive, this system comprises two simultaneously operating, but independent, systems, i. e., a grading system for providing and maintaining a constant supply of various grades of abrasive, from which the abrasives to be used may be blended; and a separate feeding system for maintaining certain selected grades of abrasive in circulation past the several grinding machines.

In the grading system new abrasive or used abrasive may be independently or simultaneously delivered to either or both of two independent series of grading tanks. Preferably, the grading process will be carried on alternately in these two series of tanks, the abrasive previously graded in one series of tanks being drained off into the storage reservoirs while the grading operation is being carried on simultaneously in both series of tanks, or, if there is sufficient abrasive on hand or it is desired to clean or repair the grading tanks, the grading operation may be entirely discontinued for a period without interfering with the continuous flow of abrasive from the feeding system which is replenished from the storage reservoirs. The several grades of abrasive are stored and maintained in suspension ready for use in the series of storage reservoirs 34 to 42, and the

three selected grades of abrasive for use in the machines may be varied and replenished as desired from these reservoirs.

A system quite similar to the above may be used in the polishing room to furnish one or more grades of rouge to each of the polishing machines. It is contemplated that such a system, with rouge used instead of abrasive, shall be within the scope of the following claims.

Claims:

1. In a system for supplying abrasive to a plurality of grinding machines, means for maintaining a circulation of the abrasive past the several machines, means at each machine permitting withdrawal of a portion of the abrasive when desired, a series of storage reservoirs for different grades of abrasive, means permitting selective replenishment of the circulating system from these reservoirs, and a series of grading tanks for supplying the reservoirs.

2. In a system for supplying abrasive to a plurality of grinding machines, means for maintaining a circulation of the abrasive past the several machines, means at each machine permitting withdrawal of a portion of the abrasive when desired, a series of storage reservoirs for different grades of abrasive, means permitting selective replenishment of the circulating system from these reservoirs, a series of grading tanks for supplying the reservoirs, and means for returning the used abrasive to the grading tanks.

3. In a system for supplying abrasive to a plurality of grinding machines, means for maintaining a circulation of the abrasive past the several machines, means at each machine permitting withdrawal of a portion of the abrasive when desired, a series of storage reservoirs for different grades of abrasive, means permitting selective replenishment of the circulating system from these reservoirs, a series of grading tanks for supplying the reservoirs, and means for feeding new abrasive to the grading tanks.

4. In a system for supplying abrasive to a plurality of grinding machines, a supply tank for the abrasive mixture, a conduit extending in proximity to the several machines, means for circulating abrasive from the supply tank through the conduit and returning the unused abrasive to the supply tank, means at each machine permitting withdrawal of abrasive from the conduit as desired, a series of storage reservoirs for different grades of abrasive, means permitting selective replenishment of the circulating system from these reservoirs, and a series of grading tanks for supplying the reservoirs.

5. In a system for supplying abrasive to a plurality of grinding machines, a supply tank for the abrasive mixture, a conduit extending in proximity to the several machines, means for circulating abrasive from the sup-

ply tank through the conduit and returning the unused abrasive to the supply tank, means at each machine permitting withdrawal of abrasive from the conduit as desired, a series of storage reservoirs for different grades of abrasive, means permitting selective replenishment of the circulating system from these reservoirs, a series of grading tanks for supplying the reservoirs, and means for returning the used abrasive to the grading tanks.

6. In a system for supplying abrasive to a plurality of grinding machines, a plurality of supply tanks for different abrasive mixtures, conduits extending from each tank past the several machines, and means for circulating the abrasive mixtures through the conduits and returning the unused abrasives to the respective supply tanks, means at each machine permitting withdrawal of abrasive as desired from any conduit, a series of storage reservoirs for different grades of abrasive, means permitting selective replenishment of the different grades of circulating abrasive from certain of these reservoirs, and a series of grading tanks for supplying the reservoirs.

7. In a system for supplying abrasive to a plurality of grinding machines, a plurality of supply tanks for different abrasive mixtures, conduits extending from each tank past the several machines, means for circulating the abrasive mixtures through the conduits and returning the unused abrasives to the respective supply tanks, means at each machine permitting withdrawal of abrasive as desired from any conduit, a series of storage reservoirs for different grades of abrasive, means permitting selective replenishment of the different grades of circulating abrasive from certain of these reservoirs, a series of grading tanks for supplying the reservoirs, and means for returning the used abrasive to the grading tanks.

