"The Potsdam Red Sandstone Quarries"

In *Scientific American*, Vol. LXVIII, No. 1
New York, January 7, 1893, pp. 1, 8-10

This article, which begins on the next page,
is presented on the Stone Quarries and Beyond web site.
http://quarriesandbeyond.org/

Peggy B. Perazzo
Email: pbperazzo@comcast.net
November 2012

"The Potsdam Red Sandstone Quarries"

Scientific American, Vol. LXVIII, No. 1
New York, January 7, 1893, pp. 1, 8-10

"A perfect building stone is far from being a common product of nature. To be qualified as a perfect building material, a stone must unite the qualities of resistance to weather and to fire, must be of good appearance and impervious to moisture. It should also not be of a tint as to become dingy or of ugly color when exposed. The streets of this and other cities furnish the best possible examples of defective building stones. Brownstone buildings are seen whose carved portions are disintegrating and the faces of whose smooth wall pieces are flaking off. To avoid this destruction various suggestions and experiments have been made either in the way of chemical treatment or of method of laying, but nothing seems to stop it. The experience of Boston and other cities has demonstrated how poor a resistant to fire is granite. Granite is often a stone of handsome appearance, and will in some cases stand any amount of exposure to the elements, but it is very unsatisfactory in the presence of a conflagration. Although stone is everywhere recognized as the noblest and most desirable of building materials, yet so great has the difficulty of securing good stone become that many large buildings are built entirely of brick and terra cotta, the art of man being relied on to surpass nature.

"The Potsdam sandstone is a member of the lower Silurian group and rests upon the primitive rocks of the Eozoic. This lower portion of the Potsdam formation varies from an absolute quartzite to a sand. In the present issue we illustrate the quarries at Potsdam, N.Y., from which this stone is extracted for building purposes. Here the famous sandstone is attacked at the place where it seems to be of the best average quality. A thickness of 70 feet is exposed in the quarries. At this point it is almost a quartzite.

"The examination of a microscopic section of the rock discloses the following characters: It is found to consist of angular grains of clear quartz, quite unmixed with other granular material. There is no feldspar or mica intermingled with it. The interstices between the grains contain a cementing material. This is found to be a clear, colorless silicious cement, so that the rock is virtually silica. On this point, Professor Thomas Egleston, of the Columbia College School of Mines, and an authority on building stones in the United States, in a paper read before the American Society of Civil Engineers, on the decay of building stones says: 'Of the sandstones having a silicious binding material, Potsdam sandstone, which has been used in the recently constructed Columbia College [an engraving of which is published herewith], and the silicious Triassic sandstone, which was the material used in the lower part of the cathedral at Rodez, are the best examples, and in these no decomposition takes place. Of these sandstones, it will be noticed that there are two general varieties, one in which the quartz grains are more or less large, and are rounded, but are cemented together by silica…In the Potsdam sandstone, on the contrary, the grain of the quartz is quite small; its shape, when it can be distinguished at all by a magnifying glass, is always angular…This is the best of all building materials, though mouldings made of the other variety (large grains) will last for many years without suffering any appreciable amount of deterioration.'

"The other sandstones vary greatly from this. In many cases the quartz grains which form a body of sandstone are mixed with grains of feldspar and mica, which in themselves present at least a change or probability of decay. The cementing material also varies: It may be of argillaceous nature or may be even a calcium carbonate. As cements all these are defective. They always tend to yield to the weather.

"As a weather resistant pure crystalline quartz would be the best of all materials. This, of course, being out of the question, the next best thing would be in the line of a flint rock or quartzite. To the latter type, the Potsdam sandstone is closely assimilated. It departs far enough from it to be workable. Although extremely hard, it can be wrought into all shapes demanded by modern building, including the most exquisite carvings and mouldings. Its strength is very great. It has been tested on the Emery testing machine at Columbia College in this city, and proved to be of extraordinary compressive strength. Some pieces placed in the machine and subjected to stress broke at a little over 18,000 pounds to the square inch. This figure brings it as regards strength quite out of the range of most sandstones and limestones and makes it surpass the majority of granites. But one marble and one sandstone in a very long list approaches this strength. What is still more extraordinary is that two inch cubes from one of the quarries proved too strong to be broken by the testing machine, although the pressure was carried to 151,000 pounds. This test reduces to a compressive strength of nearly 43,000 pounds to the square inch, or more than double the strength of the best granite. This result, so extraordinary as to be properly termed an anomalous one, proves what the stone may be.

"We have said that granite may be weather resisting. While this is very true, it may be equally true that other samples will fail to withstand the American climate. To determine, as well as possible, what the action of the weather, including a contaminated city atmosphere, might be on Potsdam sandstone, it has been tested by subjection to acid and sulphurous acid gas. Dilute sulphuric acid, after long action, dissolved only 2/100 of one per cent, or a mere trace, while some stones lost over six percent. Sulphurous acid gas only changed its weight 6/1000 of one percent. These tests are designed to represent the action upon it of the city atmosphere. As a direct test, samples have been repeatedly subjected to the severest freezing and thawing, and have remained absolutely unaffected.

