

MEMOIR
OF
THOMAS LINCOLN CASEY.
1831-1896.

BY
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BIOGRAPHICAL MEMOIR OF THOMAS LINCOLN CASEY.

Mr. President and Gentlemen of the Academy:

Our late associate was born in garrison at Sacketts Harbor, New York, on May 10, 1831. His father, the late General Silas Casey, was then stationed at that post, and the boy's earliest associations were those surrounding a military life. His family trace their ancestry back to the early settlers of Rhode Island, and the old homestead near Newport still retains the bullet marks received in a skirmish during the war of the Revolution. With such antecedents it was but natural that a West Point education should be the object of his wishes, and an appointment at large was conferred by President Polk dating on July 1, 1848.

With fine natural abilities and stimulated to persevering exertions by ambition and by an appreciation of the influence of high standing at the Military Academy upon his future career, he at once took a prominent position in his class, and at the expiration of the four years' course was graduated at its head. In the Corps of Cadets his soldierly figure and military tastes and bearing won for him successively the appointments of first sergeant of his company in his second class year and of senior captain in his last year. Among his classmates who attained high rank and distinction in the civil war were: Generals H. W. Slocum, D. S. Stanley, G. L. Hartsuff, C. R. Woods, Alex. McD. McCook, Aug. V. Kautz, and George Crook.

On graduation Cadet Casey was assigned to the Corps of Engineers as brevet second lieutenant, and, passing successively through all intermediate grades, on July 6, 1888, he attained the highest, that of Brigadier General and Chief of Engineers. He was retired from active service on May 10, 1895, by operation of law; and died on March 25, 1896.

At the outset of his career, after serving for about two years as assistant engineer at Fort Delaware, Lieutenant Casey was transferred to West Point, where he remained, performing various

academic duties, for about three years; he was then sent to the Pacific coast, where he commanded a detachment of engineer troops and performed other military services until the spring of 1861, when the gathering war clouds caused him to be ordered to the East. After serving on General Butler's staff at Fort Monroe for about two months he was placed in charge of constructing defensive works on the coast of Maine and on recruiting duty for the engineer troops in the field, taking station at Portland. Here he remained until November, 1867, when he was transferred to Washington as assistant in the office of General Humphreys, then Chief of Engineers. This city remained his permanent residence for the rest of his life, although he was absent for about two years, as president of the Board of Engineers, in New York in 1886-'88, and was sent to Europe in 1875 as a member of a board to study and report upon the condition of submarine mining for coast defense in Europe.

There are but few of the more modern public works in Washington and its vicinity which have not come under General Casey's skillful administration. He constructed the last two-thirds of the State, War, and Navy Department building, saving to the Government over two million dollars by improved methods; completed the Washington Monument; nearly completed the Congressional Library; had charge of the construction of the Medical Museum and Library; had much to do with the Washington Aqueduct; served on an important board to advise upon the ventilation of the House of Representatives, and was long a member of the Light-house Board. To all these duties he brought intelligence, energy, and professional skill of a high order. Congress on several occasions showed by special legislation its appreciation of his services in reducing expenses and judiciously directing the works committed to his charge.

During the seven years in which he was at the head of the Engineer Department of the Army, appropriations for works of river and harbor improvement were liberal and much progress was made, a good beginning was had in renovating our antiquated system of coast defense, and the administration of these public works was improved by grouping all the different engineer districts in charge of junior officers of the corps into five "divisions" and placing them under the systematic inspection and supervision of five of the colonels, designated Division Engineers.

This detail of administration was a distinct advance on the earlier practice, and is to be credited to the good judgment of General Casey.

From this brief outline of the public duties which engrossed the time and attention of our colleague it is evident that scant leisure remained for purely scientific investigation. He was interested in physical research, and his name appears among the signers of the original letter to Professor Henry requesting him to preside at a meeting called to organize what is now well known as the Washington Philosophical Society. He was elected a member of the National Academy of Sciences in 1890, and his presence will be missed at the annual meetings in Washington. He had in view the preparation of a paper on the motion of the center of gravity of the Washington Monument under the varying effects of temperature and wind, based on a long series of accurate observations conducted under his direction, but it was never completed. While his life work was so largely directed to architectural construction as to afford little scope for the solution of novel scientific problems, the bold and successful method he adopted for replacing the defective foundations of the Washington Monument won for him the cross of an officer in the Legion of Honor of France, conferred by the French government in recognition of professional merit; and perhaps a brief description of this achievement will be not out of place here.

