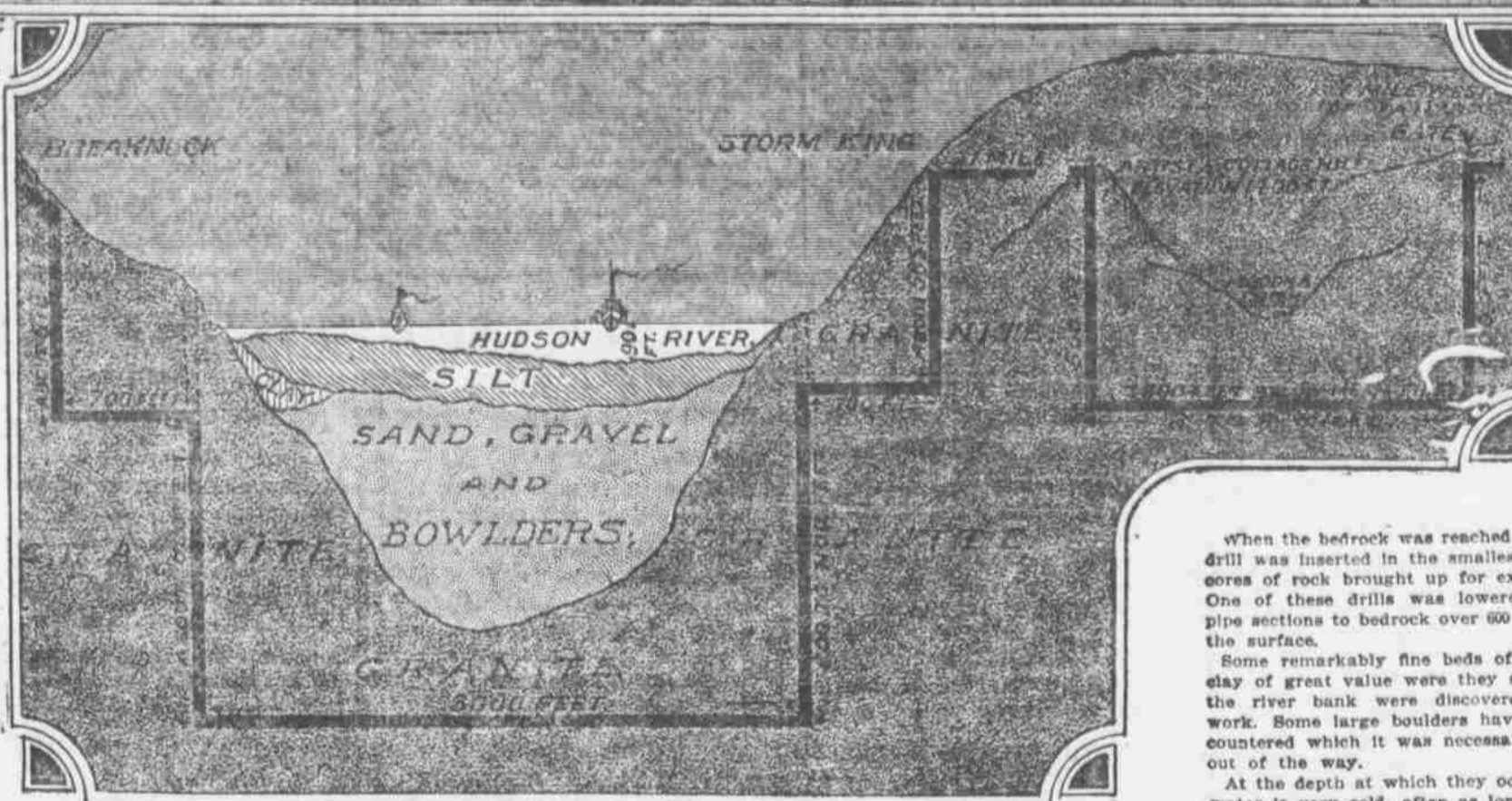


# Siphon for the New Catskill Mountain Aqueduct a Wonderful Feat



PANORAMA LOOKING DOWN THE HUDSON RIVER WHERE THE NEW CATSKILL AQUEDUCT WILL CROSS IT. THE DREDGES KING AND STORM KING CROSS ON ITS SIDE. STORM KING IS BEING SUNK. ON THE EXTREME LEFT IS BREAKNECK AND ON THE RIGHT IS BULL HILL. THE AQUEDUCT WILL PASS BY A TUNNEL.



THE GREAT SIPHONS IN THE NEW CATSKILL AQUEDUCT WHERE IT CROSSES THE HUDSON RIVER AND STORM KING CREEK.

