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ELROY ALBERT CHASE, OF NORTHFIELD, VERMONT.

METHOD OF PRODUCING A POLISHED SURFACE ON GRANITE BLOCKS.

No Drawing.

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This invention relates to an improved method or process of producing a highly polished surface on granite blocks of varying sizes.

5 It is the general object of my invention to provide a method or process by which a better surface may be attained, together with a very material reduction both in the labor cost and in the time required to complete
10 the polishing operation.

With this general object in view, my invention includes a series of successive operations upon the blocks to be polished, which will be hereinafter described and more particularly pointed out in the appended claims.

For a clear understanding of my improved process, a brief statement is necessary of the method by which a polished surface has been heretofore produced upon granite blocks. It
20 has been the previous practice to assemble a number of different blocks on a single bed surrounded by raised side walls, the spaces between the blocks being filled in with plaster so that the bed might present a continuous surface. The assembled blocks were
25 then subjected to a so-called "ironing" operation in which steel shot was forced against the high spots of the blocks by means of scroll wheels which picked up the shot at
30 their outer edges and worked it toward the center of the wheel. This process broke down or crushed the high spots on the different blocks and was continued until all of the blocks were brought to a comparatively
35 smooth surface in a single plane. The entire bed was then cleaned and all shot and steel particles were carefully removed.

A "coarse grinding" operation was then carried out with a coarse grade of emery or carborundum which was fed to ring wheels
40 having smooth continuous sides and bottom faces and of less diameter than the width of the bed. The grinding material was manually applied to the rings by the use of a
45 paddle or similar device and the grinding process was continued until the ironing marks were removed. The coarser portion of the grinding material was then removed and the intermediate polishing or "fining-up"
50 up" step of the process was carried out with a reduced amount of grinding material, the grain of which became gradually finer as it was worn down in the grinding operation.

After the grinding and "fining-up" or polishing was completed, the grinding wheel
55 was removed and the bed was again cleaned,

preparatory to the buffing operation in which a polish was produced by a soft wheel. It was then necessary to tear the entire bed to pieces and build it up again with the
60 stones in reversed position, before the opposite faces could be ironed, ground, polished and buffed as previously described. During the latter operations, the finished
65 under surfaces of the stones were frequently stained by rust from the particles of steel shot. The process required the personal attention of an operator throughout the whole time.

With my improved process, the operation
70 is commonly carried out on individual blocks of stone which preferably have their flat faces formed by a granite saw such as has been heretofore patented by me. The surfaces are thus approximately plane and accurate and the improvements which I have
75 devised in the grinding process enable me to entirely omit the "ironing" operation. If, however, certain blocks are found to have faces which are too irregular for the coarse
80 grinding operation, a preliminary ironing operation may be performed thereon, preferably using the improved type of ironing wheel which is shown in my prior Patent
85 No. 1,455,477, issued May 15, 1923.

The sawed or ironed stone is supported in fixed position in a suitable box or trough and is first subjected to a coarse grinding operation by a ring wheel or scroll of special form, such as is shown, for instance, in my prior
90 applications, Serial Nos. 536,533 and 552,278, filed respectively February 14, 1922 and April 13, 1922. In each of these constructions, the inner faces of the grinding rings or scrolls are provided with pockets of special
95 design which act to receive and store the grinding material as it works gradually outward from a central feed opening. The pockets feed the abrasive directly under the grinding surfaces of the wheels.
100

This storage capacity of the wheels greatly assists me to dispense with the formation of the large continuous bed which has been heretofore required and to use a wheel of greater diameter than the width of the block,
105 as I find that the abrasive is retained in the pockets when portions of the wheel revolve beyond the edges of the stone, and that the abrasive is thus held in position so that each portion of the wheel will resume its grinding
110 effect as soon as it re-engages the stone. The ring wheels used in the old process en-

tirely lacked this storage features and merely swept the abrasive off of the edges of the stone if allowed to revolve beyond the edge thereof.

