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Authors alone are responsible for the statements made and the opinions expressed in their papers.

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No. 2. Failure No. 1; wet guncotton dated "1886." Dense red fumes of NO_2 evolved.

No. 3.—Final success; wet guncotton dated "1907."

WET GUNCOTTON

with duplicate firing arrangements. The wet guncotton used was part of the service equipment of the Sapper and Miner Company concerned, and the slabs bore the impress of "1886." The fuzes were duly ignited but, although the explosion of the primers was distinctly audible, the wet guncotton failed to detonate, and only decomposed instead with the evolution of dense volumes of dark red nitrous oxide (*Photo* 2). Again a similar charge (the remainder of the same box of wet guncotton) was placed and fired in precisely the same manner—and with a precisely similar result. A third effort was made with some new wet guncotton (dated "1907") borrowed from another unit, and the tower at last successfully demolished (*Photo* 3).

Now, had this been service, and the same wet guncotton have been used, the same failures would have followed. Whether any further disasters would have ensued it is impossible to say, but the probability is that this protracted delay would, quite possibly, have prevented the column from reaching its proper camp that night.

It is surely desirable, therefore, that the question of the deterioration of wet guncotton in tropical climates should receive expert attention, and that all wet guncotton of more than a certain age be cast as being untrustworthy, or returned to the laboratory for testing. What that age is, the writer has not sufficient experience even to suggest, but if ordered on service he would without doubt make a strong effort to get rid of all his wet guncotton of more than 15 summers to somebody else.

It is practically impossible for the O.C. of a unit to carry out any periodical tests of the reliability of his wet guncotton, short of opening each box on his charge and actually firing one of the slabs. To open, however, a hermetically-sealed tin-soldered case of wet guncotton for such test, and then reseal it in the only available manner with a tape and varnish makeshift is hardly practicable in a hot climate, and would only add to its chance of being useless when really required.

SOME REMARKS ON WET GUNCOTTON.

By Bt. Major R. L. McClintock.

While instructing Infantry and Cavalry Classes in the art of demolition, the writer has frequently encountered the apparently widespread idea that wet guncotton is so stable and reliable an explosive, that any failure on its part to detonate properly is entirely the fault of the maker-up of the charge. Consequently, the misbehaviour of any wet guncotton used in such demonstrations, serves to supply the usual merry jest at the expense of the operator in particular, and the Corps in general.

It is an unhappy fact, however, that wet guncotton which has been stored for a long period in a tropical climate becomes unreliable, and is, in course of time, as likely to burn as to detonate properly, and this no matter how tightly the primer may be in contact with it, and however efficiently the latter may explode. This statement will probably be heartily endorsed by any R.E. officer who has had the misfortune to come across any of the very old wet guncotton to be met with sometimes in India. To quote an extreme case, the writer was recently told by an officer just back from delivering a course of demolition lectures at various garrisons on the N.W. Frontier, that about half the wet guncotton given him for the purpose from one local magazine could not be detonated under any circumstances.

Now, the failure of a charge in peace is at worst a matter of a jibe at the operator, but in war it is another story. On a frontier campaign it may mean the delay of an hour in the retirement of a hard-pressed rear guard, or the abandonment of the demolition for which, perhaps, the day's operations had been undertaken.

The writer had been aware for a long time of this failure of old wet guncotton, but its extreme undesirability was strongly brought home to him early in the present year, the occasion fortunately being the peaceful one of an Indian field day. The attached photos illustrate the events.

The general idea was the forcing of a defile, the destruction of a frontier tower (previously built for the occasion, *Photo* 1), and the withdrawal of the force on the completion of the demolition. On the appointed day, the defile having been duly forced and the heights beyond occupied, the Sappers and Miners engaged the tower. The charge (21 lbs.) was placed in the orthodox way in a hole excavated in the raised floor of the tower, fully tamped and provided

A FIELD COMPANY AT TRAINING AND MANŒUVRES.

By Major A. F. Sargeaunt, R.E.

Colonel Buckland's article in the May number of the *R.U.S.I. Journal* has done much to enlighten officers of other branches of the Service on the use of engineers in the field; and a memorandum on the employment of divisional engineers by Colonel Milne (General Staff, 6th Division), has further assisted infantry brigadiers in solving the question as to the best way of employing engineers under their command.

During brigade training this year (when the 12th Company, R.E., was attached consecutively to the 16th and 18th Brigades), and during divisional training, and manœuvres, there was always a determination to make the most of the engineers; but at the same time a great deal still depends on the initiative of the O.C. Company.

If the section commanders and the sappers generally are to take an interest in the day's proceedings, it is necessary to explain to them from time to time the outline of the scheme and the trend of events, so that they may understand the reason for different movements; otherwise it seems to them that they do many miles of aimless marching.

Brigade training was carried out from standing camps so that there was no scope for employing R.E. on the line of march, but this was not the case in attack and defence schemes.

To take a concrete example:—

R.E. in Defence.—Before taking up a defensive position, R.E. officers rode on ahead of the column with the staff officer told off to select the position, and the R.E. officers acted as his technical advisers; on arrival of the troops, the tool carts were sited in a safe central position behind the line of defence, and the company was divided up and allotted to the different sections for the purpose of assisting in strengthening the position.

The G.O.C. then decided to retire to a second position which was indicated to O.C. Company on a map; the Sappers were withdrawn and taking the tool carts along with them they retired to the chosen line in order that they might select the best line of defence, and, having selected it, commence strengthening it.