**N**EW YORK, Oct. 25.—The borings into the bed of the Hudson river off Storm King mountain, which have been in progress during the last year under the direction of engineers of the New York Board of Water Supply, have now reached a depth sufficient to justify certain definite conclusions as to the character and location of the great siphon which will carry the new Catskill aqueduct under the river.

It has frequently been contended that the planning and building of the aqueduct will be, in addition to its probably larger cost, a far greater achievement than the construction of the Panama canal. In the opinion of an eminent engineer this is especially true as to the system of tunnels provided for. Of all the tunnels the siphons are the most interesting, and they will be of a magnitude never before approached in the history of civil engineering.

What is probably at present the largest siphon of its kind in existence, that which carries the new Croton aqueduct under the Harlem river, at a point between 11th and Washington bridges, has a drop of something over 60 feet from the surface of the horizontal tunnel beneath the bed of the Harlem. On the Catskill aqueduct there will be not one but many siphons which will carry the water far deeper beneath valleys than this, while the greatest siphon of all, that at Storm King, may be three times as deep.

It will carry the waters from the Ashokan dam possibly 1,000 feet below the surface of the Hudson, with a vertical drop from the aqueduct grade to from 1,000 to 1,300 feet. The exact depth will depend on the result of the operations now being carried on to determine the character and location of the bed rock beneath the river.

The work of planning the Storm King siphon and its approaches and of constructing it will constitute the greatest single feature of the aqueduct. Nothing like it has ever before been attempted. Two years have already been spent in preliminary work. Barring accidents, the siphon will be completed by December 31, 1911. The object of the tests now being carried on by boring apparatus and diamond drills in the river off Storm King is to determine the depth below the river surface of the bedrock which joins Storm King and Breakneck. It was until recently supposed by geologists that the depth below river level of this bedrock was not very great at this point, the river proper being only about ninety feet.

The operations of the last year have shown that bedrock is between 60 and 700 feet under the surface at places, with a probability of still greater depths toward the middle of the river. The siphon must be cut through the solid rock, with at least 100 feet of bedrock above the roof of tunnel.

The Catskill aqueduct as a whole is very far from being the generally level waterway that one might suppose. There is, it is true, a general grade of about 400 feet elevation established for the aqueduct, but the crossing of deep valleys compels a constant deviation from this grade.

The section embracing the Storm King crossing and its approaches, about seven miles long, is shown in part in the drawing. The Moodna siphon, also there pictured, would attract more attention were not its importance overshadowed by the neighboring crossing at Storm King.

Near Valla Gate the aqueduct approaching the Hudson along the normal 400-foot grade comes to the Moodna creek watershed. In order to pass it the aqueduct will drop perpendicularly into the earth for 400 feet and run horizontally in a tunnel for three or four miles, at a grade 200 feet below sea level, straight toward Storm King. It will be bored through Hudson river slate and then through granite and gneiss.

exceedingly deep tunnel where the pressure of the confined water would be something enormous. It must be noted that the inside diameter of the completed tunnel will be nearly fifteen feet, or large enough to accommodate a railroad train.

It should be further understood that the immense floods of water pouring through it will lift themselves out of the tunnel back to grade, a distance almost as great as the height of Storm King itself, and this without any mechanical aid. These facts may make plain to the lay mind why it is desired to keep these deep tunnels as short as possible.

The eastern arm of the siphon will rise within the mass of Breakneck, well back from the front to avoid the danger of being exposed or otherwise injured by rock slips from its precipice, and will approach the surface of the mountain near the north-west ridge of its slope.

Resuming its horizontal course at the 400-foot grade the aqueduct will then tunnel southeastwardly through the mountains, and coming out on the south side just east of the old quarry follow the contour of Breakneck valley around to the north slope of Mount Taurus or Bull Hill. It will plunge straight through that elevation in a tunnel over a mile long, some 1,700 feet in all.

Here will be found the opposite of the conditions presented in the Hudson river crossing. Instead of being about a thousand feet below sea level it will be buried in the Bull Hill tunnel by a solid mass of granite more than a thousand feet thick. That is the greatest amount of rock which will overlay the aqueduct along its course.

South of Bull Hill several other mountain peaks must be pierced before the aqueduct emerges from the Highlands at Peekskill, one tunnel being some two miles long.

Two shafts are already under construction for the engineers at either land end of the Storm King siphon. They may be described at the present time as experimental laboratories.

One of the most interesting tests to be carried on in them will be the search with drills for evidences of water bearing faults or fissures in the bedrock underlying the river. None of the tunnels is to be excavated under the air chamber method of

construction such as is employed in the shield driven tunnels about New York. They will be dug much after the manner of railroad tunnels. Their excavation will be largely a matter of plain drilling and blasting. It is important, therefore, that there shall be no leakage of water in the case of the Hudson river siphon from the river bed above. More important still, there must be no leakage from the high pressure aqueduct upward into the river bottom. This will be partly guarded against by allowing for 150 feet of rock between the tunnel and the ancient river bed.