"In the vicinity of the quarries, buildings have been constructed of this stone, which have stood for over seventy years. Yet exposed for this length of time to the trying climate of Northern New York, the stone has preserved its fresh appearance and has not yielded in the least, the tool marks being as clearly discernible as if made yesterday. Prof. Newberry has expressed the opinion that 'had the obelisk now standing in our Central Park been composed of such a dense, homogeneous sandstone as Potsdam sandstone, it would to-day be as perfect as when created at Tanis 1500 B.C.' Here it may be noted that this very obelisk, which suffered so much on exposure to our climate, is made of granite.

"We have spoken of the poor qualities of granite as a resistant of fire. The action of a conflagration upon granite is to cause it to flake off; walls composed entirely of this material may thus become so reduced in thickness as to fall. It is there that the qualities of Potsdam sandstone appear at their best. It is so absolutely fire-resisting, its granular structure so completely prevents it from cracking, that it can be heated to a red or white heat without injury. By many foundrymen it is preferred to fire brick for lining cupolas, and in the vicinity of the quarries is always used for lining lime kilns. The report of Prof. Wilbur, of Rutgers College, to Dr. Smoke, the New York State Economic Geologist, showed that this stone withstood repeated heating to the temperature of melted copper, and sudden cooling, without injury or change of color – something which no other stone of the large number tested by him could do.

"The qualities of Potsdam sandstone have been carefully examined and tested by men of the highest scientific standing. Dr. J. S. Newberry had occasion to examine the stone in 1890, and his report fully carries out all that we have said above. Dr. Newberry is professor of geology in Columbia College School of Mines; the opinion of his eminent colleague Prof. Egleston, who has charge of the department of mineralogy in the same great institution, is sufficiently indicated by the extract from his famous essay on the Decay of Building Stone, read before the Society of Engineers, which we give above. Prof. John C. Smock, New York State Economic Geologist, and Prof. Francis A. Wilbur, of Rutgers College Scientific School, as among the authorities we may refer to. Dr. Geo. P. Merrill, of the Smithsonian Institution, at Washington, is our authority on what we have said of the microscopic examination of the stone. In his new work on the Building Stones of the United States, Dr. Merrill says, referring to Potsdam sandstone: 'I consider this, from the standpoint of durability, almost an ideal stone. It is practically non-absorptive, and its surface affords no foothold for growing organism.'

