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NEW YORK, SATURDAY, DECEMBER 7, 1901.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

RECONSTRUCTION OF THE CROTON DAM.

The board of three engineers appointed by the Aqueduct Commission to examine the design and condition of the core-wall embankments at the Croton Dam and at the Jerome Park Reservoir have reported, and the matter has been referred back to the chief engineer, Mr. William R. Hill, at whose request the investigation was made. It is recommended that the design of that portion of the Croton Dam which is to consist of an earthen embankment with a central core-wall be changed, to prevent the possibility which now exists of leakage and ultimate destruction of the dam. With regard to the Jerome Park Reservoir, the board states its opinion that there is no possible danger of sliding or sloughing of the bank, and that the utmost that can be anticipated is the seepage of a small amount of water through the embankment and the earth, and that this would be carried off by the sewers in the adjacent avenues. It is considered, therefore, that a large expenditure to absolutely prevent such seepage would not be warranted nor advisable.

Dealing first with the Jerome Park Reservoir, it should be explained that this is an artificial basin which is being excavated to form a reservoir of two billion gallons' capacity, the purpose of the scheme being to enlarge the total storage capacity of the local reservoirs within the city's boundary. The reservoir lies in a natural depression on the summit of the ridge of high land which extends between the Harlem Railroad and the line of the Putnam Railway. On a considerable portion of its perimeter the dam is shut in by rising ground, but on other sides it has been necessary to build an artificial embankment to impound the waters. This embankment consists of an earthen dam with a central core-wall or diaphragm of masonry. On certain stretches of this dam the core-wall stands upon a substratum of material which is permeable by water, and Mr. W. R. Hill, the new chief engineer of the Aqueduct Commission, considers that there is danger that when the reservoir is filled, the pressure due to a head of 24 feet would cause a serious leakage through this stratum, which in time might undercut the embankment and lead to serious damage. To test the possibility of such leakage, pits were sunk on the outside of the line of the embankment and coloring material was placed in holes sunk within the area of the basin. Mr. Hill found that the coloring matter passed entirely underneath the embankment, and showed itself after a lapse of time in the test pits. The expert board, however, as we have stated above, are of the opinion that this seepage will not be of sufficient amount to endanger the structure.

At the great Croton Dam, which is being built at the mouth of the Croton watershed for the purpose of impounding some thirty-two billion gallons of water, the problem is a far more serious one, and it is evidently considered by the board that the chief engineer's contention admits of no dispute. The great dam consists of three portions; the first 400 feet on the southern side of the valley is an earth dam with a thin, masonry core-wall; then follows the masonry dam, 650 feet in length, which extends to within 200 feet of the northern side of the valley, where the dam swings around upstream and parallel to the hillside for a distance of 1,000 feet, and finally turns in to a junction with the natural rock of the bluff. This 1,000 feet forms the spillway. In searching for foundations for the masonry dam it was necessary to go down 131 feet below the original depth of the river. The dam at its base measures 216 feet in an up and downstream direction, and the massive masonry rises to a height of 300 feet above the lowest foundation course. The earthen portion of the dam commences abruptly at the end of the masonry dam; a thin interior core-wall 18 feet in thickness at the base and 6 feet at the top extends from the masonry dam proper through to a junction with the side of the hill. This wall is backed on both the upstream and downstream sides by a filling of earth, with a slope in each case of two to one. By virtue of its rock foundation, its enormous width of base, its magnificently-built masonry, and its enormous mass, the masonry portion of this structure is everything that can be desired; but the chief engineer has always had the gravest doubts as to the permanence of the earthen dam, and it is his belief that the security of the whole work can only be assured by continuing the masonry structure clear across the valley and building it to a junction with the original rock of the hillside. That the expert board indorse this view of the situation is shown in the summary of their report to the Aqueduct Commission, the full text of which will be found in current issue of SUPPLEMENT. They state that the new Croton Dam is a reservoir of 125 feet depth of water retained by an artificial embankment, the outer toe of which is 5 feet lower than the bottom of the reservoir and which rests on a filling of earth 100 or more feet deep, which in turn rests on a steeply sloping rock surface. The percolation of water through this embankment to such an extent as may reasonably be expected under the existing conditions would be liable to induce sliding of the bank and its destruction.

We most heartily concur with the findings of the board as far as they concern the Croton Aqueduct. The failure of the masonry portion of the dam, letting loose over thirty billion gallons of water, would not merely produce enormous destruction in the valley below, but the powerful current set up within the reservoir itself would undoubtedly sweep away the old Croton embankment, which will be buried some 30 feet below the surface level of the new Croton Dam. In thus breaking down the embankment of the old reservoir it would deprive New York of its whole source of water supply, for both the old and the new aqueducts take their supply directly from the old Croton Reservoir.

IRRIGATION OF THE DELTA OF THE COLORADO.

No more interesting series of engineering problems has been worked out of late than those connected with the irrigation of the delta of the Colorado River, including lands in Arizona, California and Lower California, Mexico. At the time of writing (November 1, 1901) water is in use for the irrigation of several thousand acres of land, while it is expected that before the close of the coming winter fully 200,000 acres will be subject to irrigation.

The total area which will be brought under irrigation within two or three years on the delta is estimated as follows: In Arizona, from several canals leading from the Colorado River, 150,000 acres; in Lower California, from similar canals, 300,000 acres; in Southern California, from similar canals, 500,000 acres; in Southern California, from artesian wells, 50,000 acres. This makes a total of 1,000,000 acres of irrigable land where heretofore has been desert, and considerably the most forbidding desert on the American continent. That the addition of that vast amount of productive soil, most of which will be devoted to cattle raising, will greatly increase the productive power of the far Southwest is already being demonstrated.