R.E. in Attack.—The proper employment of R.E. in attack is most difficult at manœuvres; everything moves so quickly, and so much ground is covered in so short a time owing to the absence of shells

and bullets, that there is as a rule no time for any preliminary reconnaissance. On one occasion a temporary bridge was required to facilitate the attackers crossing a river, but generally the main objective of engineers in attack at manœuvres, is to reach the attacked position as soon as possible in order that it may be defended against a counter-attack.

Both in divisional training and at the Irish Command Manœuvres the R.E. companies were nearly always allotted to infantry brigades, and worked under the orders of brigadiers.

R.E. on Line of March.—The 12th Company, R.E., during the advance into the manœuvre area was with the 17th Infantry Brigade, which first acted as a flank guard and then as an advanced guard, and whether with the advanced guard or the main body of this force the R.E. were always kept well to the front, which was very necessary as it always fell to their lot to make watering arrangements on arrival in camp, no arrangements having been made beforehand. The necessity too of R.E. being well to the front was exemplified during divisional training when a bad piece of road was encountered and the advance was checked till a deviation had been made.

Bridging equipment was carried during Irish Command Manœuvres as it was thought that it would be necessary to bridge the River Barrow, but thanks to the energy and zeal of the cyclist companies the road bridges were secured against demolition by the opposing force. A light bridge was however ordered to be constructed by the R.E. companies across the Barrow, but it did not prove to be of any use; the making of this bridge turned out to be somewhat unfortunate, as, had the 12th Company taken their bridging equipment with them into camp, the construction of a raft to connect the two sections of the outpost line would have been most useful and would have saved a détour of many miles.

More cyclists with the company would have been a distinct advantage, as a party can then be pushed on with the tool carts, or without tool carts when it is a question of hasty demolition. A party of R.E. cyclists with demolition stores accompanied the infantry cyclists in their advance to the Barrow, in case events should make the destruction of the river bridges necessary.

The gratifying aspect of the manœuvres was the desire of brigadiers to have R.E. attached to their force, and the manner in which they used them not only when practical work had to be done, but when work could only be executed in theory.

GIBRALTAR UNDER MOOR, SPANIARD, AND BRITON.

(Continued).

By Col. E. R. Kenyon, R.E.

The British Capture of the Fortress (1704).

In 1704 Admiral Rooke once more visited Gibraltar, but this time he came, not to take refuge under its guns, but as the foe of the reigning prince from whom he was destined to wrest this Key of the Straits. With him came a military force under the command of Prince Henry of Hesse-Darmstadt. On July 21st (O.S.)—or August 1st (N.S.) they anchored in the bay and landed a force of about 2,000 men on the isthmus under the Prince ;—not at Punta Mala as stated by Ayala.* The garrison, which consisted of only 150 men was then distributed at the Old Mole, the covered way of the Land-port, the New Mole, and the Castle.† The details of the attack and capitulation are somewhat variously stated by different historians, as indeed is usually, and not unnaturally, the case in dealing with the confused and rapidly changing events of war.

James collects the accounts of various authorities and it seems that the following is a fairly correct statement of the course of events :—The Prince having summoned the fortress to surrender and having been refused, the Admiral issued orders for a bombardment by the fleet, which was carried out on the 23rd July (O.S.) for about six hours. Rooke then seeing that the works defending the South Mole were much damaged and were evacuated by their garrison, signalled to Capt. Whittaker of the *Nottingham* (60 guns) to take possession of them. Capts. Hicks and Jumper of the *Yarmouth* and *Lennox* (both 70 guns), however, also reading the signal and being nearer inshore succeeded in landing first and getting into the Tuerto Tower at the landward end of the Mole. An explosion took place there which killed 2 lieutenants and 40 seamen and wounded 60.‡ The captains,

* Drinkwater, p. 9, and Montero, p. 260. Colonel Skinner in an official report of February 24th, 1758, to the Board of Ordnance states that the attacking fleet consisted of 54 English and Dutch ships and the landing force of 2,000 Marines: British Museum Add. MS. 10034.

† Montero, p. 264.

‡ Colonel Skinner in his report of February 24th, 1758, states that they landed between the New Mole and the 8-gun battery where the wall was not over 10′ high, scaled it, and pursued the Spaniards back into the fort which they had evacuated; and that the explosion was due to a pistol shot fired by one of the seamen at a party who were fleeing into the magazine.

however, kept possession of the platform of the fort and were reinforced there by Whittaker. They then moved northwards along the line wall till they came to a small work armed with eight guns which they took. Rooke now summoned the place again and received its capitulation on July 24th. Montero places the capitulation two days later, but this is probably due to a difference in time between the occupation of the gates by the British at the commencement of the negotiations for surrender, and the actual signature of the capitulation. It appears that a naval detachment was also landed at some point further to the south (said by James, Vol. II., pp. 311 and 328, to have been at Europa Advance which was afterwards made more difficult by scarping); and there is a story (repeated by James, and many English writers) that these men captured a party of women who had gone to pray at the Shrine of "Our Lady of Europa." Burnet who is very hostile to Rooke attributes the surrender entirely to the wish of the Governor to rescue these women; and Skinner states, on the authority of "Commissioners Faulkingham and Geddes who were both Lieutenants of Men-of-War and landed on that attack," that the captors threatened to march with the women and children in front.* Montero, however, states (p. 266) that contemporary accounts show that there is no foundation for this story,† and we may well hope for the credit of British arms that he is right. The women had indeed gone to the Shrine with old men and children, but fearing to be cut off had returned to the town, suffering some losses on the way from the fire of the ships.‡ The 8-gun battery captured by the combined landing parties had become one of 10 guns in the time of James, the two additional embrasures having been opened in 1753,§ but in Drinkwater's time had again reverted to eight. It still commemorates the assault by bearing the name of "Jumper's Bastion." Montero (p. 266), following Ayala, erroneously makes Whittaker to have landed on the North Mole and represents the explosion, which they attribute to a mine intentionally fired by the garrison, as having taken place in the "Leander" Tower at that place. The plan in the pamphlet *Reasons for Giving up Gibraltar* (1749) names the work at the inshore end of the New Mole "Fort of the New Mole, by the seamen called Jumper's Battery." The same plan also shows (without any special name) the 8-gun battery on the line wall; and it may