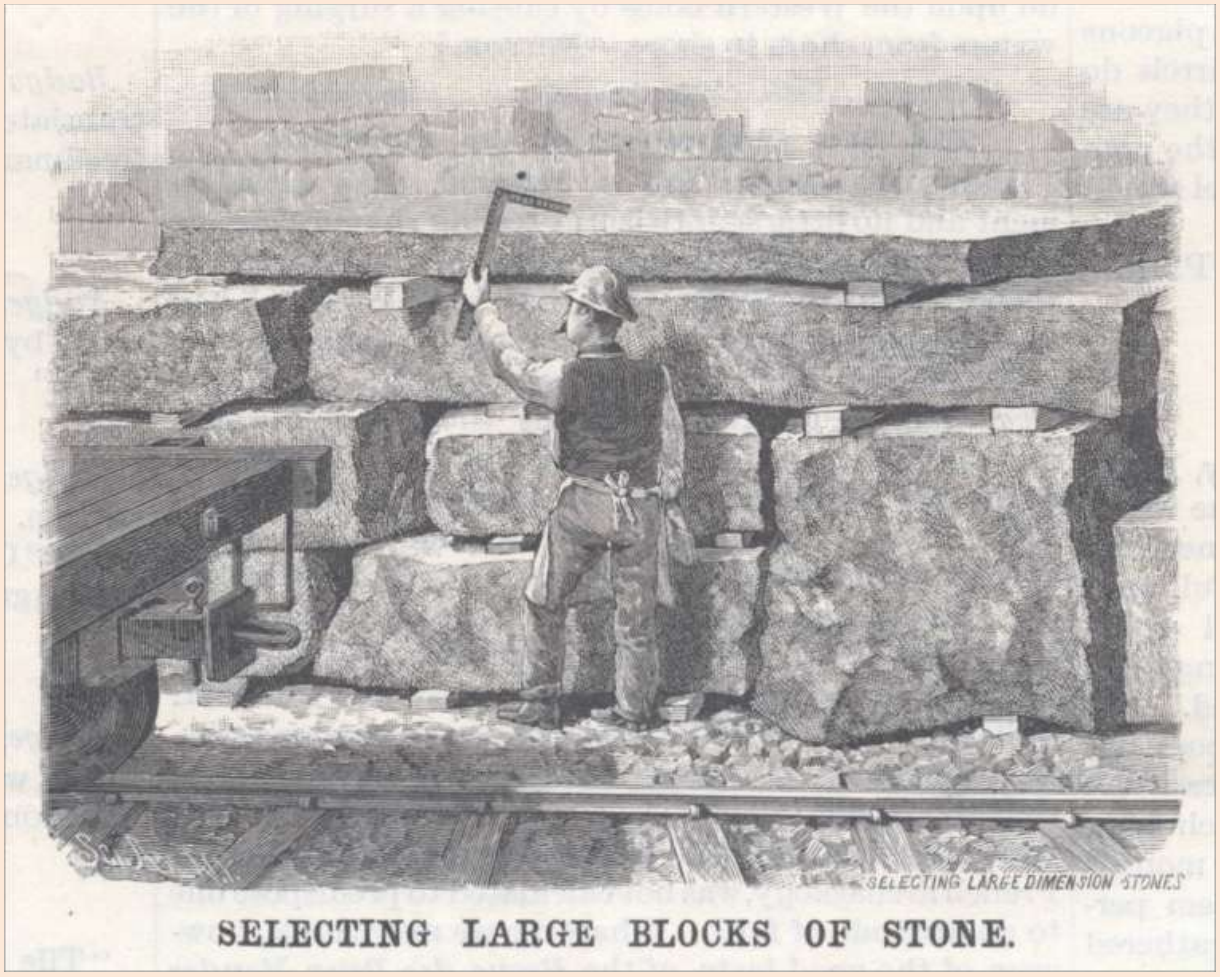
"Our illustrations of the quarries and workshops of the Potsdam Red Sandstone Company, of Potsdam, N.Y., tell their own story. They show the immense scale on which the operations are there carried on. From the everyday point of view a valuable feature is the large accumulation of ready quarried stone, nearly 100,000 cubic feet usually being carried in stock, including 40,000 or 50,000 feet of the famous Potsdam random rock-faced wall facings, cut ready to ship, so that contracts can be filled immediately on receipt of orders. This puts the business on a par with the brick and terra-cotta makers, who from necessity are compelled to ship from stock, and absolutely avoids the proverbial delay in stone contracts, which is a standing joke among builders. Although it is the policy of the company to sell rough stone only, yet where local cut stone contractors refuse to make fair figures on work, their unrivaled facilities enable them to cut stone ready to lay in the building, and to set it if required in any part of the United States and Canada.

"The peculiar stratification of the material as it lies in the quarries will be noticed. The natural beds are nearly perfect, which greatly reduces the cost of cutting. Immense blocks are got out almost of perfect shape, by the use of wedges and feathers, sometimes assisted by some of the patented methods of blasting. The equipment of machinery is of the most modern and complete description.

