THE NEW CROTON DAM—NEW YORK CITY'S WATER SUPPLY.

New York city is favored with a water supply which is not only plentiful, but is of an exceptionally good quality. The Croton watershed, from which it is drawn, is located from 30 to 40 miles north of the city, and has a catchment area of 362 miles and an average yearly rainfall of 46 inches, the average yearly flow being 135,400,000,000 gallons. The Croton reservoir, from which the present water supply of the city is conveyed by two aqueducts is located about six miles from the mouth of the Croton River, which empties into the Hudson. It was constructed about fifty years ago and has a capacity of 1,000,000,000 gallons. The Croton reservoir was built about half a century ago; subsequent to its completion several others of various capacities have been built further back in the higher levels of the Croton watershed.

Although the Croton works sufficed for the population of 350,000 which New York contained at the time they were built, they have long since grown inadequate to the needs of the present population. The new Croton dam, which is being built across the valley at a point 3¼ miles below the old dam, is part of a great scheme for increasing the total capacity of New York city's water supply to 75,000,000,000 gallons. In some respects the new dam will be the most monumental work of its kind, for while there are dams that are longer on the crest and that impound a greater amount of water, there is none that equals this in its enormous height and the great area of its cross-section.

The dam will consist of three portions. The first 400 feet on the south side of the valley will be an earth dam, with an interior masonry core wall. The commencement of this core wall is shown at the extreme left of the dam in our illustration, Fig. 2. It reaches from the hillside to a massive wing-wall which extends down stream at right angles to the axis of the dam. This wall will also be noticed in the same engraving. Next to the core wall portion is the masonry dam, which is 650 feet in length and extends to within 200 feet on the north side of the valley, where it bends sharply back to the right and runs up the valley, parallel to the contours of the hillside, for a distance of 1,000 feet, finally turning in to a junction with the hillside. This last 1,000 feet is the spillway, and on account of its great length and width it will be amply able to take care of any flood that comes down into the lake, even should the flood be caused by the bursting of one or more of the upper reservoirs.

In Fig. 3 we show a cross-section through the masonry dam at its deepest point. In order to find a satisfactory foundation, it was necessary to excavate a huge trench across the valley, removing all of the sand, gravel and hardpan until solid and compact foundation rock was laid bare. This necessitated digging the trench to a maximum depth at the center of 131 feet below the original bed of the river. The vast amount of material thus removed was carried by cars and dumped above and below the dam in the embankments which will be noticed in our engravings. The width of the trench at the bottom was over 216 feet, this being the greatest breadth of the masonry foundation. The work of excavating was commenced in 1892 and completed in 1896. During this period it was necessary to remove 1,100,000 cubic yards of material. The appearance of this great excavation when only partially completed in shown in Fig. 4. Another important preliminary work was that of providing a temporary channel to convey the Croton River around the dam during the progress of the work. This channel, which is a conspicuous feature in our first illustration, was formed by constructing across the axis of the dam 600 feet of wall, 20 feet high, with two wing dams at each end of the wall, the width of the channel thus formed being 125 feet measured from the toe of the hill.

The cross section of the dam (Fig. 3) shows the up-stream face to be approximately vertical, while the other face slopes up stream at an angle of about 45°, rounding up into the perpendicular at the coping. The bulk of the masonry will lie out of sight below the bed of the river, the depth from the bed of the river to the lowest course of masonry being 131 feet. As fast as the masonry was built up in the trench, the excavated material was brought back in cars and dumped in the trench. The new bed of the reservoir as thus filled in will be about 134 feet above the foundation, while the water level of the dam when full will be 160 feet above the new bed; the total height of the masonry from foundation to crest will therefore be about 300 feet. The masonry has now been completed to slightly above the level of the new bed, the amount of rubble masonry already laid being about 475,000 cubic yards out of a total amount in the completed dam of 650,000 yards. From the bed of the reservoir to the crest of the dam the masonry will be faced with a very handsome, light-colored granite, which will have the appearance of marble, and with the parapet and ornamental finish which it is intended to give the crest, the finished structure will have an exceedingly handsome and imposing appearance.