When the bedrock was reached a diamond drill was inserted in the smallest pipe and cores of rock brought up for examination. One of these drills was lowered through pipe sections to bedrock over 600 feet below the surface.

Some remarkably fine beds of pure blue clay of great value were situated on the river bank were discovered in this work. Some large boulders have been encountered which it was necessary to blast out of the way.

At the depth at which they occurred the water is very cold, often as low as 47 degrees, which was sufficient to chill dynamite to a temperature at which it would not explode. The difficulty was overcome by forcing the dynamite down through a pipe in company with a warmer volume of water, a wire being attached to the descending explosive, which was immediately set off by electricity when it reached the point desired. The pipe was raised out of harm's way just before the operation.

A discouraging accident happened to one of the big drills last summer, which had reached very deep bedrock after nearly a year's work and taken out about nine feet of core. It had been intended to go a little further down, but one night a river boat broke its steering gear, and, drifting down upon the scaffold supporting the drill near the scow from which it is worked, bent

the drill badly and broke the diamond drill sharp off within the deep down granite.

The interest attached to the Hudson river crossing partly due to the facts disclosed as to the nature of the gorge through which the ancient Hudson flowed and partly to the fact that the dimensions of this gorge are far greater than many geologists believed them to be.

Only two years ago the author of a bulletin issued from the state geologist's office, in discussing the prehistoric valley of the Hudson, asserted his belief that the old rock bottom of the river might be found at a depth not very great. Off New York City, where a dozen or more tunnels will soon penetrate the mud of the river bottom, he thought it might be only a few hundred feet deep, while among the highlands it would be still nearer the surface.

According to the figures given out some time ago by the geologist of the Water Supply board, the rock off Manhattan Island has been scoured out to the enormous depth of 3,000 feet. New York, in fact, he states, was once a mountain 2,000 feet high, bounded by the gorges up the North and East rivers.

According to this theory the continent was once very much higher above sea level than now. The present drowned delta of the Hudson may be traced far out through the harbor below the city. The coast is still sinking at the rate of a foot or more a century.

As the land gradually sank the old river gorge filled with silt, especially off New York. In the Highlands it is largely with boulders and other drift material, left there during the glacial period.

The accompanying drawing is one of the first published pictures of this old Hudson rock valley, and was made possible only through the researches of the last twelve months.

## Pioneer Builder of Churches

(Continued from Page One.)

and hundreds of shovellers were pressed into service. After three straight weeks of plowing and shoveling the road came within reach of the snowbound train. The occupants were given a square meal for the first time in ten days and hauled into Laramie. This is accounted the record experience of a snowbound train in the history of American railroads.

Called from the Front. The completion of the Overland road revolutionized missionary conditions. Population increased rapidly along the railroad, towns began developing on permanent lines, and with this growth came ministers to relieve those who labored at the outpost. Having completed a church at Cheyenne and the foundation of one at Laramie, Father Kelly was called to Omaha and assigned to less onerous tasks. He was then 50 years of age, the last ten of which called into action all the zeal, devotion, courage and physical endurance which he possessed.

During the period of the country west of the Missouri river, the time of toll and struggle, of obstacles overcome and lines of progress definitely established. In the succeeding years Father Kelly's activities were confined to Omaha, his home city. With the exception of a few years at Lincoln he has been attached to old St. Philomena's cathedral, acting as pastor during vacancies, and as assistant until advancing years relieved him of responsibility. He did not like the responsibility of parish management, preferring the duties of assistant to the honors of the other. Simplicity marked every phase of his life, whether on the altar or in the world outside the church. He avoided elaborate ceremonies when possible. An instance illustrating the dominant trait of modesty occurred when he was appointed vicar general by Bishop O'Connor. Shortly afterward he received a formidable document enumerating his powers, duties and responsibilities. His associates at the cathedral jotted him about the honors of his new position and the necessity of living up to dignity imposed. That was too much. A few days after he conferred his power to grant dispensations upon a fellow priest, and later the "formidable document" was found in a waste basket, to which Father Kelly had consigned it.

Treatment of Pledge Takers. The native trait of love of humor did not shine in Father Kelly. If he inherited the gift of wit, it was held in check or crushed by the earnestness of his devotion. On one occasion, at least, the latent fire burst into a flame, producing amusing results. The priest was a great favorite among drinking men desiring to "take the pledge. His earnest counsel and heart-touching "God bless you" turned countless numbers of men from danger to paths of sobriety and usefulness. Some would repeat the pledge-taking and dishonor it as quickly as a loaded schooner hoys in sight. For this grade of boozers Father Kelly decided heroic treatment was necessary. He compounded a "medicine" consisting of thickened Missouri water flavored with ginger, tobacco sauce and like things and obliged each chronic pledge-breaker to drink a glass of the dose as proof of good faith. It is related that few of the chosen victims balked at the test, most of them gulped it with evident relief. One day a caller far advanced toward dipsomania took the treatment cheerily and was taken to the hospital a few hours after. Father Kelly was thoroughly scared when the news was brought him. He hurried to the



REV. WILLIAM KELLY.

hospital and sought the doctors, telling what he had done and pleading for help. They assured him his dose did not cause the man's illness, but advised him to quit dispensing free medicine. To this he readily assented, the mixed medicine was banished and practical joking solemly abandoned.

