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NEW YORK, SATURDAY, APRIL 30, 1904.

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.

THE AQUEDUCT COMMISSIONERS AND THE NEW YORK CITY WATER SUPPLY.

The object of constructing the new Croton dam, which was begun in 1892, was to relieve the pressing danger of a water famine in the city by increasing the storage capacity of the Croton system to its fullest extent. The Jerome Park reservoir was begun in 1895, with the object of providing an adequate distributing reservoir within the city limits, capable of impounding between two billion and three billion gallons of water, and providing Manhattan and the Bronx with from a week's to ten days' supply of water, which could supply the city temporarily, should there occur any break in the thirty-five miles of the new Croton aqueduct. It was the intention of the contracts that the new Croton dam be finished by July 1, 1899, and Jerome Park reservoir by November 1, 1902. As matters now stand, four years and ten months have passed since the contract date of completion of the Croton dam, and over two years more will be required to complete the structure. That is to say, if we may be so optimistic as to hope that the intolerable delays that have marked the construction of this dam in the past will not be repeated, it is possible that this urgently-needed work will be ready for public use seven years after the date on which it should have been completed, the contract taking fourteen instead of the seven years contemplated and promised for its execution. In 1903 the Acting Chief Engineer, in an official report to the Aqueduct Commissioners, stated that the Jerome Park reservoir, at the then rate of progress, would not be finished in less than four years from that date, that is to say, five years after the original contract date for completion.

In the presence of these astounding facts, it is not surprising to learn that the Merchants' Association of this city, whose good work in the safeguarding of the city's interests is on record, have considered the matter to be so serious as to call for the preferring of charges against the Board of Aqueduct Commissioners, upon whose shoulders they consider that the chief blame for this inexcusable neglect of the city's interests is to be laid. The Association states that it can be clearly shown, by the records of the Aqueduct Commission, that the Commissioners had knowledge of the grave exigencies confronting this city in the way of a possible water famine, and that they have explicitly recognized the need for expedition in providing new reservoirs; that these Commissioners have been specifically informed, by their Chief Engineers and by the Department of Water Supply, that action was urgently necessary for the due progress of the work; and that although they were thus informed, they refrained during several years from taking any steps toward compelling the active prosecution of the work and, indeed, that at no time since 1898 have they taken any effective or proper steps to compel the contractors of either the Cornell dam or the Jerome Park reservoir to observe their contract obligations as to time. The Merchants' Association claims that it is shown by the Aqueduct Commissioners' report that, in the case of the new Croton dam, the Chief Engineer, as far back as 1899, protested officially to the Aqueduct Commission against "the inexcusably flagrant delay" of the contractors, and recommended measures to compel satisfactory progress; but that no measures to compel progress were adopted at the time or since. It is further charged that in the case of Jerome Park reservoir also, the Aqueduct Commissioners have taken no action of any kind to enforce a reasonable degree of progress, despite the obvious and unjustifiable delay in every branch of the work, including the complete stoppage for about four years of work upon the northern half of the reservoir, on which expedition had been previously ordered by the engineers.

The indifference of the Aqueduct Commissioners to the needs of the city is claimed to be the more culpable, because they have repeatedly granted unmerited extensions of time, and this in the face of many reports made to them by their own engineers, that the contractors' delay was extreme and altogether unnecessary. These are grave charges, and in view of the unparalleled delay on both these urgently-needed public works, the public will not fail to draw its own conclusions as to the inefficiency of the Aqueduct Commissioners, and their apparent indifference to the trust that has been reposed in them.

The Commission is a body of laymen who were appointed for the express purpose of safeguarding the city's interests and seeing to it, not merely that contractors do their work well, but that they do it within contract time. Now, the Scientific American is perfectly well aware that there have been justifiable causes for some of the delay. There has been a change from core wall to solid masonry on a portion of the Croton dam, while at Jerome Park further delay has been occasioned by a similar change from core-wall embankments to solid retaining walls. We are perfectly willing to admit that these changes were necessary at the Croton dam, and that they may have been to a certain extent necessary at Jerome Park reservoir; but having admitted this much, we must confess that after reviewing the history of these two works, and going carefully over the charges made by the Merchants' Association, we cannot but feel that the Commission has done very little to justify its existence. Amid the continued and reiterated complaints against the delay in these works, we fail to remember a single instance in which the voice of the Commission has been heard in similar expostulation. Judging by its silence, the citizens of New York might well believe that the delay was causing the Commission but very little uneasiness.

It is gratifying to know that the charges of the Merchants' Association will be presented before a Mayor who has shown himself to be thoroughly independent and fearless in protecting and promoting the welfare of the city over which he presides.

LONGITUDINAL BULKHEADS AND BATTLESHIP STABILITY.

A correspondent has asked us to give an editorial discussion of the probable cause of the Russian battleship "Petropavlovsk's" capsizing so suddenly. At the outset we must frankly confess that in the present state of our knowledge of this disaster, it is impossible to give a definite answer; but we are inclined to think that, when our correspondent asks if the capsizing of the ship was due to a too great subdivision of the water-tight compartments, he has failed to understand the true functions of the multiple-compartment system. The primary object of subdivision is to localize the effect of under-water penetration of the hull, so that should a vessel run aground, the entering water would be confined to certain compartments of a limited capacity, and her buoyancy would not be too seriously impaired. An ordinary grounding of the vessel, a ripping open of the outer shell by a jagged point of rock, will usually admit water only to the double bottom. This has been shown in the majority of the accidents of this character to our own ships that have happened of late years. As a defense against the smashing in of a considerable area of the under-water hull by the ram or by the torpedo, it is customary to divide the ship transversely by several bulkheads, and also by a continuous longitudinal bulkhead that bisects the ship in the line of the keel from stem to stern. The various compartments thus formed are further subdivided both longitudinally and laterally, particularly in the wake of the magazines and engine and boiler rooms.