5 I preferably provide an automatic feed of abrasive to the center of the grinding wheel, from which point the material works gradually outward toward the edges, bringing the surface rapidly to a smooth condition. This
10 center feed permits increased speed of rotation and the increased speed, together with the storage effect of the pockets, reduces the time of the grinding operation to a small fraction of the time previously required for
15 ironing and coarse grinding. This reduction in time is also partly due to the fact that the old form of wheels with hand feed ran for a considerable portion of the time practically idle, as it was almost impossible
20 for the operator to maintain at all times an even supply of abrasive under the grinding faces.

After the coarse grinding operation is completed, the stone is preferably removed
25 entirely from the coarse grinding machine and is placed in a second machine for the intermediate polishing or "fining-up" process. No careful cleaning of the grinding machine is required, as it uses the same
30 grade of material continuously. For this second operation, I may desirably use a wheel having a plurality of concentric plain rings secured together by radial arms which also connect the rings to a driving head, the
35 wheel being of lighter construction than the coarse grinding wheel and preferably having no pockets in its grinding surface. An improved form of wheel for this intermediate or polishing operation is shown in my copending application, Serial No. 599,037, filed
40 November 4, 1922.

In carrying out this intermediate polishing, the upper surface of the stone is moistened and a certain grade of fine powdered
45 abrasive is fed to the wheel. The wheel is then rotated over the stone, the motion of the wheel preferably being such that the wheel advances bodily toward that edge of the wheel which is leaving the edge of the
50 stone, thus carrying the coarser particles of the material over the edge. Water is allowed to drop on the stone in sufficient amounts to keep the polishing material in a paste-like form.

55 After perhaps five minutes, a finer grade of polishing material is applied to the stone and the wheel is run with this material for another short period, after which a still finer grade is substituted, this process being
60 continued until the desired polish is produced.

It is found that this process of substituting successive grades of fine polishing material saves a great deal of time when compared with the old process in which the orig-

inal coarse abrasive was gradually worn down by grinding contact with the stone until it was sufficiently fine to give the desired finish. This old process frequently required
70 some four or five hours for the intermediate or "fining-up" step, whereas similar or better results can be obtained by my improved process in from twenty minutes to half an hour. The certainty of the results is also
75 much improved, as a certain definite grade of polishing material can be supplied at each step in the process, instead of depending upon the indefinite and uncertain wearing out of the original abrasive, as previously
80 employed.

When a wheel of this sort is used, it is desirable that the wheel be larger in diameter than the width of the block so that it may be moved back and forth in a straight line
85 over the block to act on all portions thereof. Such movement may be produced automatically, enabling one man to attend several such machines instead of giving his entire
90 personal attention to a single polishing wheel.

After the "fining-up" operation, the final buffing operation is carried out by means of wheels having felt buffing surfaces and using a fine polishing powder, such as oxide of zinc. The time required for the buffing operation
95 has also been very materially reduced, due in part to the fact that the blocks of stone are not bedded in plaster and consequently there is no plaster to mix with the polishing powder and reduce its efficiency. The time
100 is also reduced by the use of the improved form of buffing wheel shown in my prior application, Serial No. 536,532, filed February 14, 1922, in which the buffing surface is
105 made up of a plurality of separately yieldable cushion members or projections. This construction permits the wheel to adapt itself much more readily to the surface on which it works, so that it will quickly produce a uniform polish upon a surface which
110 may vary slightly from a true plane.

As a result of the use of my improved coarse grinding, intermediate, and buffing wheels, together with the improved method
115 or process in which the wheels are utilized, the work of producing a polished surface on granite blocks has been made very largely automatic and both the time required and the cost of labor have been greatly reduced when compared with the results attained by the old process.
120

A very important result arises from the omission of the ironing operation. Certain kinds of granite contain mica which is
125 crushed by the steel shot to a point below the level of the harder quartz and feldspar in the granite. It was almost impossible by the old process to remove these mica depressions from the surface and obtain an unbroken
130 polish. With my new process, the ironing

is omitted and these depressions are not formed. My improved coarse grinding wheels with center feed are also able to use a coarser abrasive than the old ring wheels and to use it much more effectively, greatly reducing the time required to produce a given result.

The center feed of this wheel also makes possible a higher speed of rotation than could be used with the old "paddle" feed and this higher speed in turn increases the storage capacity of the wheel by retaining a portion of the abrasive against the inner faces of the rings or scrolls, from which it flows gradually to the pockets and thence to the work.