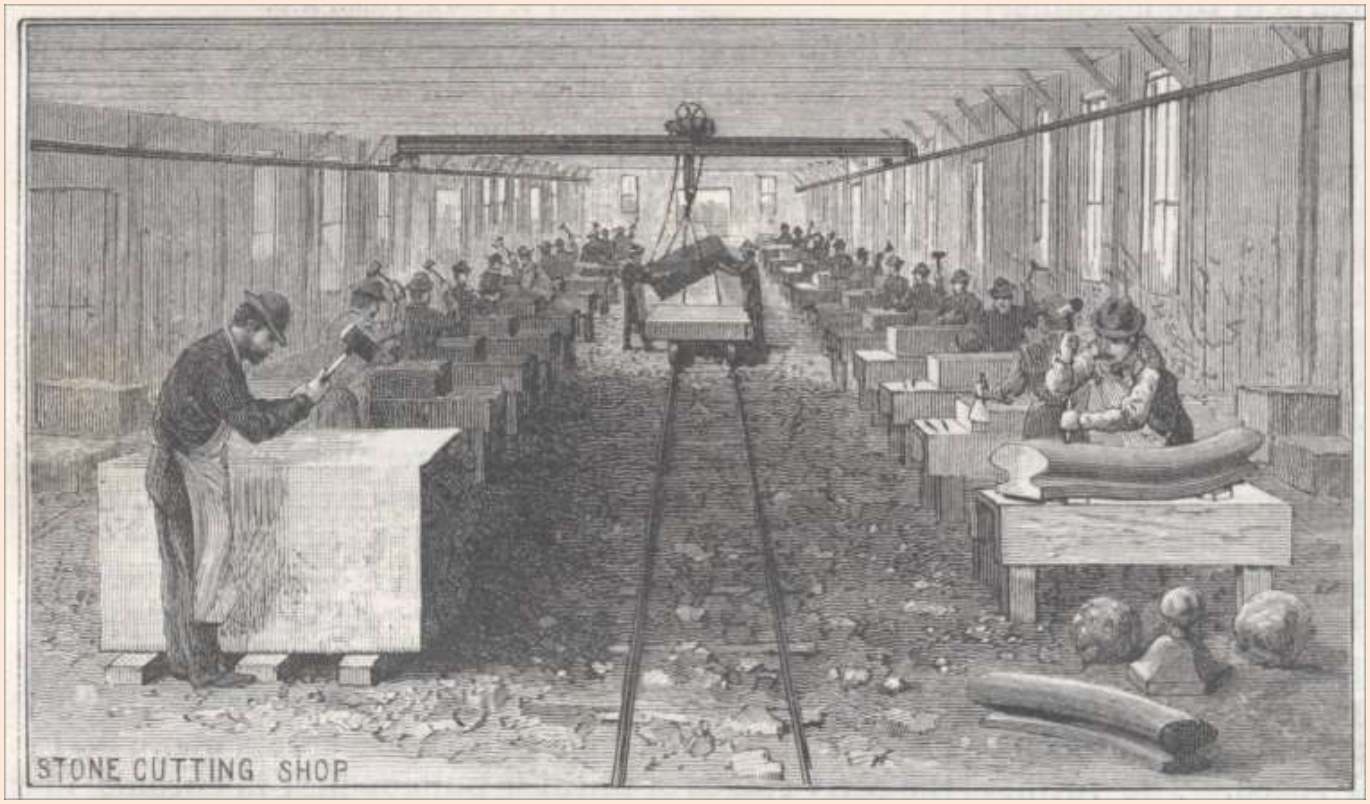
"The different quarries of the company afford a certain choice of color. The red stone is of an exceptionally pleasing and bright tint. About fifty feet of these layers is exposed in the quarries. Stone can be taken out from two to six feet or more in thickness, and can be wedged into any size from these thick stones, resembling granite in this. The company's quarries are distributed for about a mile up and down the Racquette River, and embrace the best outcrops of stone to be found in the district. Dr. Newberry reported, after personal examination, that these quarries were practically inexhaustible. We may, therefore, pronounce the company's quarries an almost ideal source of building material.

"One of the cuts, showing a workman selecting dimension stone from stock gives an idea of the form in which stone comes from the quarry. Another cut, showing the interior of a stone cutting shed, shows workmen getting out stoop rails and other forms.

(Continued on the next page.)