8. In a system for supplying abrasives to grinding machines, means for grading the abrasives, means for separately storing the graded abrasives in suspension in a liquid, means permitting selective combining of the various grades to obtain the desired grade for use, means for continuously circulating this selected abrasive to and past the several machines, and means permitting selective delivery of portions of this circulating abrasive to any machine.

9. In a system for supplying abrasives to grinding machines, means for grading the abrasives, means for separately storing the graded abrasives in suspension in a liquid, means permitting selective combining of the various grades to obtain the desired grade for use, means for continuously circulating this selected abrasive to and past the several machines, means permitting selective delivery of portions of this circulating abrasive to any

machine, and means for grading the used abrasive and returning it to the storage means.

10. In an apparatus to supply abrasives to grinding mechanism, a series of grading tanks through which abrasive in suspension flows, a series of storage reservoirs into which the graded abrasives deposited in the grading tanks are withdrawn, means for feeding abrasive to the grinding machines, and means permitting selective drawing from certain of the storage tanks to supply the desired grade of abrasive to the feeding means.

11. In an apparatus to supply abrasives to grinding mechanism, a series of grading tanks through which abrasive in suspension flows, a series of storage reservoirs into which the graded abrasives deposited in the grading tanks are withdrawn, the reservoirs being divided into a plurality of groups, means for feeding abrasive from each group to the grinding machines, and means permitting selective drawing from any reservoirs in a group to supply the desired grade to that feeding means.

12. An apparatus for supplying abrasive to sheet surfacing machines, comprising a supply tank, a conduit extending from the tank past the machines and discharging back into the tank, means for forcing abrasive through the conduit, means for feeding abrasive from the conduit selectively to the machines, a series of reservoirs for different grades of abrasive in suspension, means permitting replenishment of the abrasive circulating in the conduit and tank from the reservoirs, a series of grading tanks, means permitting discharging of the graded material from the grading tanks into the reservoirs, and means for conducting the used abrasive from the machines to the grading tanks.

13. In an apparatus for supplying abrasives to grinding mechanisms, two series of grading tanks, means for alternately feeding abrasives in suspension to either series, a series of storage reservoirs into which the graded abrasives are withdrawn, a circulating system for feeding selected grades of abrasive to the grinding mechanisms, and means permitting replenishment of the circulating system from the reservoirs.

14. In an apparatus for supplying abrasives to grinding mechanisms, two series of grading tanks, means for alternately feeding abrasives in suspension to either series, a series of storage reservoirs into which the graded abrasives are withdrawn, a circulating system for feeding selected grades of abrasive to the grinding mechanisms, means permitting replenishment of the circulating system from the reservoirs, and means for returning the abrasives used on the grinding machines to the grading tanks.

15. An apparatus for supplying abrasive

to a sheet-surfacing machine, comprising a supply tank and a conduit leading from the tank past the machine and back to the tank, means for permitting abrasive to be fed from the conduit to the machine, means for maintaining a continuous pressure on the abrasive in the conduit, a valve for intermittently closing communication between the discharge end of the conduit and the tank, a series of reservoirs for different grades of abrasive in suspension, and means permitting replenishment from the reservoirs the abrasive supply circulating in the tank and conduit.

16. An apparatus for supplying abrasive to a sheet-surfacing machine, comprising a supply tank and a conduit leading from the tank past the machine and back to the tank, means for permitting abrasive to be fed from the conduit to the machine, means for maintaining a continuous pressure on the abrasive in the conduit, a valve for intermittently closing communication between the discharge end of the conduit and the tank, a series of reservoirs for different grades of abrasive in suspension, means permitting replenishment from the reservoirs the abrasive supply circulating in the tank and conduit, a series of grading tanks and means for discharging graded abrasive from the grading tanks into the reservoirs.

17. An apparatus for supplying abrasive to a sheet-surfacing machine, comprising a supply tank and a conduit leading from the tank past the machine and back to the tank, means for permitting abrasive to be fed from the conduit to the machine, means for maintaining a continuous pressure on the abrasive in the conduit, a valve for intermittently closing communication between the discharge end of the conduit and the tank, a series of reservoirs for different grades of abrasive in suspension, means permitting replenishing from the reservoirs the abrasive supply circulating in the tank and conduit, a series of grading tanks, means for discharging graded abrasive from the grading tanks into the reservoirs, and means for conducting used abrasive from the machine to the grading tanks.

Signed at Toledo, in the county of Lucas and State of Ohio, this 21st day of December, 1923.

JOSEPH P. CROWLEY.