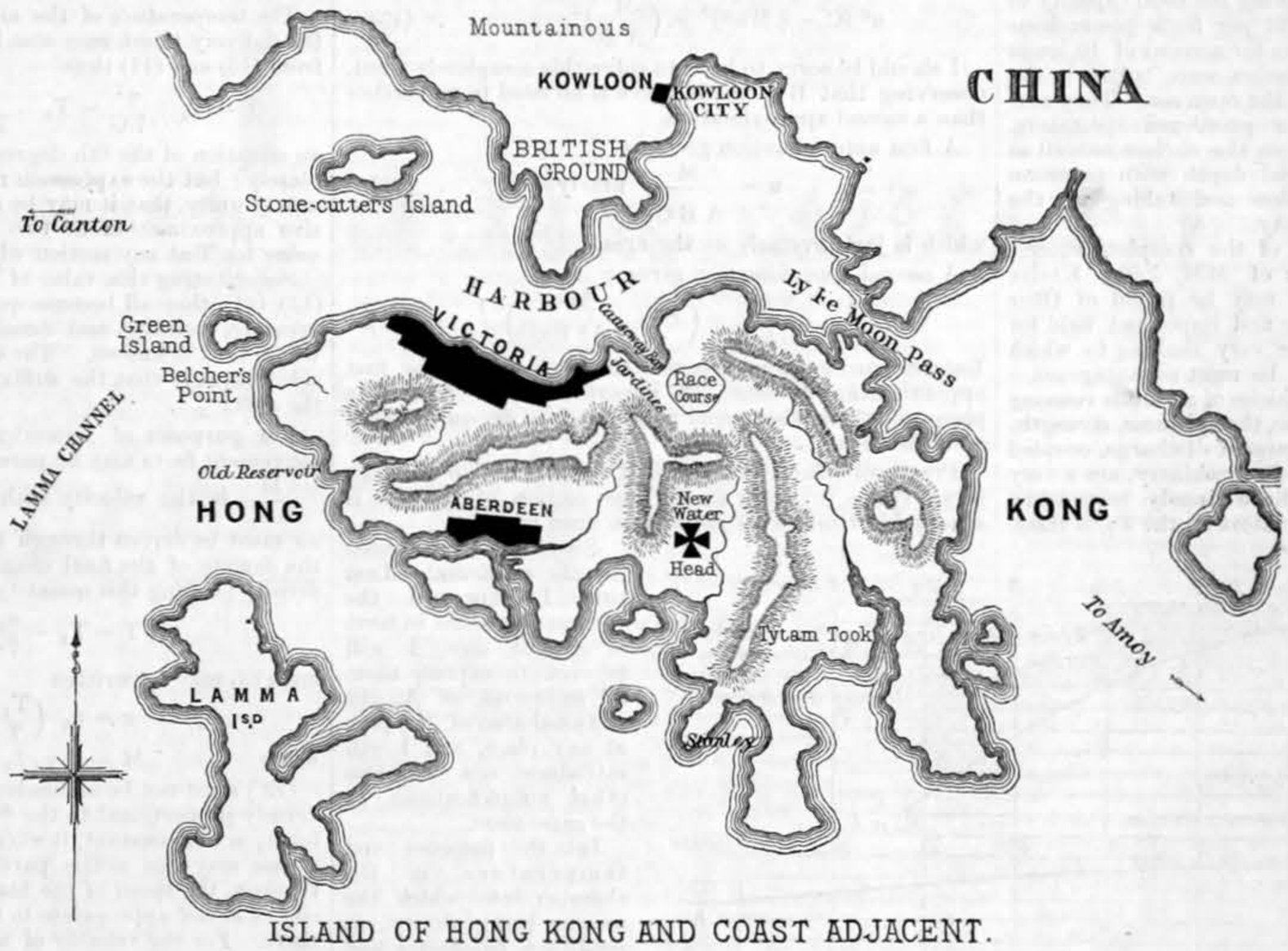
DEFENCES OF OUR COALING STATIONS.