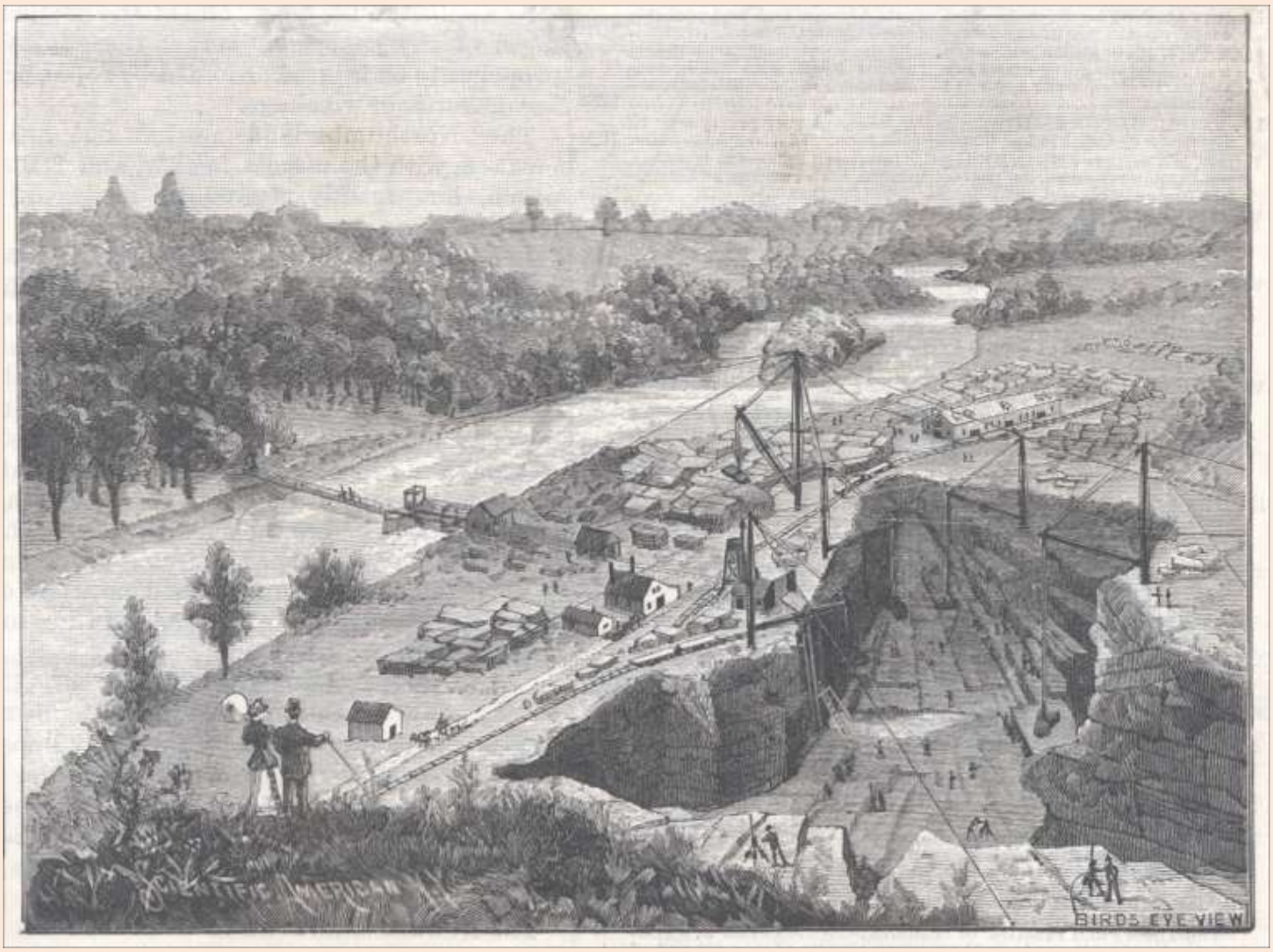


Selecting Large Blocks of Stone / Dimension Stones

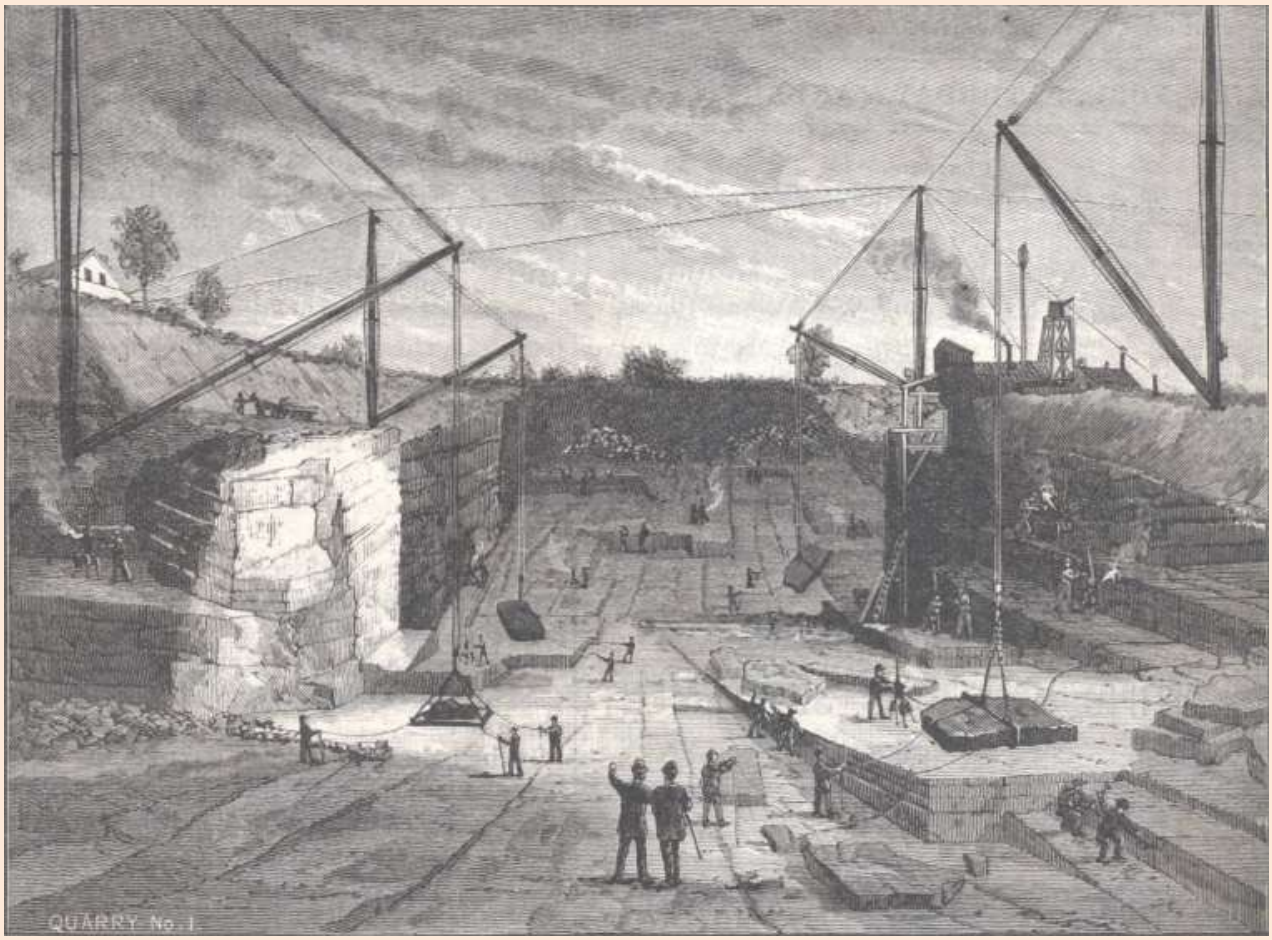


Stone Cutting Shop

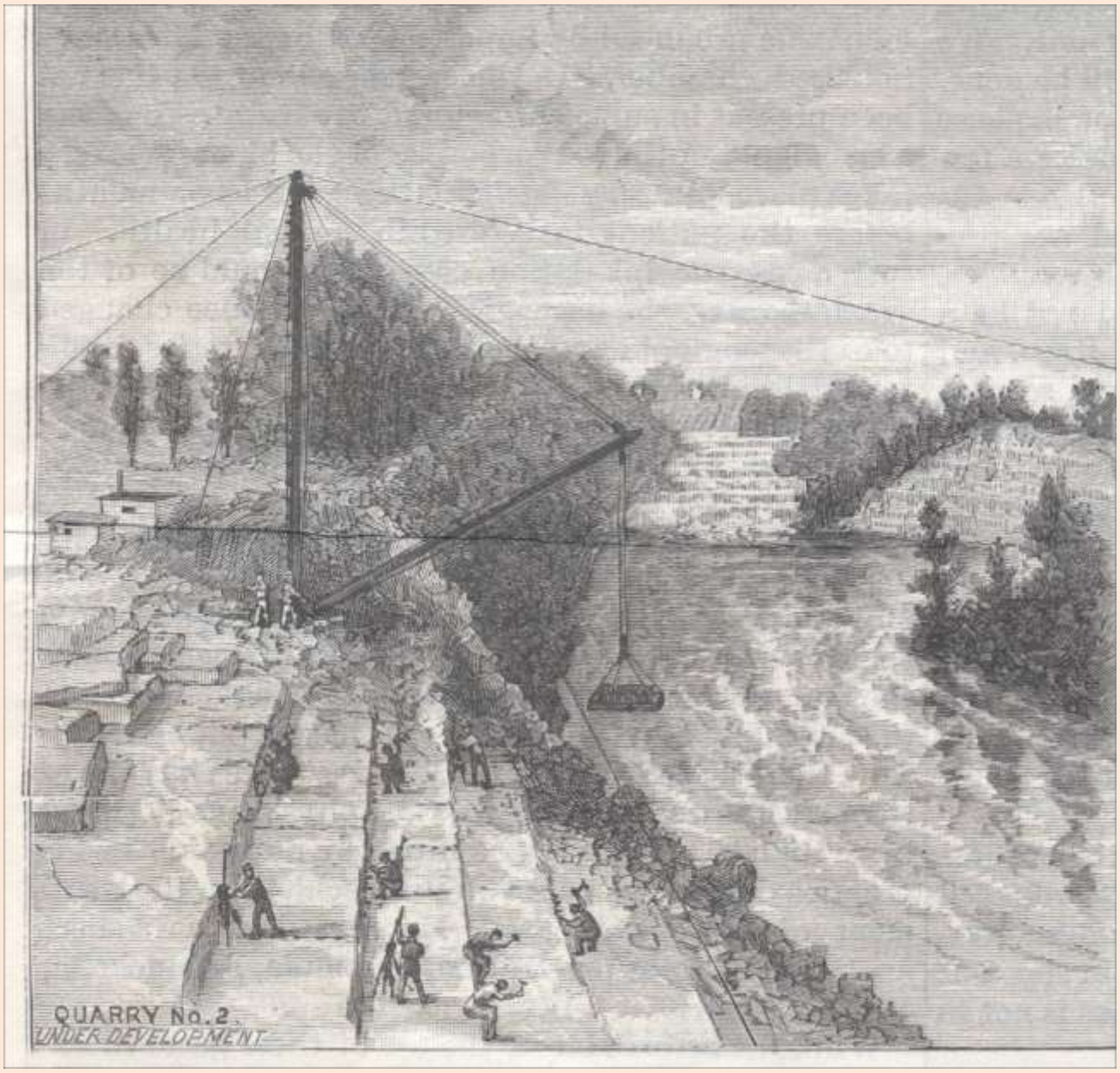
"Quarry No. 1, from which the main supply is derived, is shown in two cuts. The peculiar stratification of the stone is very noticeable. It is exceedingly regular, with sudden variations in the dip. The drainage of this quarry is effected by an undershot water wheel, shown in the bird's eye view to the left of the picture. From Quarry No. 2, now under development a medium red stone is taken. This quarry, for a long time to come, will be self-draining, as will also be the case with Quarries Nos. 3 and 4. From Quarry No. 3 a dark red stone is taken.