Having thus described my invention and the advantages thereof, it will be readily apparent that changes and modifications can be made therein by those skilled in the art within the spirit and scope of the invention as set forth in the claims, and I do not wish to be otherwise limited to the details herein disclosed, but what I claim is:—

1. The method of producing a polished surface on granite blocks which consists in providing each granite block with an approximately plane regular surface co-extensive with one face thereof, in subjecting said single granite block as a complete unit separately and successively to a coarse grinding operation, and a fining-up operation over said entire surface, said coarse grinding operation being carried out in a machine especially adapted for coarse grinding and said fining-up operation being carried out in a different machine especially adapted for fining-up, said granite block being moved from the first machine to the second machine after the coarse grinding operation thereon, and each granite block being individually and firmly supported as a separate unit in each machine and throughout each operation thereon, and the edges of said block being at all times free from embedding material.

2. The method of producing a polished surface on granite blocks which consists in providing each granite block with an approximately plane regular surface co-extensive with one face thereof, in subjecting said single granite block as a complete unit separately and successively to a coarse grinding, a fining-up and a buffing operation over said entire surface, and in moving each block to a successive machine between each two successive operations, each machine being especially adapted to its particular operation, and each block being individually and firmly supported as a unit in each machine and throughout each operation thereon, and the edges of each block being at all times free from embedding material.

3. The method of producing a polished surface on a granite block which consists in providing an approximately plane unfin-

ished surface on a block of granite, firmly supporting said block as a complete and separate unit free from embedding material about its edges, smoothing said unfinished surface by grinding with a coarse abrasive, thereafter fining-up said surface, in a series of separate steps, using separate and successive applications of fresh and successively finer polishing abrasives of definite grades, each grade of abrasive remaining on the block for a relatively short run only, and the greater part of each grade of abrasive passing from the block while it is of substantially its original grade, and finally buffing the polished surface of the block.

4. The method of producing a polished surface on a granite block which consists in providing an approximately plain unfinished surface on a block of granite, smoothing said unfinished surface by grinding with a coarse abrasive, thereafter fining-up said surface with a relative finer abrasive of a definite and substantially uniform grade until a texture of surface is produced upon which said abrasive will not have further substantial smoothing effect while it retains substantially its original grade, repeating said fining-up operation with an abrasive of still finer and substantially uniform grade to a corresponding condition of surface smoothness, and continuing said fining-up operations and said changing to successively finer grades of abrasive until the desired smoothness of surface is attained.

5. The method of producing a polished surface on a granite block which consists in providing an approximately plain unfinished surface on a block of granite, firmly supporting said block as a complete and separate unit free from embedding material about its edges, smoothing said unfinished surface by grinding with a coarse abrasive, thereafter fining-up said surface with a relatively finer abrasive of a definite and substantially uniform grade until said grade of abrasive has no further substantial smoothing effect on said surface, repeating said fining-up operation with a still finer abrasive of substantially uniform grade to a corresponding condition of surface smoothness, and continuing said fining-up operations, using successively finer but substantially uniform grades of abrasive until the desired smoothness of surface is attained.

6. The method of fining-up a block of granite which consists in supporting the block in fixed position with its edges free from embedding material, supplying water and abrasive thereto, rapidly rotating a fining-up wheel thereover and in contact therewith, and moving said wheel bodily over said block with a portion thereof projecting beyond the edge of the block, the movement being in such a direction that the projecting portion of the wheel at its ad-

vanced edge is leaving the edge of the block and is feeding water and abrasive toward and on past the said edge of the block.

7. That improvement in the art of surfacing granite which consists in first rough surfacing the stone, then reducing the surface by a coarse abrasive of substantially uniform grains, discontinuing such reduction when the asperities of the surface are reduced to the normal size of said coarse abra-

sive, removing said coarse abrasive, then reducing by an abrasive of substantially uniform finer grade, discontinuing such reduction when the asperities are reduced to the normal size of said finer abrasive, removing said finer abrasive at said stage, and so on until the desired finish be attained. 15

In testimony whereof I have hereunto affixed my signature.

ELROY ALBERT CHASE.