* Burnet, p. 389, and Skinner's Reports of February 24th, 1758, and August 14th, 1769: British Museum Add. MS. 10034.

† He refers to the priest, Don Juan Romero, who remained in the town to protect his Church of St. Mary the Crowned.

‡ Possibly the following entry in a "Journal of the Taking of Gibraltar" may show how the story originated as to the surrender being due to the women:—This journal says that it was in consequence of "the enemy finding themselves weak and also being overcome by the Prayers and Importunitys of the Women." British Museum Add. MS. 10034, p. 175.

§ James, Vol. II., p. 308.

well be that Jumper's name was originally given to the fort which he first captured and where his heavy losses were incurred, and was afterwards transferred from the ruined and reconstructed work to the battery whose capture was the final act of war prior to the surrender.

After the capitulation Rooke sailed away, but the Prince remained as Governor for the British with 2,000 men, chiefly supplied from the Navy, and is commemorated by Hesse's Demi-Bastion flanking the Landport, of which gate he was placed in possession after Rooke's summons on July 24th. The Tuerto Tower, which appears in an engraving of the battle between the Dutch and Spaniards in 1607 as a round tower of no very considerable dimensions, had been rebuilt and enlarged in 1620 when it was given "all the size and importance of a castle with suitable artillery and had its own Governor." * The body of this fort was formed by a pentagon of Moorish foundation. Its site is now occupied by the Alexandra casemates (known until recently as "Alexandra Battery.").

After the capitulation, the British garrison plundered the houses and wantonly desecrated the churches, apparently making the Shrine of Our Lady of Europa a special object for their hostility,—no doubt on account of its valuable contents and also its reputation as the principal shrine of the place. They are said,† after plundering it of its jewels, to have cut off the head of the Virgin's figure and to have flung it away among the rocks.‡ The whole Spanish population (which numbered some 6,000) left the place "except one woman and some sick old men," and the priest Romero who says that some 12 persons in all remained. The 75 nuns of Santa Clara fled through the woods of Almoraima to Jimena, where they were sheltered in the Franciscan Convent and whence they were afterwards distributed amongst the convents of their order.§ The convent of Santa Clara stood on the site now occupied by the Cecil Hotel.‖ It belonged to the Franciscans and was founded in 1587 in the private houses of its foundresses; and its first abbess was a relative of theirs, Leonor Gentil, who came from Seville¶ and whose name is still recalled (although perhaps not intentionally) by "Leonora's Cave." Romero himself remained in order to protect his Church of "St. Mary the Crowned" and its property; and subsequently he busied himself in gradually, with the assistance of others, smuggling out of Gibraltar various sacred images, etc., among which is said to have been the mutilated figure from the Chapel of the Virgin of Europa, which was restored and enshrined in Algeciras, where it remained until 1864 when

* Montero, p. 276.

† Montero, p. 268.

‡ Montero, p. 268, on the authority of the priest Romero, but others say it was the child's head which was cut off.

§ Montero, pp. 269 and 278.

‖ Dewing.

¶ Montero, p. 278.

it was brought back and entrusted to the Loreto Sisters until 17th May, 1866, when it was carried in solemn procession through the streets to a new chapel prepared for it at St. Bernard's College. Some of the inhabitants fled to Ronda, Cadiz, and Malaga, but others took refuge at the neighbouring sanctuaries. Of these the most numerous group betook themselves to the Hermitage of San Roque; others to that of San Isidro, thus founding the town of Los Barrios; while a third party fled to that of La Palma within the boundaries of the old town of Algeciras which was thus refounded.*

Probably a few of the exiles soon returned, for in a letter of November 22nd, 1712 (N.S.), Colonel J. Bennett states that after the capitulation about 30 families and six clergymen remained, "but the whole number of men, women, and children did not exceed 70."†

Montero (pp. 274, etc.) gives a description of the place at the time of its loss by Spain. The town consisted of the Castle and three wards, Villa Vieja, Barcina, and La Turba. The Castle with Villa Vieja formed the ancient Moorish city. Villa Vieja and Barcina were walled and had their respective gates and towers. La Turba was not walled separately but was included within Charles V.'s Wall and was coterminous with the city boundary. It was the southern part of the town and received its name on account of the wretched class of people by whom it was inhabited. Barcina was the central part and was the richest and most populous.‡

The Spaniards lost no time in attempting to recover their lost fortress; and on September 5th (N.S.) the twelfth siege was begun by the allied forces of France and Spain, consisting of 9,000 Spaniards, 3,000 French, and 12 French ships.§ An English squadron under Leake however arrived and secured the command of the bay. Both the attack and defence were carried on with great vigour. It is mentioned‖ that among other steps Prince Henry mounted guns on the Devil's Tower and formed the inundation which is shown by a plan in James to have taken the form of an irregular morass until 1731. The most notable incident of the siege was the gallant attempt of Colonel Figueroa with 500 Spanish soldiers to surprise the place, under the guidance of a local shepherd who led them by the east side of the Rock past Catalan and Sandy Bays, and thence by

* Montero, pp. 280—325. In the *Gibraltar Chronicle* of October 8th, 1885, an interesting article by Don F. M. Montero which appeared in the *Epoca* of October 4th is quoted, describing the exodus from Gibraltar and the growth of San Roque, in which he mentions that at first the people settled amongst their own vineyards and gardens in the district in much misery before collecting into a township.