No. I.—HONG KONG.

SINCE the days when the "gay cavalier" condemned his faithless mistress to a justly merited exile in Hong Kong, the current and popular impressions of this colony have been associated with a remote little island at the mouth of the Chekiang, or Pearl River, which appears like a mere dot upon the map of China—and is, in very fact, a geographical expression! But when it is borne in mind that this "dot" possesses an actual trade influence of £20,000,000 per annum, and that upwards of a hundred large steamers and sailing vessels may often be counted in its capacious harbour at one and the same time; that there are 180,000 permanent residents in the island, including upwards of 8000 Europeans; and that a greater tonnage of shipping is annually entered there than was registered at the Port of London in 1840—the immense commercial importance of the "land of fragrant streams" begins to be partially appreciated. This importance has for a length of time been fully recognised by the heads of great Oriental business houses, not only those hailing from the United Kingdom, but from Germany, Portugal, France and America. When we mention that only a few years ago the junior mess of Messrs. Jardine, Mathieson, and Co., at Hong Kong, received a pecuniary allowance from the firm of £4000 per annum, the position of these merchant princes in their more palmy days will be understood. Since then great changes have taken place, and a more wholesome economy has been observed. This has not only been carried out by individual firms, but in the colony as a whole. Such being the case, it was ascertained, some years ago, that the policy of retrenchment inaugurated by Sir Pope Hennessy had resulted in a saving of £300,000 to the Colonial exchequer. About this time the question of coaling station defence began to be mooted, and it was decided to spend part of it in fortifying the town and harbour of the island. Sir William Crossman, who had gone out from England to report upon the defences of Singapore and Hong Kong, originated an extensive system of fortifications for the latter place. These included batteries to the east and west of the island, commanding the Lammas Channel, and the Lye-ee-Moon Pass; also works upon Stonecutters' Island, and upon Green Island which commands the western approaches to the harbour; and batteries upon the Kowloon Peninsula, on the mainland of China opposite to Victoria. The defences up to 1879 had consisted of a feeble open work off the east end of the town, called Wellington battery, mounting a few smooth bore popguns. No works existed for the protection of either entrance to the harbour, so that, in the absence of British war vessels, the town of Victoria, the anchorage, and the naval establishment, might, at that date, have been shelled with impunity by an enemy's fleet. In consequence of the recommendations of Sir W. Crossman, special works were commenced in 1883, some of a permanent character, others of the nature of open redoubts. The greater part of these are now completed, and they effectually protect the channels, by which access is obtained to the harbour. A number of heavy rifled muzzle-loading guns, including 9in. and 10in., are mounted in batteries at East Point, beyond Jardine's and the old Mint, which sweep the whole of the anchorage from Pedder's Wharf eastwards; and further out, in the throat of the Lye-ee-Moon Pass are redoubts armed with 6in. steel breech-loaders of the latest pattern. These command the approaches to Victoria in that direction. Opposite, upon the Kowloon Peninsula, batteries have also been erected which seal the north-west channels. The Lammas Pass, due west, is protected by batteries of heavy muzzle-loaders, and by works mounting 6in. steel breech-loading guns at Belcher's Point and upon Green Island opposite. Stonecutters' Island, in conjunction with the west Kowloon battery, completes the circuit north of this spot, and submarine fields have been laid down on all shoal spots in this direction. A proportion of 6-pounder and 3-pounder Hotchkiss guns has also been ordered for the completion of these defensive works, and they will probably be