Father Kelly was more attached to St. Philomena's cathedral than any priest called to that sanctuary. To him the locality was holy ground. One block east, Eighth and Howard streets, where stood the pioneer church of St. Mary, he took the vows of priesthood and entered upon his life work. In the erection of the cathedral building his energy and devotion holds first rank. For fully a quarter of a century his home was within the shadow of its spire. He was as much a part of the parish as the cathedral itself, so firmly was his life interwoven with its existence. There is little doubt that the sundering of the ties which bound him to the old home banished his unflinching cheerfulness and hastened his death. When on Wednesday a week ago the work of stripping the cathedral residence begun, the venerable

dean was beside himself. He could not believe the time for removal had come. From his own room he would walk into the hall, then into the rooms of his associates and back again, sighing at the wreckage he saw, and striving to suppress the tears the scene brought forth. That night was the first in years he had spent away from the cathedral. Early next morning he returned to his old home. But it was deserted. Every room was stripped. Everything proclaimed definitely and silently that the end had come. Overwhelmed by a realization of the ruin he turned away, broken in spirit and sobbing his grief. To a parishioner who met him with a kindly salutation his only answer was "Good-bye, my child, good-bye." As events proved it was his last "Good-bye."

In the local biographies of Father Kelly, his record as a collector has been given prominence. That he was a successful collector the record shows. Indeed he possessed a delicacy of touch, rarely in his smoothness, a touch so gentle that a second experience would not be unwelcome. It was the cause for which he labored, his manifest sincerity, his unselfishness and devotion which made him successful. He was, first of all, a church builder among pioneers and a pioneer among church builders west of the Missouri river. To be a successful church builder nowadays, one must be successful in reaching the means wherewith to build. It was a far greater and more difficult task thirty and forty years ago. Many of the humble buildings reared by Father Kelly have been succeeded by more elaborate and costly structures, but for each he laid a foundation as enduring as the republic.

Father McGovern's Tribute. "Whoever we think of Father Kelly, it is as the patriarch of the Omaha diocese, with which he was intimately associated for almost half a century," says Rev. P. A. McGovern, pastor of the abandoned cathedral, who has been as a faithful son to the aged father for nine years past. "He was a pioneer, and suffered all the hardships which that term implies. If physical strength and endurance were required to develop the new country to which our fathers had come—to break the virgin soil, to rear primitive dwellings which would protect them from the rigors of cold and storm, to establish villages and towns and

open up channels of communication between them—so too were religious influences necessary to soften and refine the character of those hardy men, who had spurned the comforts of the more populous east and turned towards the setting sun to find new homes for themselves in the wilderness.

"It was not alone a strong constitution and robust health, but a spirit of patience and Christ-like gentleness that would be a necessary qualification for the 'man of God' who could hope to evangelize such settlements. For it was a strange body of men that crossed the Missouri in the early '60s to build up this great commonwealth of Nebraska. Besides the hardy sons of Ohio and western New York, there were adventurous Irishmen and sturdy Germans from the banks of the Rhine. All of these needed the refining influences of religion, and, above all, the example of truly apostolic men who could show forth in their own lives the lessons of virtue which they preached. To this class belongs the venerable priest whose death has cast a gloom over this city and diocese. He was one of those men whom Almighty God raises up as a benediction to their generation, and whose kindly deeds live long in the memory of posterity.

"Many were the difficulties he met with, many the trials he suffered in the long years of his missionary career, but his simple, unaffected faith sustained him in every crisis. In saying that he founded a large number of churches, we form no estimate of his life-work, for we must remember that these churches were built in sparsely settled communities, with slender means at his disposal. If we speak of his missionary journeys, we must remember that they were made for the most part on horseback or by stage, without any of the modern conveniences of travel. If we speak of his lodgings, we cannot forget that they were frequently the sodhouses of the plains, whose clay floors furnished his only couch.

"However, what we admire more than his extensive labors was the child-like confidence in God which prompted them. His constant advice was, 'Trust in God and all will be well.' Doubtless it was this strong abiding faith that made him so gentle in disposition. We have known him intimately for many years, and he has always shown that same gentleness of character that endeared him to all with whom he came in contact."



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