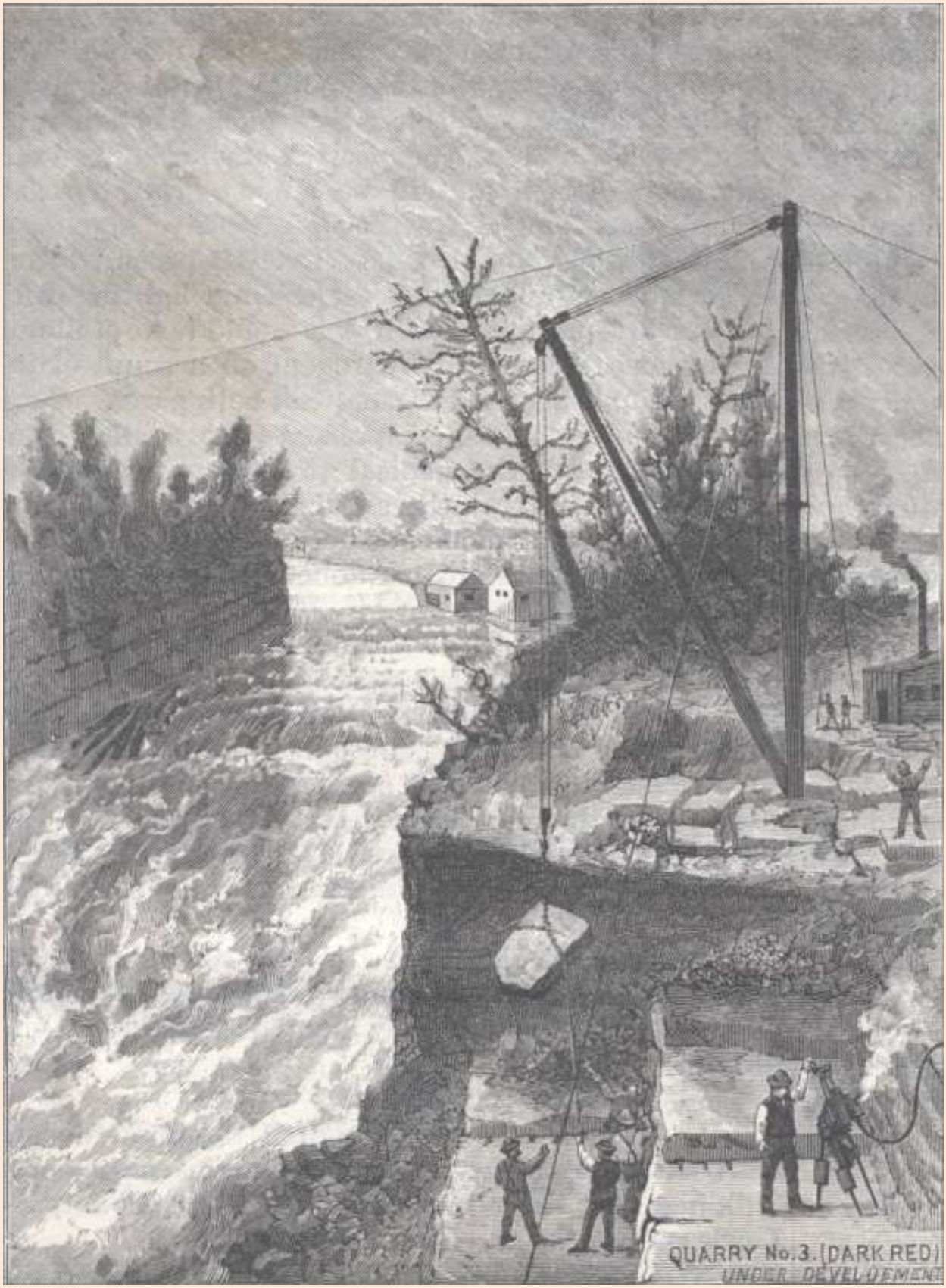
Bird's Eye View of the Potsdam Red Sandstone Quarry No. 1