† "Some Remarks concerning Gibraltar," British Museum Add. MS. 10034, on p. 274 of which he gives a list of those who remained.

‡ Montero, p. 122.

§ See Montero, pp. 282—292.

‖ Montero, p. 283.

a path which ultimately brought them to St. Michael's Cave where they slept that night. The path was subsequently scarped away by the British and its exact route is not now known. The next morning they surprised the guard at the Signal Station and killed them all and then took post (according to Spanish accounts) at the "Silleta" about 100 yards south of St. Michael's Gate (or, according to English accounts, at Middle Hill) in order to assist a storming party which was to have been sent from the camp to scale the precipitous cliff at that place. This party however never appeared. The alarm was given to the garrison by a boy who had come up with food for his father at the Signal Station where he found the whole guard killed. A force was at once sent up and after a fierce fight it destroyed or took the entire Spanish detachment except the shepherd and a few others who succeeded in effecting their escape. The English version is borne out by the "Journal of an officer who was present during the whole siege"* who says "500 Spaniards attacked the Middle Hill"; while Ayala and Montero base their accounts on that of the priest Romero. James (Vol. II., p. 313) also states that it was at Middle Hill that the Spaniards "made the guard prisoners" and that the rocks there had been "within these few years" "scarped, with a wall raised, a sergeant's guard and a parapet" for 20 muskets "so that there is no danger of an escalade." Another contemporary account is given in the "Journals of the Sieges of Verue and Gibraltar" stating that 500 of the besiegers "found means to climb up the rocks and by the help of rope ladders and other things got upon the mountain through a way thought inaccessible; . . . 200 were killed on the spot and 180 with a colonel, lieutenant-colonel, a major, 30 captains, lieutenants, and ensigns were taken prisoners, and the rest who endeavoured to make their retreat by the same way they came fell down the rocks so that few, if any, returned to the camp."† The officer previously quoted, records that Prince Henry himself was wounded in this fight. Probably the apparent discrepancies between the accounts are due to the term "Middle Hill" having been at that time applied to the whole of the central height between the two deep depressions which cut it off from O'Hara's, or Sugar-Loaf, Hill on the south, and from the Rock-gun summit on the north.‡ The very detailed Spanish account describes—as given

* Quoted by Sayer, p. 138.

† An undated MS. (apparently of about 1767) now in the possession of Major Harrison, Secretary of the R.E. Institute, states that "At the end of this Guard called the Rock Guard is the place from whence they say the General or Chief Officer of the En: threw himself down in 1705, & his bones are still reported to lye in a Cliff halfway between y^t & the Queen's Battery on the N. end of the Rock, after having been disappointed of Storming the Garrn."

‡ This was evidently the use of the name "Middle Hill" so late as 1868 for Professor Busk in his paper on the Caves, says "The middle portion, 'Middle Hill' or Signal Station, forms the central eminence."

above—an attack on the southern end of what would on this supposition naturally be described by English writers as "Middle Hill"; and the plan in Ayala confirms this by marking the Shepherd's Path as in the dip between Signal Hill and O'Hara's.

During the siege the Spanish trenches were pushed right up to the inundation (or morass, as it then was*) and between it and the Rock. The bastion of San Pedro (now called Hesse's Demi-Bastion) was destroyed and both the Landport curtain and the King's Lines were breached.† On February 7th (N.S.) an assault was delivered on the work called "El Pastel" by the Spaniards and "The Round Tower" by the English. The tower (of which only the foundations now remain) was taken and held for about an hour, but finally the assault was repulsed.‡ Ultimately, the British squadron having left the bay, the French squadron which had previously evacuated it, returned. The Prince immediately called on Admiral Sir John Leake to again come to his aid. Leake promptly returned from Lisbon and fought an action which resulted in the capture of three French ships and the burning of two others, and was immediately followed by the raising of the siege which had lasted eight months. "During this siege," says Colonel Skinner in his report of 24th February, 1758, "two guns were got up to the Rock and called it Willis's Battery":—afterwards called Queen's Battery; and in a MS. of 1705 which was formerly in the Royal Artillery Record Office it is stated that the battery received the name of Willis's because the man who was most energetic when it was first armed bore that name.§ During this war the staunchest Spanish supporters of the Archduke Charles' claim to the throne were the Catalonians or Catalans; and it is therefore not surprising that we find them providing a contingent to assist in the defence of Gibraltar. Their memory was preserved by a "Catalan Battery" near the "Salto del Lobo" eastward of Queen Charlotte's Battery and the Moorish Castle, "so called," says Colonel Skinner, "from a company of Catalan Miquelets who served in the "siege of 1704 and guarded that part of the Rock."‖ Green in his report had erroneously stated that "Catalan Battery" was the original name of "Queen Charlotte's" which was the nearest battery to the

* In British Museum Add. MS. 24939, which is a plan of the town with the siege works of 1727 by J. Emden, it is shown as a "Morass about 3' deep dry the end of May."