The construction of the Washington Monument was begun in 1848 by the Washington National Monument Society, organized in September, 1833, after the failure of Congressional legislation, the intention being to depend upon voluntary contributions for the cost of erection. Economy became, therefore, a matter of more than usual importance in works of this character. Shortly after operations were begun doubts as to the sufficiency of the foundations appear to have been raised, for under date of January 18, 1853, Comptroller Whittlesey wrote to the president of the commission, "There were persons here who wanted to have the money on hand all buried beneath the surface, and as much more as might be contributed for some time. The building committee and the board of managers felt the responsibility of having a safe foundation, and believing that was obtained, they considered they were bound to the contributors to spend no money unnecessarily." At that date the structure had been

raised 170 feet above the ground and no cracks had appeared. Operations were suspended from lack of funds in 1856, the total height above ground being 174 feet.

Nearly a quarter of a century passed before work was resumed under a Congressional appropriation, and as no useful records had been preserved to indicate details of construction, grave doubts were entertained as to the character of the early work. A select committee was appointed by the House of Representatives in 1873, and its first step was to call for an examination of the security of the foundations. The necessary borings and excavations were made and efforts to detect what, if any, settlement had occurred were skillfully conducted with the following results:

The foundation course rested at a depth of 8 feet below the surface on a compressible bed consisting of a mixture of clay and fine sand, the former in excess, but decreasing with the depth in the following proportions, the figures indicating the excess of clay over voids, the plane of reference being that of the bottom bed:

Depth.	West side.	East side.	North side.	South side.
2 feet	68 per cent.	68.5 per cent.	70 per cent.	61 per cent.
7 feet	51 per cent.	45.2 per cent.	46 per cent.	46.7 per cent.
12 feet	31.5 per cent.	.....	43.8 per cent.	33.8 per cent.
14 feet	19.7 per cent.	.....	17 per cent.	.....
15 feet . . . . .	.....	18.5 per cent.	.....	.....
16 feet . . . . .	.....	11 per cent.	5 per cent.	13.3 per cent.

Water was reached at about 13 feet. Below that level a stratum of gravel and sand was encountered containing a less proportion of clay and changing gradually at a depth of 15 or 16 feet into a mixture of clay, sand, gravel, pebbles, and bowlders, forming a hard-pan of good resistance.

The masonry foundation at the bottom course was 80 feet square, and at the top course 59 feet square, rising between these planes to a height of about 24 feet, of which 8 feet were below and 16 feet were above the surface of the ground. The mass consisted of rubble masonry of inferior quality, the rock being gneiss of random dimensions, with approximately rectangular faces about 3 feet in height, roughly laid, with probably an ex-

cess of moderately pure lime mortar, having spalls embedded therein.

The projected shaft was of bluestone rubble masonry faced with white marble. Its height was to be 600 feet above the foundation, with a breadth at base of 55 feet and at top of 30 feet, having an interior well 25 feet square to accommodate a stairway. Its weight, including that of the foundations, was estimated at a little over 70,000 tons, giving, with no allowance for wind pressure, a dead load of about 11 tons per square foot of bed. The height above ground being already 174 feet, accurate measurements demonstrated that the top inclined 1.6 inches toward the north and west, with a corresponding dip in the upper surface of the lower course of marble.

The old records afforded no means of determining the amount of subsidence due to the weight of the actual construction. Although tests made at an early day had shown that the stone possessed ample strength to support the weight, the faulty method of laying had caused a few cracks in the courses near the base of the shaft, together with chipping and fracturing at the lower joints.

These results demonstrated that the doubts as to the stability of the monument were well founded. The matter was referred to two boards of distinguished engineers. The first reported: "The result of our investigations is that five tons is an excessive pressure for soils composed of clay and sand. We could not, therefore, with the information before us, recommend that any *additional* pressure should be thrown on the site of the Washington monument." The pressure of the incomplete structure as then built was estimated at five tons per square foot. The second board reported "that the stratum of sand and clay upon which the monument rests is already loaded to the limit of prudence, if not indeed to the limit of safety, and that it does not offer sufficient resistance to compression to justify the completion of the shaft in accordance with the modified design (400 feet high) or any other design that will load the underlying soil beyond 10,000 pounds per square foot."

In a supplementary report, dated June 13, 1877, the second board reported that it deemed it practicable to give additional spread to the foundations of the monument, and to carry them down to the underlying gravel bed "either by replacing with

solid masonry" (Portland cement and sharp sand) "the bed of compressible clay and sand which underlies the base of the monument or by circumscribing it with a wall possessing sufficient depth and stability to resist for an indefinite time any lateral movement of the soil under such additional load as may be placed upon the structure," and proceeded to set forth in detail the two methods suggested, giving preference to the latter.

