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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.

RAPID AND SLOW CONSTRUCTION OF PUBLIC WORKS.

The Scientific American takes particular pleasure in presenting the handsome series of views that appear in this issue of the second great dam or barrage across the Nile, known as the Asyut dam, for the reason that this is the first official description of this important work to be made public, in this country or abroad, the facts and photographs having been communicated to our special correspondent by Sir Benjamin Baker, engineer-in-chief of the Nile irrigation works. The Asyut dam is not to be confused with the Aswan dam, which was fully described and illustrated in our issue of September 20, 1902. The Aswan dam, which is the larger structure of the two, is located on the Upper Nile, 600 miles to the south of the city of Cairo; the Asyut dam is built across the Nile at a point 350 miles to the north of Aswan, and therefore 250 miles to the south of Cairo. Both of these works form part of a stupendous irrigation project carried through by the British government for the betterment of the Egyptian agriculturist in the Nile valley. The importance of the work and its far-reaching beneficence are not overestimated by our consul-general at Cairo when he says, "The boldness of the idea and the thoroughness of the undertaking rank with anything that has ever been done in this land of Titanic achievements. It may be, indeed, doubted whether any of the great works of Egypt has had so beneficent an effect on this country as will this great engineering triumph." Egypt is essentially an agricultural country, and the success of its agriculture depends absolutely upon the water furnished by the Nile. The works which were inaugurated December 10 of last year will not merely increase the cultivable acreage by 15 per cent, but it is expected that they will double the number of crops that can be gathered each year from the land now under cultivation, while the cotton industry alone will experience an increase of 25 per cent.

The project is justly described as Titanic. The great dam at Aswan is 1¼ miles in length, 22 feet in width at the top, 100 feet wide at the bottom, at its greatest depth, and has a maximum height of 130 feet. It is pierced by 180 sluices, 140 of which are 23 feet high by 6 feet 6 inches wide, and the balance 11 feet 6 inches high by 6 feet 6 inches wide. When they are closed the waters of the Nile will be raised to a maximum height of 67 feet above the normal height of the river at this point, and in the great reservoir thus held back in the Nile valley will be no less than 280,000,000,000 gallons of water. In the dam itself there are over 1,000,000 tons of masonry. The contract time for the construction of this huge work was only five years; but such was the assiduity of the contractors that it was completed in four years, or twelve months less than the contract time.

The Asyut dam, though not so large as the one further up the Nile, is, as shown in our illustrations, a gigantic structure. It measures over one-half a mile, or 2,750 feet in length, and its massive wall is pierced by 111 bays or sluices, each 16.4 feet in width. Before erecting this barrier it was necessary to provide a foundation of solid masonry 10 feet in average thickness, 87 feet in width, and half a mile long; and it was necessary to build temporary dams on the up and down stream sides of the dam, and pump out the water before a foot of the masonry work could be laid.

Now it is the fact that these two barriers had to be constructed across one of the greatest rivers in the world, which renders the Nile irrigation works, considered from an engineering standpoint, doubly meritorious. At Aswan, foundations had to be laid across channelways through which, in times of flood, the river rushed with a speed of 15 miles an hour, and consequently the very highest skill and resourcefulness of the hydraulic engineer had to be brought into play to devise means of stemming the great river, diverting it, and pumping dry the river bottom, before a single stone could be laid in the work of erecting the dam itself.

Yet, in spite of these difficulties, in each case the contractors completed their work twelve months within the very limited period of four and five years allotted for construction.

Now, this matter of the rapid construction of waterworks is one that will appeal very strongly to the residents of the city of New York, for the reason that they have now under construction two great waterworks which are as vital to their comfort and well-being as the Egyptian waterworks are to the dwellers in the Nile valley. We refer to the great dam, which is being built at Croton and the Jerome Park reservoir, now under construction in the northern part of this city. As compared to the Aswan dam, with its total length of a mile and a quarter, the Croton dam proper is but 1,200 feet in length, with a spillway that involves no great depth of foundations 1,000 feet in length. The maximum depth of the Croton dam from foundation to crest is, it is true, double that of the Nile dam, but this depth is only found at the center of the dam, and the depth reduces rapidly as the abutments on each side of the valley are reached. The contract for the Croton dam was signed August 31, 1892, or six years before that of the Aswan dam. The Aswan dam was completed last year, whereas the Croton dam has just had an extension of time to October 1, 1904. It is true the extension was required partly on account of important structural alterations; but even had these alterations not been made, the dam would not, in all probability, have been completed and handed over to the city for another eighteen months.

The contract for the construction of Jerome Park reservoir was signed August 23, 1895. The reservoir was to have been completed by August 23, 1902; yet the best we can hope for is that the western half of the dam will be open by the end of this year, and the eastern half twelve or eighteen months later.

Scarcely less vital to the interests of the city than a perfect supply of water, is the provision of bridge facilities for inter-borough communication, and one of the most crying necessities of the past decade has been for more bridges connecting New York with Brooklyn. Unfortunately the same exasperating delay is being experienced in the Department of Bridges as in that of Water Supply, as witness the following facts: The construction of the new East River Bridge, now known as the Williamsburg Bridge, was commenced in 1896. Considering the urgency of the situation, it should have been possible to secure the services of this bridge within five years' time, or in 1901. A reasonable despatch was shown in the construction of the foundations, and there is some excuse for the comparative slowness of the erection of the steel towers, in the fact that it was difficult to obtain steel from the manufacturers. The great delay, however, has been occasioned by the failure of the contractors for the cables, not merely to live up to their contract time, but to show even the semblance of a desire to do so.