† Montero, pp. 285, etc., James, Vol. II., p. 192, and Drinkwater, p. 14. The ruinous condition to which the northern defences were reduced is described in a report dated 1st January, 1705 (N.S.), in British Museum Add. MS. 10034, p. 162.

‡ Journals of the Sieges of Verue and Gibraltar.

§ Duncan's *History of the Royal Artillery*. The papers have been removed to the Record Office in Chancery Lane and this document connot now be traced.

‖ Skinner's Report of 30th August, 1770, in British Museum Add. MS. 10034, pp. 206–7.

Castle; and Skinner corrects this mistake adding that Queen Charlotte's was erected just before the siege of 1727. In order to reap the fruits of Catalan support an expedition was organized in 1705 against Barcelona under the command of the Earl of Peterborough which was accompanied by Charles himself. The fleet called at Gibraltar where Prince Henry joined it. The expedition succeeded in its object of capturing Barcelona, but Prince Henry was killed in the assault on Fort Monjuick, the capture of which was a necessary preliminary to that of the city itself.

On 19th February, 1706, Queen Anne proclaimed Gibraltar a free port which evidently led to a considerable influx of population; for in a letter of November 22nd, 1712 (N.S.), bitter complaint is made that a short time after it was declared a free port many people came to live there and paid high rents, and that the garrison was removed out of their quarters and put into the very worst and ruined houses to make room for strangers.*

Gibraltar under the English.

In February, 1712, the war was terminated by the Treaty of Utrecht by the tenth clause of which Gibraltar was definitely ceded to England by Philip V. who granted "the full and entire ownership of the place together with its castle, port and the defences and forts which belong to it, giving the said ownerhip to be held and enjoyed absolutely with full rights and for ever without any exception or hindrance, but without any territorial jurisdiction and without permitting any Moors or Jews to reside within its limits, nor allowing Moorish ships to enter its port."†

The stipulation as to the Jews and Moors cannot have been long observed, for we find both mentioned during the siege of 1727. "The Jews were not a little serviceable; they wrought in the most indefatigable manner, and spared no pains when they could be of any advantage, either in the siege or after it."‡ The same authority mentions a plot to surrender the town of which Moors and Jews were accused. Two Moors were convicted and executed; and their skins were nailed on the town gates.§

"Hargrave's" Barracks preserve the name of Lieut.-General

* "Some Remarks concerning Gibraltar humbly offered by Colonel Joseph Bennet" in British Museum Add. MS. 10034. Lists are given of the old inhabitants who had remained after the capture and of those who were paying rents for houses: pp. 274, etc., of the MS.

† The whole clause is given by Ayala, p. xxxix. of the Appendix.

‡ *An Impartial Account*, etc.

§ Montero states (p. 439) that almost all the Jews in Gibraltar are descendants of those expelled in 1492 from Spain who took refuge in Barbary and other parts of Africa, whence they returned to Gibraltar, and that they use words of the ancient Castilian language, undoubtedly learnt from their ancestors.

W. Hargrave who was Governor in 1739 when these buildings were converted into Barracks and who was Commandant of the troops when the siege commenced in February, 1727. A monument to him by Roubiliac stands in the south aisle of Westminster Abbey. During the siege Lord Portmore was Governor and General Clayton Lieutenant-Governor with a garrison which at first numbered 1,500 men but was afterwards raised to over 5,000.* The Spanish trenches (which commenced with a parallel from the middle of the Spanish frontier line to the Devil's Tower) again reached to the morass; and the besiegers attempted to effect a lodgment by mining from a cave under Queen Anne's Battery (shown on the 1745 plan as "formerly called Willises") which mounted 12 pieces and was doing them much harm. Its site is now occupied by the obsolete "Princess Royal's" Battery. The mine was driven by two galleries† and penetrated 70′ out of the total 134 needed to gain the point aimed at‡ but was never fired and after the siege was built up. After five months, hostilities were suspended as negotiations for peace were in progress, but it was not until June, 1728, that the blockade was actually raised.

The name of "Camp Bay" dates from this siege, a regiment having been encamped above it on Rosia Parade which then extended as far south as the rear of Parson's Lodge Battery.§

Another name which is also a memento of this siege is that of "Forbes'" or "Lord Forbes'" Battery as it was originally called.‖ Lord Forbes was a naval officer and, later in life, a diplomatist, who assisted on shore and afloat during this siege. By him the first gun was fired in the defence from the Old Mole.¶ In Colonel Guise's Diary we find under date March 15th "Lord Forbes brought in a Spanish man-of-war." The *War Office Journal* records this as occurring on March 14th and mentions that he sailed again for Lisbon on March 16th. He had served as a midshipman on the *St. George* at the capture of Gibraltar and afterwards as A.D.C. to the Prince of Hesse-Darmstadt on shore. In 1734 he obtained his flag rank and also succeeded his father, the second Earl of Granard, in that title.** Forbes' Battery is mentioned in the *War Office Journal* as armed with two iron 6-pounders, and its casemates are described as "two divisions, each 20′ × 10′ for 60 men sitting"—somewhat closer packing than would suit modern ideas!