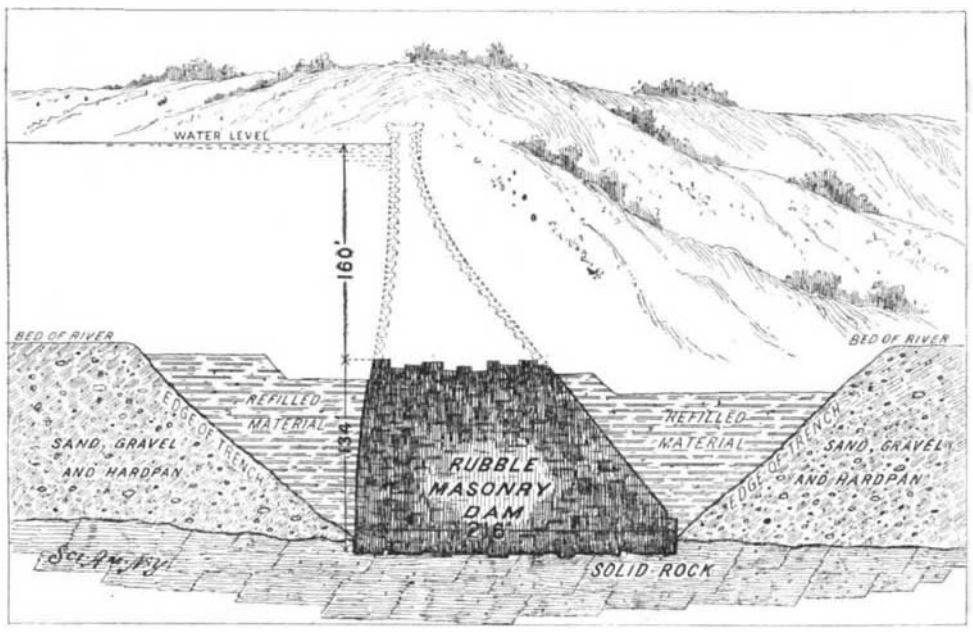

Fig 3.—Section Through Croton Dam, Showing the Excavation, Completed Masonry, and Refilled Material.

The illustration, Fig. 1, shows that portion of the dam which intersects the temporary river channel. The retaining wall of the channel will not be removed, but is now being incorporated and built into the permanent masonry. A narrow channel is being left for the passage of water, and this will serve for drainage until the large blow-off gate-house which is to be erected at this point has been built. The latter will contain three 48 inch pipes, and through these the reservoir water will flow during the construction of the dam. After its completion they will be used for emptying the reservoir whenever it is desired to inspect it.

The present series of illustrations show that this great engineering work is within measurable distance of completion, and it will probably be opened in the year 1902. As soon as everything is ready, the blow-off gates will be shut and the dam will be allowed to fill. As it does so, a great change will take place in the appearance of this picturesque valley, which will ultimately be filled with a vast sheet of water that will back up as far as the well-known Croton Falls, fifteen miles up the river. As the crest of the new dam is 30 feet higher than the crest of the old Croton dam, 3¼ miles up stream, the latter will disappear from view entirely, being buried 30 feet below the surface of a beautiful lake eight square miles in extent, which will henceforth form not the least attractive feature of this most attractive country.

The whole work is being carried out by Messrs. Coleman, Breuchaud & Coleman, under the immediate direction of Divisional Engineer C. S. Gowan.