despatched in the spring. Another important work, which was the result of Sir W. Crossman's visit, is the reclaiming of a large, shallow lagoon at the entrance to the "Happy Valley," beyond Jardine's, called Causeway Bay. It is almost the only flat piece of ground in the Colony beside the racecourse, and has been reclaimed at enormous cost. When it is remembered that such spots are the only possible sites in Hong Kong for future graving docks which are under the protection of our guns, their prospective value can scarcely be overestimated. Whilst touching upon the important subject of dock accommodation, we may mention that this has largely increased within the past ten or twelve years. There are at present, at Aberdeen and Kowloon, the former being on the island of Hong Kong, and the latter upon the mainland opposite, graving docks of the following dimensions:—One of 350ft. by 80ft., with 18½ft. over sills; one of 400ft. by 90ft., with 24½ft. over sills; and one of 500ft. by 86ft., with 29ft. over sills. Hence, ample accommodation exists for executing the repairs to a couple of ironclads or armoured cruisers of moderate size. This fact was taken advantage of by the French, in their recent naval war with Tonquin. One regrettable condition obtains in regard to the position of the docks at Aberdeen. This place, which contains not only docks and building slips, but repairing sheds and steam machinery of recent type, lies on the south-west of the island, quite outside the harbour and its adjacent fortifications. Hence it is entirely open to attack from an enemy's cruisers, and might be destroyed without the possibility of a shot being fired in its defence. This is a sad blot in the scheme of fortification which has been worked out for Hong Kong. But to continue. Another essential adjunct to the completion of the fortress has been carried out within the past three or four years, out of the surplus £300,000 before alluded to. In so densely populated a position, fresh water is, of course, an essential element. The streams from which the island took its name, and which were used in early days for watering ships, rise beyond West Point, at a spot called Pok-fu-lun; but they are insufficient in volume, and at far too low a level to convey water to the town of Victoria. A proposal made by Mr. Rawlings, an architect, to dam up a valley below the signal station, was carried out; but the stream thus intercepted was found to be inadequate to keep the reservoirs full, and the upper portion of the town suffered from drought. Moreover, the establishment of villas right up to the Peak itself, the drainage of which ran into the valley, contaminated the water supply. Consequently, it was determined to conduct the water from a copious spring, which existed at a considerable elevation near Ty-tam-took, on the south of the island. A heading was driven right through the mountains of solid granite. It was 6ft. high, 4ft. wide, and two miles in length. This stupendous work, which is now completed, was accomplished by means of blasting operations with dynamite, and pneumatic drilling machines. It delivers water, without any accessory pumping, as high as Robinson-road, the highest in the town of Victoria. Thus, so far as regards an abundant supply of spring water, the town and anchorage are absolutely independent. The spring head is, however, outside the radius of defensive works, and consequently liable to the depredations of an enterprising foe. Blot No. 2! Lastly, we may mention that Hong Kong will always have a force available for manning its batteries under circumstances of actual warfare. Some years ago a strong volunteer contingent was established in the Colony, the germs of which are still extant, and a body of some 800 Sikh police, all drilled and disciplined soldiers, is constantly recruited from our Indian Possessions. A proportion of Royal Artillery, as a matter of course, forms part of the garrison at this station. To sum up, the condition of Hong Kong, so far as regards its military features, is highly satisfactory, and reflects great credit upon the efforts of the War Department, and upon Sir Pope Hennessy.