Much damage was done to the buildings in the northern part of

* James, Vol. II., p. 237.
† Guise's Diary.
‡ Montero, p. 311.
§ Plan in James.
‖ James, Vol. II., p. 321.
¶ *War Office Journal*, under date February 10th.
** *Dictionary of National Biography*, Vol. VII., p. 393.

the town, or Villa Vieja, which ultimately resulted in the clearing of the present site of the Casemate Barracks. The officer who wrote the *Impartial Account*, in his description of the preparations for defence, says of Colonel Kane "All his designs proved advantageous to the Place but one; being prevailed upon to pull down the old gateway leading from the Grand Battery, he exposed a part of the town to the Enemy's shot . . . and a hundred houses were by that means laid in rubbish." James* says that the houses which stood on the esplanade, (as the Casemates site was then called) "being in ruins from the bombs thrown by the enemy in 1727, it was thought more advisable to clear the rubbish away, which was done in 1731, to widen that part of the Old Mole called the bomb battery," *i.e.* the rubbish was removed outside the walls and employed for this purpose. It was probably at this time that the ancient parish church of Santiago was removed in whole or in part.

The obsolete "Lady Augusta's" Battery, near the Sandpits, preserves by its name an interesting record both of the change which has taken place in the titles assigned to Royal ladies, and of the unfortunate relations which existed between George II. and his eldest son Frederick, Prince of Wales.

Originally the defences of which this battery forms a part were called "The Princess of Wales Line" which included three batteries "Lady Elizabeth's," "Lady Augusta's" and "Prince Henry's,"† being named after three of Prince Frederick's children. Horace Walpole records under date June 27th, 1773, that this Prince "for popularity had affected to call his daughters the Lady Augusta, the Lady Elizabeth, etc., but the late King" (George II.) "had never approved or admitted that appellation, and it had been dropped by the Princess herself after her husband's death."‡ By the use of this title the Prince of Wales had reverted to the Tudor and Stuart custom. The daughters of James II. were known as "the Lady Mary" and "the Lady Anne" until they became Princesses by their marriages with the Prince of Orange and Prince George of Denmark.§ The Lady Augusta married the Duke of Brunswick and was the mother of that Duke who fell at Quatre Bras on June 16th, 1815.

The half century between the siege of 1727 and the next saw many changes and improvements in the fortifications. Immediately after the siege they were naturally repaired and strengthened; and a plan in the *Impartial Account* (1728) shows the "Old Mole, ye head

* Vol. II., pp. 304, 305.

† See list following the War Office MS. diary of the siege of 1727 in the Garrison Library, p. 176.

‡ *Last Journals of Horace Walpole*, Vol. I., p. 240. Ed. 1910.

§ *Encyclopædia Britannica*, Vol. XIX., p. 738.

lower'd* and made 30' longer than before ye siege." James† gives a full detail of the changes to the fortifications with many dates, and Skinner gives a detailed list of the improvements from 1726–46 dated 20th September, 1770. Prince's Lines, which had been constructed in 1720, were widened in 1731–2 and their casemates were added; a large quantity of earth was removed below the foot of Queen's Lines; the group of Willis' Batteries (named after the Princesses Caroline, Anne, and Amelia, wife and daughters of George II.) was completed in 1732; Hesse's Demi-Bastion was reconstructed in 1730; between 1730 and 1738 the wall from Waterport to South Bastion was repaired, following the line of the old Moorish wall which was in many places left exactly as it stood but covered in by new work.‡ In it were included the "Prince of Orange's" and "Duke of Montagu's" Batteries which were old works improved and re-named.§ The Duke of Montagu's Battery (now converted into Montagu Bastion) preserves the memory of the short-lived Duchy of Montagu, which was created by Queen Anne. The London house of the first Duke became the British Museum, but has been entirely obliterated by the existing buildings on its site. The second duke, who succeeded him in 1709, was the Duke of Marlborough's son-in-law and was Lord High Constable of England at the coronation of George I., and carried the Sceptre and Cross at that of George II. He died in 1749 when all his honours became extinct. His son-in-law, the Earl of Cardigan, was however created Duke of Montagu in 1766, but the Duchy finally expired with him in 1790.‖

In 1731–4 the morass was converted into an inundation by being dug out to a depth of 2' below low-water mark, with many deep pits in it. A plan in the Gibraltar Garrison Library shows both the morass and the inundation,¶ the latter extending further east than the original morass.

In 1736 the Contractor to the Victualling Office built the wharf called the "Ragged Staff" which is now merged in the Ordnance Wharf. The reason for the adoption of this name is not recorded. In a plan of 1750** it is spelt *Wragged Staff;* and it seems just possible that the name is an anagram of that of Sir Charles Wager, First Lord of the Admiralty in 1736, suggested by the shape of the original wharf.

* Colonel Skinner's report of 14th August, 1769, states that it was lowered by 5'.

† Vol. II., pp. 301, etc.

‡ Skinner's Report of 14th August, 1769, states that before this reconstruction the houses joined the old Line Wall which only provided a passage 4' wide.

§ Both these works were further enlarged between 1770 and 1779.

‖ Burke's *Extinct and Dormant Peerage.*

¶ No. 13 the plan dated 1738.