Five years had now passed in discussions, not always free from acrimony, concerning the stability of the projected monument. In August, 1876, Congress had created a joint commission to direct and supervise the construction, and had provided funds which, however, were only to become available when the foundations had been decided to be sufficient. Authority to strengthen those existing was granted on June 14, 1878, and shortly after Lieutenant Colonel Casey was ordered to report to the joint commission as engineer in charge of the construction. He promptly prepared a project for strengthening the existing foundations sufficiently to permit the obelisk to be carried to the desired height, this project necessarily defining the form and dimensions of the finished monument. These plans were approved on October 1, 1878, and active operations were at once begun.

The project for the new foundations, as briefly stated by Colonel Casey at the dedication of the monument, in 1885, "contemplated, first, the digging away of the earth from around and beneath the outer portions of the old foundation and replacing it with Portland cement concrete masonry; then in removing a portion of the old masonry foundation itself from beneath the walls of the shaft and substituting therefor a continuous Portland cement enlargement extending out over the new subfoundation." This work was completed in May, 1880, at a cost of a little over \$94,000. "As completed, the new foundation covers two and a half times as much area and extends 13.5 feet deeper than the old one. Indeed, the bottom of the new work is only two feet above the level of high tides in the Potomac, while the water which permeates the earth of the Monument lot stands six inches above this bottom. The foundation now rests upon a bed of fine sand some two feet in thickness, and this sand stratum rests upon a bed of boulders and gravel. Borings have been made in this gravel deposit for a depth of over 18 feet without passing through it, and so uniform is the character of the material upon which

the foundation rests that the settlements of the several corners of the shaft have differed from each other by only the smallest subdivisions of an inch." The pressure on the soil underlying the structure nowhere exceeds nine tons per square foot, and is less than three tons near the outer edge of the foundation.

The substitution of new foundations for what have been shown to be insufficient under existing structures was at that date by no means a novelty to engineers, but never before had the delicate operation been undertaken on a work of this magnitude. Little by little fifty-one per cent. of the original bulk of the old mass was removed and forty-eight per cent. of the area of the base of the shaft was undermined. The effect of the successive excavations and underpinning on the huge column above, weighing over 32,000 tons, was scrutinized with all the precision known to modern science. Any apparent tendency to deflection from the vertical was at once checked by undermining on the opposite side, and thus the mass was swayed at pleasure, until at the end the original slight deviation was materially corrected.

The necessity of reducing weight to the minimum gave rise to many difficult problems in the construction of the shaft itself, notably in that of the pyramidion, but they were all successfully met as they arose. The work was done under the fire of ill-natured criticism on the part of the newspapers, which clearly indicated the storm of opprobrium which would burst upon the heads of the joint commission and its engineer had any part of their plans failed to meet public expectation. No little firmness and decision were needed under such conditions, and Colonel Casey showed himself to be the man for the occasion. He made no response to the attacks, but quietly pushed forward the work, and when the scaffolding was removed from the completed monument in February, 1885, and the beautiful shaft, 555 feet in height, stood revealed, universal admiration silenced all detractors. Much of the charming grace of the obelisk must be credited to a change in the early plans, due to Colonel Casey himself, who replaced the too flat apex by a pyramidion 55 feet in height, which, compared with the proportions of the shaft itself, conforms precisely to the lines exhibited in ancient Egyptian practice.

On August 31, 1886, the city was visited by a sharp earthquake shock, but no ill effects upon the masonry or on the level of the

base could be detected. The structure was twice struck by lightning in 1885, with no serious injury, but additional protective devices have since been added which have proved effective. The monument stands, a simple shaft of pure white marble, perfect in architectural design and worthy in sunshine and in storm to commemorate the character of Washington.

General Casey was a man of marked individuality and of indefatigable industry, giving the closest attention to whatever came under his personal responsibility. He showed good judgment in selecting his assistants, and was quick to appreciate their merit. If in his official relations at the War Department the *fortiter in re* was sometimes more conspicuous than the *suaviter in modo*, in his home and among friends he was cordial and sympathetic. He was well versed in the early colonial history of this country and took special interest in genealogical researches, being a member of the New England Historic Genealogical Society and a frequent contributor to genealogical publications. He was at one time a director in the American Society of Civil Engineers.

In early life General Casey married Miss Emma Weir, daughter of Professor Robert W. Weir, of the U. S. Military Academy, and she and two sons survive him. He died, as he would have wished, in harness, the fatal summons coming as he was proceeding to the Congressional Library to attend to his duties as the engineer in charge of its construction.