The Colorado River delta includes land which ranges from about 100 feet above sea level to 380 feet below the level of the sea, the latter point being the Salton sink, or salt marsh, in Riverside County, California.

The character of the soil throughout the delta has great uniformity, and it is evident that to a great extent the deposit of silt, aside from shutting off the gulf water, is responsible for the desert character of the land. In the Southern California section, known as the Colorado desert, alone there is an area of about 75 miles square, not all of which is subject to reclamation, in which *no* water is known to exist for the preservation of the lives of the travelers, aside from that which is hauled in by the Southern Pacific Railroad and that which is being brought in for irrigation purposes, while the temperature ranges from a minimum of 20 deg. above zero in the winter to a maximum of about 116 deg. above zero in the summer, there being six or seven calendar months in each year during which the mercury records at least 100 deg.

The extreme dryness of the atmosphere causes so rapid evaporation of moisture from the skin that human temperature does not rise above normal blood heat when there is ample drinking water to feed the pores of the skin. But with an absence of drinking water, the skin becomes dry, fever ensues and delirium and death soon come. The Colorado Desert has thus claimed many victims, but the wide-reaching irrigation canals have put an end to that variety of suffering in this region forever, and one can live on the desert with a much greater degree of comfort than he can in many regions where the mercury marks a lower maximum temperature, but where the degree of humidity is greater.

It was some forty-five years ago that army engineers first called the attention of the government to the possibility of redeeming the Colorado delta by using the water of the river for irrigation. But long the project lay dormant, and while it was an ideal line of irrigation development for the government to undertake for the rescuing of its own lands, the venture awaited the initiative of several private individuals and corporations, one of which is constructing canals for the 500,000 acres in Southern California and the 300,000 acres in Lower California, under the direction of George Chaffey, C.E., and member of the Institute of Mechanical Engineers of London.

The task of making an adequate survey of the 500,000 acres in Southern California has proceeded continuously through all degrees of temperature, and as closely as possible earlier surveys have been followed, though they serve more to confuse than to assist the work.

At Hanlon's heading, just above the international line, on the California side of the Colorado River, water has been diverted through a temporary headgate into a canal capable of carrying water for the irrigation of over 100,000 acres of land, and later the permanent headgate will be constructed in a bluff of cement conglomerate, through which water will be admitted for the irrigation of the entire 800,000 acres to be placed under the system, this water being first taken into a large natural settling basin, from which a series of canals will lead.

A very large portion of the water is provided with a natural channel in Carter and New rivers, which lead for more than sixty miles on good grade through Lower California, delivering the water again at the international line, for use in irrigating the California lands. Thence the water is taken in a series of large canals, distributed through a series of laterals, and thence into the ditches of the individual farmers, the system being based on an allowance of four acre feet a year for all the land under the system.

The settlement of the delta is progressing rapidly, the population of the Colorado Desert alone making net gains of from five to ten persons a day, while the rate of increase is rising steadily. One year ago the desert was unpopulated. To-day about a thousand people have their homes on the land, and hundreds of families are only awaiting the arrival of water at their respective farms to take possession and begin the cultivation of the soil. Some remarkable records have been made in cultivating this desert land. Moving on barren ground, within sixty days a number of farmers have had crops of millet grown, harvested and stacked, with growths of corn and sorghum from four to six feet high. Thus the complexion of the desert is steadily changing, and as a result of irrigation under the several systems, within a year probably 200,000 acres of the delta lands will be under thorough cultivation.

THE CONVERSION OF GRAPE TENDRILS INTO FRUIT CLUSTERS.

It is not generally known that grape tendrils and clusters are identical in origin and anatomical structure, and are frequently changed from one to the other in nature. In the wild state grapes develop tendrils as a means of lifting themselves up into the light and air, and are essential to their well-being; but in the vineyards of to-day, where the vines are carefully trellised by human help, these tendrils are not necessary and are considered a useless draft on the energies of the plant.

In France there is a belief among many growers that the development of large tendrils near what would normally be a fruit cluster tends to make the latter "run to tendrils." It is a common practice of growers passing through the vineyard to remove these tendrils, particularly the larger ones. For the purpose of following the evolution of tendrils into grape clusters Mr. E. Durand, of France, made a series of experiments with several varieties of grapes. The experiments took the form of different methods of treating the tendrils. In one lot that portion of the grape tendril which bears a little leaf at its base was entirely removed. In the second lot this same ramification was removed and in addition the extreme tip of the remaining branch of the tendril was pinched, removing 1 to 2 millimeters or more of the tip. In the third lot the tendrils were allowed to grow freely. The different operations were performed early enough in the season to note the effect of these methods of treating the tendrils on their production of flower buds and fruits.

In the case of the Chasselas variety, out of 292 tendrils not operated upon in any way, 11 tendrils bore flowers, producing in all 230 flower buds, thus showing that tendrils are naturally capable of diversion into flower clusters. Of 298 tendrils which had that ramification entirely removed which bears a small leaf at its base, 58 tendrils bore flowers, having a total of 500 flower buds. Where this same ramification was removed and the tip of the remaining branch of the tendril pinched, 294 tendrils produced 25 fruit clusters, having 223 flower buds. These figures show a difference between the tendrils which had one branch removed and those which were allowed to grow freely, of 270 flower buds, apparently due to the effect of