** Add. MS. 21576 at British Museum.

While the English were thus steadily strengthening their position the Spaniards were also at work erecting a fort at Punta Mala and the fortified Lines along their frontier which were demolished in 1810, but of which the ruins are still to be seen at Linea; and in 1739 the Spanish Court issued a remonstrance which is quoted by Ayala (Appendix XXXV.) "Although this fortress was given up without any territorial jurisdiction and without any open communication with the surrounding country on the land side, the English require that the distance of a cannon shot should be comprehended, and although it was agreed mutually in 1728 to abandon the posts on which the dispute was grounded (which were, one in front of the Genoese Tower, another near the Rock under the Pastelillo* and another on the east, little distant from the Rock and near the Devil's Tower) yet they have since occupied them without any regard to the Treaty."†

In 1744–5 the Town Range Barracks were built‡ and Skinner records that between 1726 and 1746 "Four Chapels, viz., Lavera Cruze, La Misericordia, the Hospital, and St. Clara were rebuilt for Soldiers' Barracks." In 1756 the cemetery at the North Front was commenced. In a MS. account of "Occurrences at Gibraltar when Lord Tyrawley was Governor in 1756–7"§ it is recorded under date October 30th, 1756, that "Great inconvenience arising from burying in the Red Sands which were almost covered with graves, Lord Tyrawley sent out the Town Major and Camp Colourmen to mark out a Burying Place without Landport towards the Devil's Tower designing that both soldiers and sailors should bury there for the future"; and under date November 1st it is noted "The burials began to-day on the north side." There is however no existing record of any grave earlier than 1804.‖ A map of the 18th century in the British Museum (Add. MS. 34067) shows the "Soldiers' burying place" on the south glacis outside the South Bastion; and no doubt it had extended from there throughout the Red Sands. The Sandpits Cemetery is probably a remnant of the old more widely scattered burial ground, and very probably when the Red Sands were formed into the Alameda, old interments may have been removed there.

During the Seven Years War (1756-63) when England and Prussia

* Probably the same as El Pastel, or the Round Tower.

† It is not quite clear what Genoese Tower is referred to as that name does not appear elsewhere in connection with the North Front, but that there were several towers in that neighbourhood which have disappeared is shown by the names which occur in the tables of distances from various parts of the defences which are given in the *War Office Journal* of the siege of 1727 and in James' *History*.

‡ Note on the 1745 plan.

§ British Museum Add. MS. 23637, p. 44.

‖ The War Department transferred the Cemetery to a Board in 1872.

were opposed to France, Austria, and their allies, Gibraltar saw no fighting, but in "Ferdinand's Battery," constructed long afterwards, it has commemorated the great General, Prince Ferdinand of Brunswick, under whom the British troops fought in Germany during a great part of that war, and who led them to glorious victory at Minden in 1759. In 1761 the "Couvre Port Work, covering Landport, was re-formed . . . into a battery for three guns."*

The *War Office Journal* previously quoted records that a party of "330 men per day, composed of Jews, Genoese, etc., was employed for nine days to level the sands upon the isthmus, between the Spanish Hutts and the Inundation, finished January 9th, 1762." In the same year the original Prince George's Battery was constructed for six heavy guns and two howitzers.† In 1766 there occurred a terrific storm during which Green states that about 130′ of the Line Wall were carried away near the southernmost point of Rosia Bay. This part was rebuilt into "Lord Granby's Battery" for five guns; and in 1769 the "Sea Line Wall and the Line of the Coast from Prince William's Battery joining immediately to the south-east angle of the New Mole Fort" received, he says, "in a very particular manner, all kind of repair and reformation as far as the guardroom at Bona Vista," at Camp Bay, etc., the cliffs being scarped and built up and the old walls being rendered more inaccessible.

In 1771 a quaint addition to the defences was made in the shape of "Healy's mortar," which may still be seen near Queen's Gate. It is cut in the solid rock and was intended to be used against landing parties. A full description of the experiments with it is given in Grose' *Military Antiquities*, Vol. II., Appendix 20. The inventor wished it to be fired with 50 lbs. of powder, but the charge actually used was only 27 lbs. with 70 paving stones of from 1 to 1¼ lbs. weight. These were scattered from Ragged Staff to the small Watering Pier which ran out just opposite where the Naval Canteen and Jumper's Well now are; about a quarter of them going 100 yards into the sea. With a charge of 13½ lbs. and 1,220 stones, about 200 passed over the Line Wall.

In the same year the Naval Hospital was built to accommodate 1,000 patients, and was long known as the Cobb, or Dollar, Hospital, on account of its excessive costliness.‡

In the following year (1772) the Company of Military Artificers, which was the beginning of the rank and file of the Royal Engineers, was formed on the recommendation of the Chief Engineer, Lieut.-Col. (afterwards Sir William) Green. Until that year all the fortification work had been done by civil labour (which proved very unsatisfactory)

* Green's Report of 10th January, 1770.

† Green's Report of 10th January, 1770, in British Museum Add. MS. 10034.

‡ Hennen, p. 135.

or by mechanics drawn from the regiments in garrison, especially the artillery. On March 6th, 1772, a Royal Warrant was signed creating "The Military Company of Artificers" which subsequently, after passing through the successive stages of "Royal Military Artificers," "Royal Military Artificers or Sappers and Miners," and "Royal Sappers and Miners," became the rank and file of the Corps of Royal Engineers, in the year 1856, this title having up to that time been confined to the officers. From the beginning the Military Artificers were placed under the orders of the Engineer officers. In 1773 Lieut.-General Boyd laid the foundation stone of the King's Bastion, which was built from Green's designs by this infant company and which may therefore be fairly taken as a memorial of General Boyd, who is buried under it in a vault prepared at his express desire and whose epitaph may still be seen on its walls; of Green, the Chief Engineer throughout the Great Siege of 1779-83; and of the birth of the Corps of Royal Engineers, although Engineer *officers* were of earlier date. The casemates of King's Bastion were intended for a regiment of 800 men (Drinkwater, p. 14) and were occupied accordingly*—a sufficient proof to anyone acquainted with the place of the advance which has been made in the housing of our troops since that time. About the same time the "Prince of Orange's" and "Duke of Montagu's" Batteries were enlarged from Green's designs into Orange and Montagu Bastions.