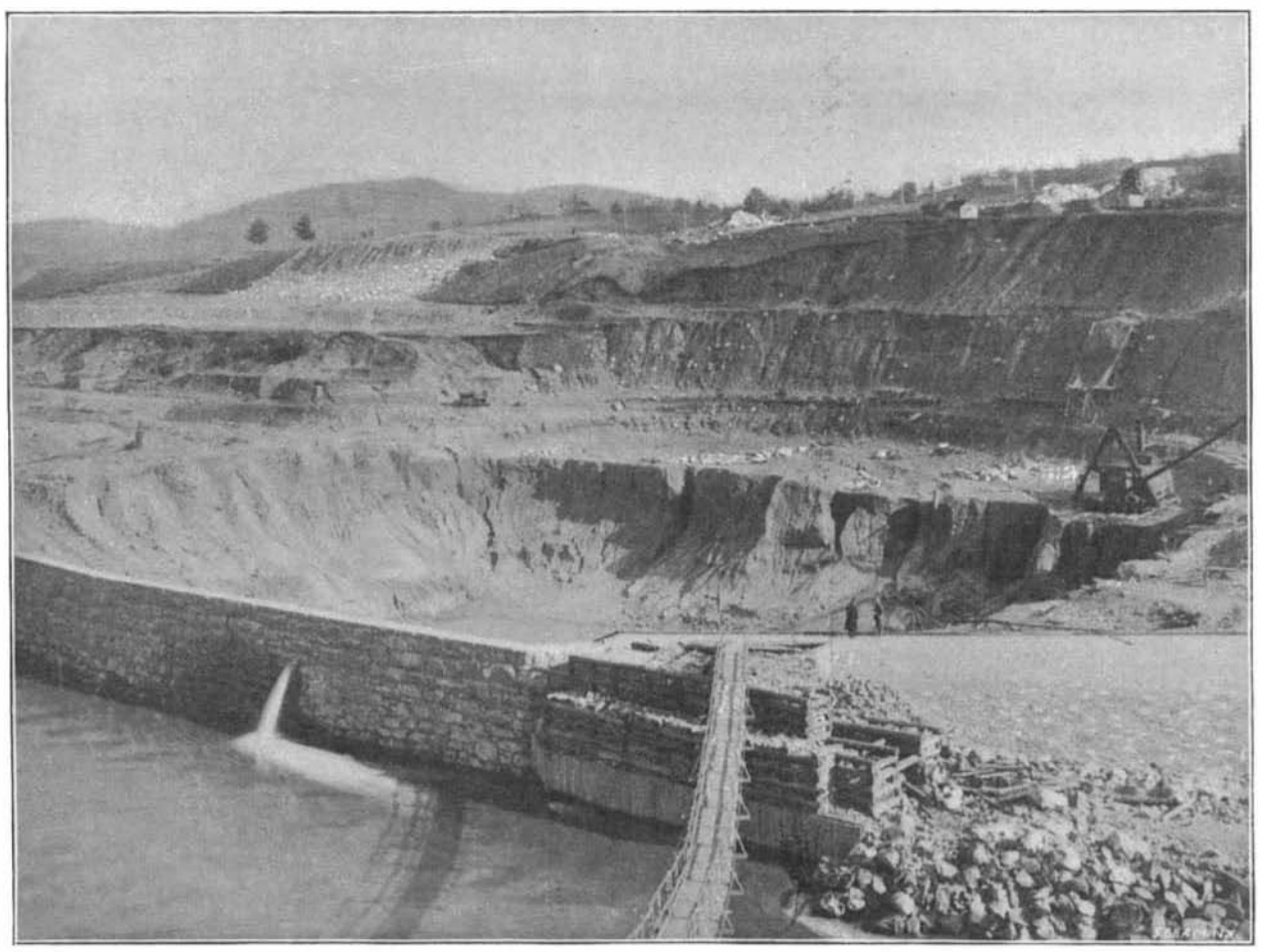

Fig. 4.—Excavation, 130 Feet Deep, for the Dam Foundation.

THE NEW CROTON DAM—NEW YORK CITY WATER SUPPLY.

Heat Radiation of the Stars.

The author commences by reviewing the negative results of C. V. Boys, who used in connection with a 16-inch reflecting telescope a radio-micrometer sensitive enough to show the heat equivalent to that of a candle 1·71 miles away. E. F. Nichols, of Dartmouth College, has spent much time in perfecting the radiometer, and the present form of the instrument is for certain purposes considered superior to either the radio-micrometer, bolometer, or thermopile. In July, 1898, Nichols was invited to test his instrument at the Yerkes Observatory, and the apparatus was installed in the heliostat room, where the stability was so perfect that deflections to tenths of a millimeter could be observed. The radiometer used consisted of a suspension system formed of two mica disks, each 2 mm. in diameter, blackened on one face, and supported by a light cross arm on either side of a thin glass staff, hung by an exceedingly fine quartz fiber in a partial vacuum. Both vanes were exposed to the radiation of the sky at the focus of a silvered glass mirror of 24 inches aperture, fed with light by a siderostat outside. The rays entered the radiometer through a small window made of fluorite. With the apparatus so arranged a deflection of 0·1 mm. would be given by a candle fifteen miles distant, neglecting loss by reflection and atmospheric absorption. Seven determinations of the heat radiation of Arcturus gave a mean deflection of 0·60 mm. Vega gave a mean deflection of 0·27 mm. Although the quantitative value of these results is not insisted upon, the author considers that they show the reality of the detection of stellar heat radiation.—G. E. Hale, Astro. Phys. Jour.

