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## Accounting for Granite Quarries

BY FRANCIS C. DERBY

Although some quarriers of granite operate manufacturing sheds wherein the rough stock is made ready for its particular place in a building, bridge or other structure, most quarriers of memorial or monumental granite sell the rough stock to manufacturers whose craftsmen transform it into a thing of lasting beauty.

This article is confined to the quarrying part of the business, and does not attempt to present in detail an accounting system for a granite quarry, but rather to consider some of the distinctive features of the business and the principles involved therein.

Rough granite is sold on a cubic-foot basis, and therefore all costs are computed and kept on that basis. A thorough survey of a quarry by competent engineers is of major importance, for in no other way can a trustworthy estimate of the number of units or cubic feet of granite in a quarry be obtained. By dividing the cost of the quarry by the number of cubic feet of granite contained therein, the first cost per cubic foot may be obtained.

However, the only time the granite is actually measured is when it is ready for shipment to the buyer, and the quantity shipped may vary materially from the quantity extracted from the quarry. The item of waste, which in the granite business is called "grout," may be a negligible factor in some quarries, such, for instance, as those which manufacture paving blocks, but it is a very important factor in others. In quarries which produce the best quality of monumental granite, the waste runs as high as eighty-seven and one-half per cent. In other words, only one eighth of the granite in the ground is recovered and sold.

This high percentage of waste is explained by the fact that at least five sides of nearly every stone quarried for monumental purposes must be free from defect. In producing granite for building purposes, however, it is obvious that if one face is free from flaw—the only face to be exposed in the finished structure—much granite that would be rejected for memorials can be reclaimed.

In some quarries near larger cities, the waste granite, or grout, is crushed and sold for road work. Grout is good material also

for such purposes as ballast in railroad construction, but the cost of handling and transporting it in most quarries is so great that it is not salable and quarriers are glad enough to give it away to get it off their property without cost. Fortunate, indeed, is the quarryman who owns plenty of land on which to store waste granite. Grout piles in size resemble small mountains and the cost of removing them, if this becomes necessary, is an item of no small magnitude.

For the benefit of those who are not acquainted with quarry operations, a few words relative thereto may be appropriate. Granite in a quarry is loosened in quite large blocks. Deep holes are drilled, where the break or "split" is desired, by compressed air from a central compressor plant. Black powder is used for an explosive in order to get a heaving effect. Dynamite shatters the granite and its use would increase the percentage of waste materially. At best, however, some granite is blown away and falls into the pit or quarry bottom. The loosened block is then hoisted to the surface where, if necessary, it is drilled and split or otherwise fabricated into "random" or ordered sizes. The broken, shattered granite which has fallen into the pit is hoisted to the surface in buckets by derricks, where it is conveyed by overhead carriers, tramways or company-owned railways to the grout piles. Quarries are usually kept free of loosened granite, although in some quarries it is allowed to accumulate in the pit or quarry bottom because it acts as a cushion for the large blocks of granite which are blasted out from a height, and substantially lessens cracking and splintering.

Many quarriers believe it impracticable to attempt to measure the waste granite. One must concede, however, that when it may amount to seven-eighths of a quarry it is a very important factor. It should be apparent that in cases where the grout or waste granite is not measured, one must rely on the judgment of quarry men of wide experience or competent engineers for an estimate of the percentage of waste. With this determined, it is necessary to multiply by the proper amount the number of units recovered, in order to obtain the number of cubic feet removed from the quarry. With this result one can readily compute the first cost per cubic foot of granite sold and the amount to charge against operations and credit to the reserve-for-depletion account.

Some quarriers in the Vermont district have quite recently attempted to measure the waste granite—usually by converting

weight into cubic feet. A comparison of the results with the method just outlined has shown this to be feasible, practicable and entirely worth while, losses from waste having been reduced by from five to ten per cent.

The next item of cost is that for quarry development. From time to time, the quarry walls become nearly perpendicular and the granite which is readily available to a derrick becomes exhausted. It is then necessary to move the derrick further away from the quarry opening, remove the soil overlying the granite and in other ways make available a new supply. Sometimes tracks and overhead carriers must be moved. The soil is usually removed with steam shovels and ordinarily a development project in a good-size quarry at any location or derrick runs into thousands of dollars. The cost of development work should be charged to an account captioned "Quarry development, derrick No.—," an asset account listed under the deferred charges, and should, of course, be applied to the granite which it makes available.