Our correspondent is under the impression that the capsizing of the "Petropavlovsk" was largely due to the existence of the longitudinal bulkheads, and he asks whether, had there been no bulkheads of this kind, the water would not have distributed itself across the vessel, and, by preventing the ship from listing heavily, have delayed her sinking until the majority of the crew had been rescued. The question is not by any means a new one, for it was brought into prominence many years ago by the sinking of the British battleship "Victoria," when she was rammed by the "Camperdown" during naval maneuvers in the Mediterranean, and went down with Admiral Tryon and most of her officers and crew. The hull was perforated on the starboard side a little forward of the 16¼-inch gun turret. The water entered rapidly, and, filling the starboard compartments, it caused the ship to list so quickly that she "turned turtle" before the boats from the other ships of the fleet could rescue her crew.

A naval board of inquiry that investigated the disaster considered the question of removing the longitudinal bulkheads, with a view to preventing the quick capsize of a rammed or torpedoed warship. But it was decided that, all things considered, longitudinal bulkheads were desirable; and they remain to-day a most important feature in the design of all modern warships. Furthermore, it is a mistake to suppose that all longitudinal bulkheading is water-tight. The keel of the ship in the double-bottom, and some of the other longitudinal members there, are perforated for the express purpose of allowing the water to flow freely across the ship in case of injury to the bottom. To follow out the same principle, however, on the various decks, would be to double, and in some cases quadruple, the amount of water that would be admitted to a ship were she rammed or torpedoed, a result which would merely mean that buoyancy was sacrificed to stability.

That the accepted system of subdivision is the correct one has received most emphatic demonstration in the present war; for there seems to be very little doubt that the quick loss of the "Petropavlovsk" was due to the fact that when the burst of flame of the exploded mine or torpedo tore its way into the ship, it ignited and exploded the magazines and rent the ship asunder, the action being similar to that which occurred in the case of our own battleship "Maine" in Havana Harbor. Therefore, the sinking of the "Petropavlovsk" can scarcely be quoted against the longitudinal subdivision system. The true test came in the case of the two battleships "Czarevitch" and "Retvizan," and the cruiser "Pallada," which were torpedoed in the opening engagement at Port Arthur. These vessels were undoubtedly saved by their elaborate system of subdivision of hull; for they were able to proceed from the outer roadstead under their own steam and beach themselves, thereby rendering subsequent salvage operations and repairs possible. Naval constructors, generally, consider that the salvage of these ships is a great tribute to the efficiency of the present cellular system of construction.

THE PREPARATION OF PURE ARGON.

In a paper recently read before the Academie des Sciences, Messrs. Henri Moissan and A. Rigaut describe a method which they use for preparing argon in large quantities in a pure state. In their first experiments, Lord Rayleigh and Sir Wm. Ramsay used the action of the spark on a mixture of oxygen and nitrogen, in order to separate the argon of the air. Afterward they used metallic magnesium, which retains the nitrogen in the form of nitride. In more recent experiments, Ramsay used the action of a mixture of lime and magnesium on the nitrogen of the air.

M. Moissan had previously shown that calcium combines easily with nitrogen at a low red heat, giving a crystalline nitride having the formula Ca_3N_2. As metallic calcium also has the property of absorbing hydrogen at the same temperature, giving a crystalline hydride CaH_2, and as this hydride is not dissociated at 500 deg. C., the writers proposed to apply these properties of the metal for the extraction of argon from the air. The preparation of the argon includes four different operations. 1. Preparation of 100 liters of nitrogen. 2. Increasing the proportion of argon contained in the gas. 3. First purification. 4. Second purification by circulating the gases over calcium. In this way a practically pure argon is obtained. The first operation is carried out by using two tubes 4 feet long and 1.2 inch inside bore, filled with copper turnings which had been first oxidized in air, then reduced by hydrogen. The gas is drawn through the tubes by suction into a gas-holder. The proportion of argon in the gas is then increased by making it pass through an iron tube 3 feet long filled with copper turnings; then, after a set of sulphuric acid and potash tubes, the gas passes through two iron tubes 2.5 feet long, filled with a mixture of 5 parts powdered quicklime and 3 of powdered magnesium. The tube containing the copper is heated to redness. After driving off the hydrogen, a rubber bag is placed at the end of the apparatus. Then 100 liters of nitrogen are passed in the apparatus, and in two hours it becomes diminished in volume and is brought down to 10 liters. The gas which is collected in the rubber bag contains 10 per cent of argon.

The next step (purifying the gas) is carried out by passing the gas through a potash drier into a large tube of Berlin porcelain 3 feet long and 1.5 inches diameter. The tube is heated in a Mermet furnace. It receives a sheet iron trough containing 80 grammes of the lime and magnesium mixture. After it comes a second tube of Jena glass containing the same mixture, then a smaller tube full of copper oxide. A sulphuric acid and potash drier complete the apparatus, which is connected to a mercury pump for the purpose of drawing the gas through and sending it into a large glass collecting cylinder 2.8 feet high and having a capacity of 1,100 cubic centimeters (67.14 cubic inches). By repeated operations, the pump empties the gas-bag in 2 hours. The gas which is finally collected is nearly pure argon, containing only 5 to 10 per cent of nitrogen.

To obtain a practically pure argon, the following operation is carried out: The gas is passed from the cylinder through a tube of Jena glass containing 45 grammes of lime and magnesium mixture. After it comes a second tube containing four troughs of nickel in which are placed 3 or 4 grammes of metallic calcium in small pieces. Two mercury pumps are connected to the apparatus by a three-way cock. The first pump serves