THE widow of the great physicist Hermann von Helmholtz is dead. Her salon at Heidelberg and in Berlin was the great center of those interested in German science and art, and the late Emperor and Empress Frederick were frequent visitors there.

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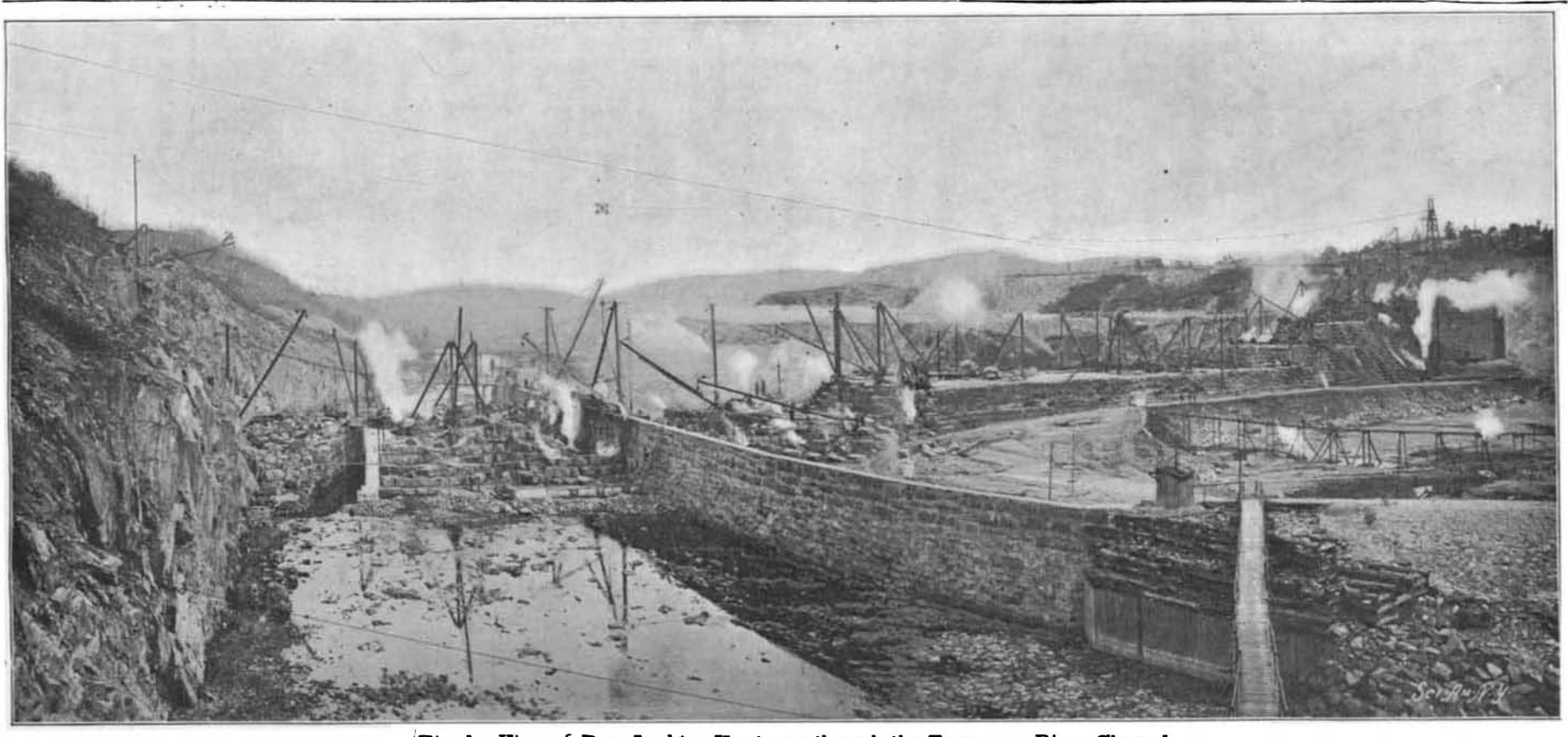

Fig. 1.—View of Dam, Looking Up-stream through the Temporary River Channel.