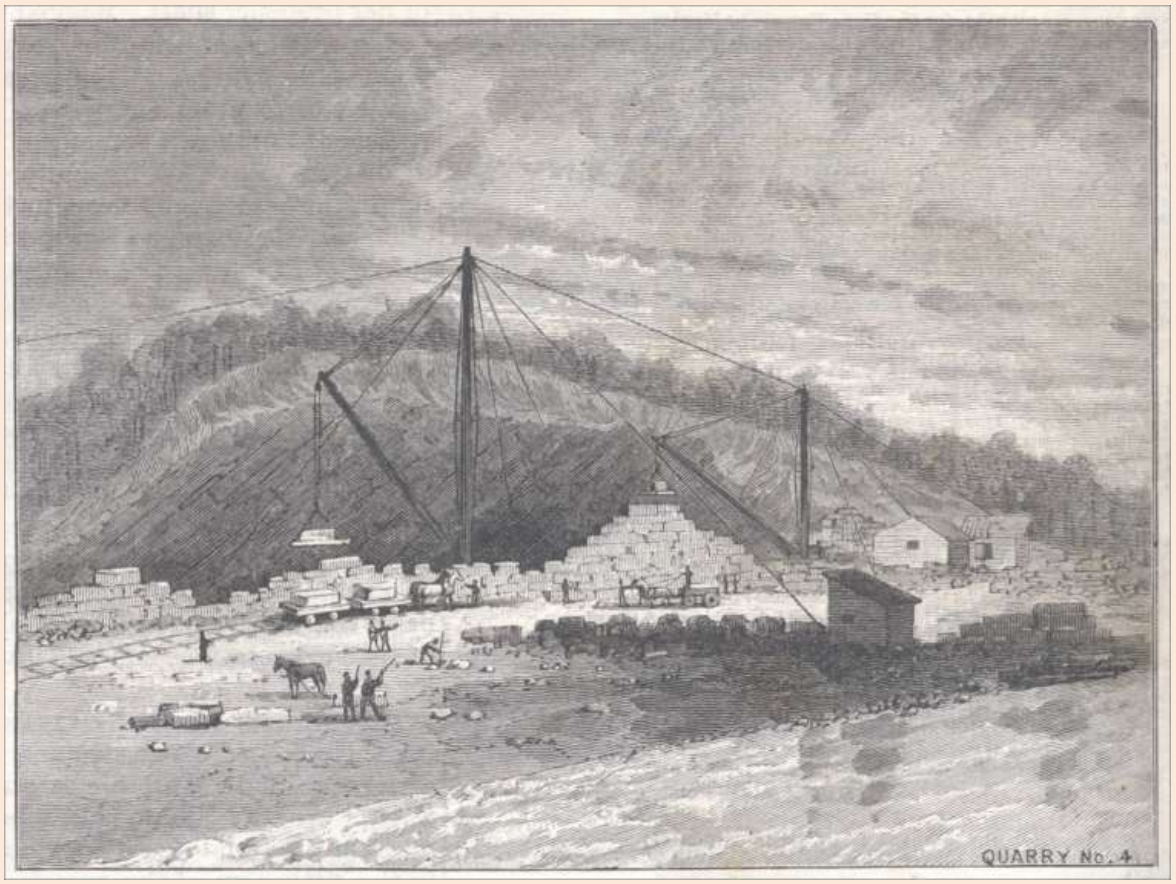
Potsdam Red Sandstone Quarry No. 1



Potsdam Red Sandstone Quarry No. 2 Under Development



Potsdam Red Sandstone Quarry No. 3 Under Development (Dark Red)



Potsdam Red Sandstone Quarry No. 4

"The Racquette River, on account of falls and rapids, is not navigable, although it is the second largest river in New York, but great numbers of logs are floated down it every year from the Adirondack forests. A fall on their quarry property gives the company nearly twenty thousand horse power, the entire river falling about sixty feet, and this will be of great value in the future development of the business, giving by means of compressed air or electricity ample power for the working of machinery now using steam, and for other purposes.

"There is one product of the quarries which should be mentioned, the banded stone. Some layers are strongly banded in different colors. With these the most beautiful architectural effects can be produced. The combination of light, medium, and dark red stone in solid colors and the banded variety gives great latitude to the architect in producing color effects. The colors harmonize excellently with granite or brick, and instances of this use are numerous. Among the buildings where the stone has up to this time been used for the whole or a part may be mentioned the dominion Parliament buildings at Ottawa, shown in the accompanying engravings; All Saints' Cathedral, Albany; Columbia College, New York City; the New York State Asylums at Ogdensburg and Matteawan (costing over a million each) and numerous buildings in New York City, Brooklyn, Buffalo, Syracuse, Rome, Albany, Troy, Lynn, Washington, D.C., Rondont, N. Y., New Rochelle N. Y., Ogdensburg, N. Y., etc., and smaller cities and villages in the United States and Canada.

“The quarries are situated near the line of the Rome, Watertown and Ogdensburg Railroad, and ship their product by the New York Central system in all directions.”

Columbia College, New York

Parliament Buildings, Ottawa, and private residences built of Potsdam Red Sandstone.