It was arranged that the Roebling Sons Company, the contractors, upon receiving notice that the towers and abutments were completed, should immediately commence stringing the cables, and that they were to have this work completed within ten months from the date of such notice. This notice was given in December, 1900, and consequently the ten months expired in October of 1901; yet in spite of the fact that the contractors were supposed to have the material in such shape that they could push the work right through within the stipulated time, they had so far slighted this important work, upon which they well knew that the interests of the whole city of New York vitally depended, that they had only done five per cent of the work on January 1, 1902, or two months after the ten months had expired. There was a penalty of a thousand dollars a day for delay beyond the ten months included in the contract, yet this firm was able to secure from the Tammany administration, merely for the asking of it, six months' extension of time, thereby involving a loss of $150,000 to the city. This extended their time to April 21, 1902. On January 1, 1902, when the present administration came into power, the contractors had the assurance to ask for yet another six months' extension of time; and on the present Bridge Commissioner very properly taking a firm stand and asserting that he would not merely refuse another such extension, but that he would hold the bridge company strictly to the terms of the contract and exact the full penalty for delay, the contractors gave speedy proof that it was indifference and not inability that had made them neglect the stringing of the cables, by building 70 per cent of the work in the four months from the time the new administration came into power to April 21, the date on which their extension of time expired. Here we seem to have another clear proof of the fact that in the construction of municipal work, contractors seem often to imagine that the interests of the public are entirely subservient to their own, and that these public works can be finished within such time as suits the convenience of the contractor himself. If anyone doubt this, let him look to the figures. Five per cent of an important work, for which the city is in the most urgent need, completed in twelve months, and seventy per cent completed in four months under the spur of an impending penalty.

If further evidence were needed of the fact that the contractor, when he sees it is to his interest, can be just as expeditious in New York as he can on the banks of the Nile, as shown by the fact that the Rapid Transit tunnel, which is to be operated by the interests that are backing the construction of the same, is likely to be completed from nine months to a year inside the contract time.

The moral of all this is that the city, if it is to properly safeguard its interests, must see to it that heavy penalties are attached to every contract for urgently needed public work. For the citizen the lesson is that he must elect and maintain in power a municipal government that will carefully safeguard his interests by holding contracting companies absolutely to the terms of their contracts.

THE COOPER HEWITT INTERRUPTER.

Mr. Peter Cooper Hewitt has just made public a new application of the principles discovered in connection with his mercury vapor lamp and made use of in his static converter. Our readers will remember that the initial resistance offered to a flow of current at the negative terminals of his converter was reduced to a minimum when once penetrated by a current of high voltage, thus permitting the passage of a current of low potential; but was resumed again when the flow of current was interrupted. Mr. Hewitt now applies this principle to wireless telegraphy. He substitutes for the ordinary spark gap a mercury vacuum globe provided with two mercury electrodes, which are respectively connected to the terminals of the transformer. Condensers in parallel with these electrodes are connected to the primary of a step-up coil, which is connected with the ground, while the secondary is connected to the antenna. Now upon actuating the alternator, the induced current in the secondary rises rapidly from zero to a high potential. No flow, however, takes place between the mercury electrodes, as the potential is not sufficient to overcome the high resistance at the negative terminals. The condensers are in the meantime charged, so that when the potential is sufficiently high, this resistance is broken down and the condensers are suddenly discharged. The resistance is then immediately re-established, and a second discharge prevented until the condensers have been recharged to their full capacity. A very rapid succession of discharges thus takes place, which depends upon the rapidity with which the transformer can charge and recharge the condensers. Obviously this effect can be increased by using a more powerful alternator and transformer. The advantages presented by this interrupter over the common spark gap are very great, because in the latter case the air between the terminals very rapidly disintegrates, with even as few as a hundred sparks per second, and the discharges soon fail to take place with sufficient sharpness. No deterioration can occur in the mercury vapor interrupter, because mercury is an elementary substance, and the only action of the current is to vaporize the liquid mercury, which condenses upon coming into contact with the cold walls of the globe, and flows back to the mercury terminals. Mr. Hewitt claims to have attained a frequency of one **million discharges per second, and probably a much higher figure can be reached.**

Dr. Michael I. Pupin, of Columbia University, in commenting upon this invention, says that it is the most important contribution to wireless telegraphy made since Marconi's earliest experiments, which demonstrated the practicability of sending messages a distance of over twenty miles without wires. The progress of wireless telegraphy has been checked by the lack of some device which would send powerful and persistent electrical waves. They should be powerful in order to carry to great distances, and should be persistent so as to permit perfect selective tuning. These requisites, says Dr. Pupin, are fully met by Mr. Hewitt's interrupter.

An ingenious process has lately been devised which, by the use of paraffin, furnishes a convenient smokeless fire. The arrangement, which is very simple and readily applicable to an ordinary domestic stove, consists of a metal tray for receiving an incombustible absorbent soaked in paraffin specially prepared for the purpose. The advantage of the process is that the paraffin in its preparation is freed of its explosive properties, so that no danger is attached to its use. The oil can even be poured directly on to the flames without the contents of the feeding can catching fire. The use of the oil does not produce any trace of evil odor. The absorbent used is prepared by a secret process.