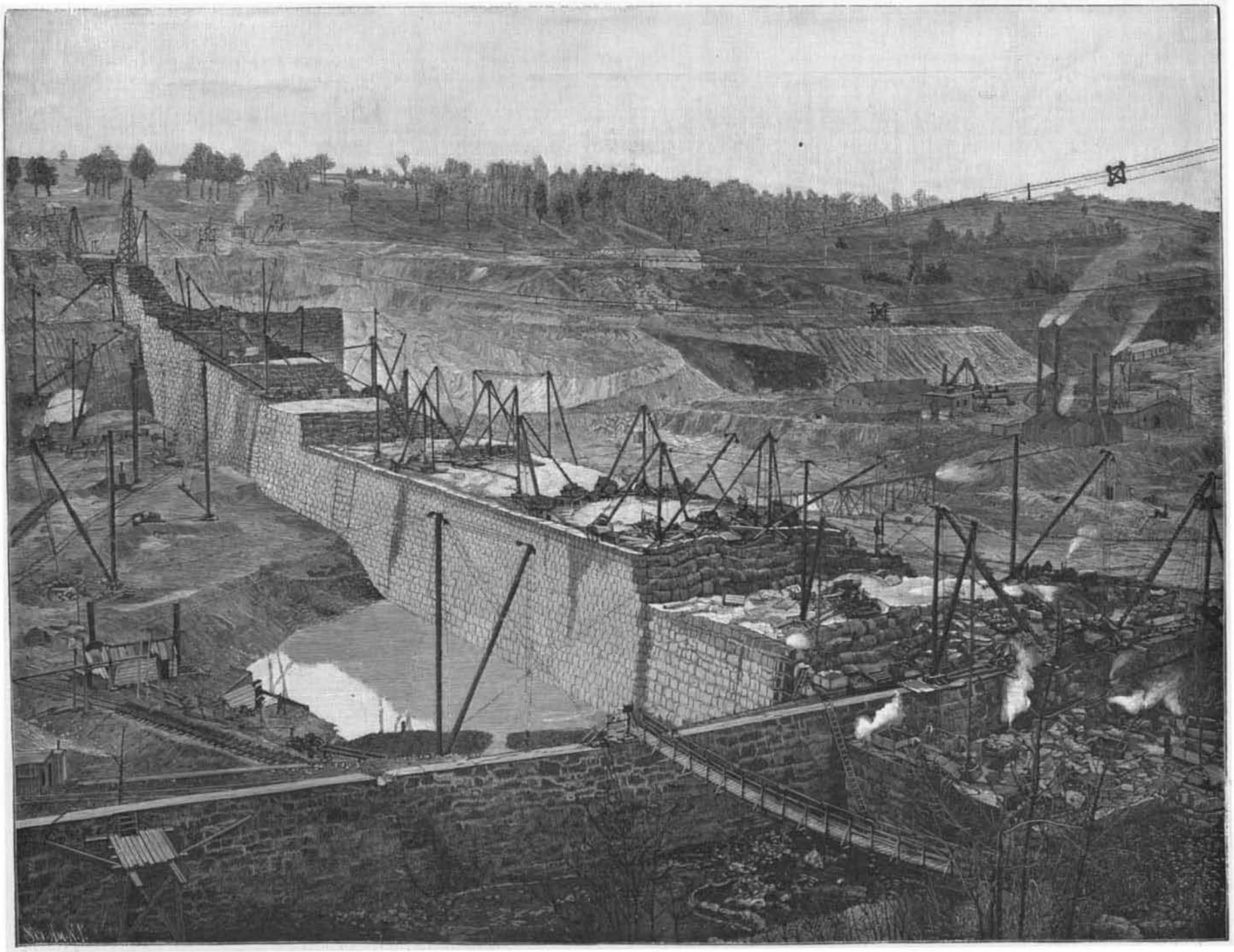

Fig. 2.—Up-stream Face of Dam; Bed of Reservoir will be at Present Level of Masonry at Center of Dam.

THE GREAT CROTON DAM—NEW YORK CITY'S WATER SUPPLY.—[See page 86.]