The larger quarries keep several derricks in operation at the same time. Each derrick and the section of the quarry in which it is operated is in charge of a foreman, and the direct costs of operating each section should be kept entirely separate so that physical advantages or disadvantages and efficiency or inefficiency may be readily observed. Development work is not carried on over the entire quarry at the same time and so the cost on each section or at each derrick can and should be kept separate. When a development project at a derrick is completed and the cost of it is determined, it is necessary to divide the cost by the number of cubic feet uncovered or made available, which, of course, must be carefully measured by a competent engineer. As granite made available by each development project is produced, made ready for shipment and measured, the number of cubic feet thus produced should be multiplied by the proper amount as in determining depletion costs, unless the grout is measured, to find the number of cubic feet extracted from the quarry, which, multiplied by the development cost per cubic foot of granite uncovered, gives the development cost per foot produced and the amount to charge against operations and credit to "Quarry development, derrick No.—."

The other direct costs in quarry operations are labor, repair parts, supplies and certain depreciation, all of which are kept

separate for each derrick. The labor item is subdivided for foremen, engineers, pit labor and surface labor. Pit labor represents principally drilling and allied operations and removing grout. Surface labor represents these same operations, loading cars and other handling of granite. The supplies are explosives, exploder caps, fuse, etc., and the depreciation represents wear and tear on equipment used for direct quarrying operations only, such as derricks, buckets, etc.

During ordinary times, quarriers do not, as a rule, carry large stocks of finished granite, known as "saw blocks," "random," or "granite stores," on hand except in the winter months. In other words, granite is not removed from the quarry during the spring and summer months, except in negligible quantities, unless there are orders for it on hand. This fact makes a check of the cost statements readily possible, because at the end of more than half the months of the year there is practically no salable granite above ground or in "stores." The percentage of waste granite increases materially when the quarry is penetrated by frost and operations are considerably more costly when the quarry is covered with snow and ice. Quarriers, therefore, begin during the early fall months to stock random and marketable sizes to an extent which it is estimated will carry them until the frost leaves the quarry in the early spring. Operations continue, but are somewhat slower.

There is so little processing to rough granite that no accounts are kept for "Granite in process." Strictly speaking, the processing begins with drilling in the quarry, but the quarry or pit work, with the possible exception of clearing away grout, is practically completed each day. When the loosened block is hoisted to the surface it is sometimes immediately loaded on cars and shipped to the customer. At other times, it requires further splitting because most orders are for sizes smaller than that of the block. Furthermore, the shape of the block is not always such that it is marketable without some processing. But here again the processing takes only a short time and is practically completed at closing time each day. Thus any granite on hand at the end of a month is "finished" and in "stores."

The indirect costs in quarrying are the expenses of operating

1. A blacksmith shop wherein chains and other equipment are made and repaired,
2. A sharpening shop wherein drills are made and sharpened,

3. A carpenter shop wherein ladders and stairs for the quarry, pulleys, etc., are made and repaired,
4. A machine shop wherein machinery is made and repaired,
5. The power plant,
6. A railroad or other carrier, for hauling grout from the quarry to the grout piles, granite from the quarry to the main line, etc.,
7. A railroad "jitney" or auto truck. This is used for carrying sharpened drills and other tools to the various derricks.

The expense of operating each of the foregoing is divided into the following classifications: Operating labor, repair labor, repair parts, supplies, fuel, electric power and sundries. Expenses are prorated according to the number of cubic feet recovered and shipped or put in stores.

All supplies are charged to "Stores control," placed in a stock room and issued by clerks on requisitions made by the foremen and approved at the superintendent's office.

Quarrying is deemed a hazardous business by insurance companies and the item of liability insurance is one of the most important expenses. It should, of course, be charged to the various departments by applying the effective rate to the pay-rolls.

Much more could be written on the subject of accounting for granite quarries. Only a few days ago a well known business man and quarry executive in conversation with the writer expressed the opinion that the lack of accurate knowledge of costs in this industry was far more conspicuous than in any other with which he is acquainted. It is hoped that the few points covered in this article may prove helpful to those interested.