ISLAND OF HONG KONG AND COAST ADJACENT.

ALKALINE ACCUMULATORS.

To invent a reversible couple or secondary battery, with iron, copper, or carbon plates in an alkaline solution, has been the aim of many electro-chemists ever since Planté gave to the world, in his modest, unostentatious way, the first so-called accumulator. The advantage of a light and strong metal for the plates, a solution nearly neutral when in a state of discharge, for transport at ordinary rates, and non-injurious to adjacent metal work, no fumes of any kind, and the use of a sheet iron cell or tin box being alone of sufficient attraction, without considering the possibility of attaining a higher rate of discharge without injury, and a greater amount of energy stored per pound of cell. But although many attempts have been made, nothing of any practical value appears to have been reached until, in 1886, a French engineer, M. Desmazures—who, together with his chemist and electrician, M. Commelin, and his associates, Messrs. De Virloy and Bailhache, had been trying all possible combinations, with more or less, but never any complete, success, mainly for want of a negative plate that would freely absorb the oxygen of the charge and give it back in the discharge—bethought himself of first obtaining a perfectly non-coherent mass of pure metallic copper by electrical reduction from the oxide, and then compressing it in a steel mould to the extent of some thousand atmospheres, by means of a hydraulic press. On immediately carrying out this idea, they found that, by nothing but an enormous pressure, it was easy to make a pure copper plate, of equal strength and hardness to rolled copper, from the loose reduced metallic "mud." Then, by regulating the pressure so as to produce an apparently solid copper plate, but in reality of only about two-thirds the specific gravity of rolled copper, and consequently, infinitely porous, a beautiful negative plate was produced. I use the term "beautiful" in a literal sense, for everyone who sees these plates with their planished surface of shining copper—cannot but admire them. This plate was found to possess the properties required, perfect depolarisation and very low electrical resistance. It was then only a question of finding a suitable solution from which a metal could be alternately deposited upon the positive plate and re-dissolved.

Research having already been made in this respect, it was an easy matter to test the most favourable results in combination with the new negative plate, and the following general construction has been finally adopted, with certain modifications when used for special purposes:—A copper negative 2 to 3 mm. thick, enclosed in an envelope of parchment cloth, ordinary parchment paper being liable to get torn by rough handling, opposed to an iron positive plate of wire gauze, in a solution of zincate of potassium of 50 deg. Beaumé, the whole contained in a thin sheet steel tinned box. An extremely strong, light, and serviceable cell is thus obtained. During the charge, the zinc in the solution is deposited upon the iron gauze plate and the superfluous oxygen is absorbed freely by the copper plate. In the discharge, the zinc is re-dissolved, combining again with the oxygen from the copper plate.

It will be thus seen that there is no reason why the plates should in any way suffer, and it is found, after the considerable experience referred to below, that whilst the iron plates remain absolutely unchanged, the copper plates actually become harder and stronger by long use. These cells give a comparatively low electromotive force, and a very large quantity of current, and where small quantity only is required the cells may be made up in cases of three, one of such boxes measuring 10in. by 4½in. by 10in. high, and weighing 28 lb., giving a discharge of 150 ampère hours at from 2·70 to 2·05 volts, according as the rate of discharge be slow or rapid. This division into three cells for each box is very favourable in preventing swilling, where much knocked about. A discharge may be made in as little as 2½ hours with fair efficiency and perfect safety to the plates, and for sudden efforts—such as are required for tramway work—a current of 200 ampères may be obtained without injury from a cell weighing 19 lb. This was actually shown by Messrs. Sautter Lemonnier and Co., of Paris, when they kindly lent a battery of these cells to the Académie des Sciences for illustrating the Cowles aluminium process. The cell may be completely sealed up for portable work, and, when used for stationary purposes, the solution may be covered by a film of oil to prevent carbonisation and "creeping" up the terminals. The notice of the French Government experts was early drawn to this invention, and in the spring of 1887 a battery of 132 cells, weighing 40 lb. each, was ordered for a large steel launch. This launch was thoroughly tested at Havre the following months of September and October, with the result that the naval authorities ordered a large battery of 560 of the same cells—9¾ tons—for the new submarine torpedo boat, the Gymnote, then being designed by M. Zédé and Captain Krebs. Meanwhile a few tests were carried out in London, where an electric omnibus was driven by 14 cwt. of these cells at the same speed as 23 cwt. of the most approved lead cells could drive it. This battery was tested at Havre by the Government officials previously to its installation on board the Gymnote, and accepted as most satisfactory. An account of these tests was read by M. Hascart before the Académie des Sciences at Paris, and showed a total weight of 37 kilogrammes per electrical horse-power hour, and an efficiency of 65 per cent., without including a considerable residual charge afterwards taken from the cells.

The Gymnote was not launched until last autumn, and