When the foundation stone of King's Bastion was laid General Cornwallis (whose connection with Gibraltar has been commemorated by the name of "Cornwallis Hall" given to one of the most striking features of the Galleries) was Governor; and during his time Windmill Hill also was fortified. He was Governor from 1762 to 1777 when he was succeeded by General Eliott; but was only resident during part of this period, the Government being as usual administered during his absence by Lieutenant-Governors, to which office Boyd was appointed in 1773 while holding the rank of Major-General.

The next great event in the history of Gibraltar was the siege of 1779–1782—"The Great Siege"—which was conducted by the combined forces of Spain and France. The British colonies in North America had declared their independence in 1776 and were waging war against England. In 1777 Burgoyne had capitulated at Saratoga; in December France had recognized the independence of the colonies, openly joining them in the war in 1778; in June, 1779, Spain also joined this alliance; and on the 21st day of that month communication between Gibraltar and the Spanish territory was closed by order from Madrid. On 7th August Lieut. Holloway of the Engineers records in his diary "Began fitting up

* The pay lists of June, 1788, refer to them as "now occupied by the Queen's or 2nd Regiment."

Poca Roca's Cave as apartments for the Governor,"* but it does not appear that he ever occupied it. The story of the siege is so fully detailed in Colonel Drinkwater's History and Capt. Spilsbury's Diary that it is unnecessary to repeat it but it is interesting to note that the principal trenches were practically parallel to the Spanish Lines instead of running diagonally across the isthmus as in the previous sieges. The climax came with the great bombardment of September, 1782,† the destruction by red-hot shot of the enemy's floating batteries, and the total defeat of this attack. During the hottest part of the bombardment the Governor, Sir George Eliott, took his post on the King's Bastion while General Boyd took his on the South Bastion, from which he was able to see the fulfilment of the wish he had expressed when laying the foundation stone of the former: "May I live to see it resist the united efforts of France and Spain." Several mementoes of the siege remain. Eliott (who was created Lord Heathfield for his services) is commemorated by a bust in a prominent position to the south of the Alameda, and by "Eliott's Battery," built in 1845. Green, his Chief Engineer, who was promoted to Major-General during the siege and was subsequently created a baronet for his services, and was Chief Engineer of Great Britain from 1786 to 1802 has his name preserved by "Green's Lodge"—the name given by Eliott to this work which was proposed by Green before the siege, commenced on August 20th, 1779, and completed as a 5-gun battery on September 10th, being then the highest battery on the Rock.‡ Boyd, the second in command and Lieutenant-Governor, is commemorated as already narrated in King's Bastion and by a tablet in King's Chapel. "Witham's Garden" preserves the name of a Captain in the Royal Artillery who seems to have been a very energetic officer, and who evidently made things lively when he was on duty in the batteries. The following are two of the entries in Spilsbury's Diary which no doubt refer to him: "July 15th, 1781. The Jews' burying ground dug up in the night by Capt. W.——, Artillery, and made a garden of." "September 10th. The inhabitants, etc., all leave the Town when they know Capt. W. is on the batteries; at other times the Dons fire only their usual three shells." As a reward for his services during the siege he was granted an honourable augmentation of his arms, and was given a pension of £300 a year derived from the property now occupied by the Lunatic Asylum, Witham's Garden, and Villa Plata. The lease of this property was continued to his widow, and then to his unmarried sisters, after whose deaths it reverted to the Crown. The keys of one of the gates or bastions of the fortress were given to him and are still in the possession of the family, but it is not known to what gate they belonged nor

* Porter, Vol. I., p. 84.
† A spirited account is given in the *Annual Register* for 1782.
‡ Porter, Vol. I., p. 85.

whether they were granted to him on account of any specific act of valour in connection with that gate. He died as a Colonel in Jamaica in 1799.* "Corsican Post" commemorates the detachment of Corsicans who arrived in July, 1782, numbering about 70 officers and men and who were posted at first at Windmill Hill to guard the prisoners. In December, 1782, they furnished two guards near the Rock-gun whose duty was to pick off the Spaniards below, and, in January, they also furnished posts in Queen's Lines, and above Middle Hill. There is frequent mention of them in Spilsbury's Diary.

At Government House there are interesting relics:—the gigantic wooden figure of Eliott grasping the Key of the Fortress, which was cut out of the bowsprit of the Spanish man-of-war *San Juan*, taken at Trafalgar; and one of the grates used for heating the red-hot shot (or "roast potatoes" as the men called them); while the panels of the dining-room doors are formed out of the dining tables mentioned by Drinkwater as having been made from the wreckage of ships destroyed during the great attack.

The residence of the Admiral Superintendent of the dockyard is connected with the memory of Sir William Green. In 1775, Green having, at his own expense and with the approval of the Commander-in-Chief, enclosed and cleared the ground a grant was made to him of about half of the present grounds of "The Mount"; and in 1783 the remainder of the grounds were granted to him. All the property, including a house which he had built upon it and which he occupied during the siege was sold by him to the Admiralty in 1797. It was then known as "Mount Pleasant" (a name now applied to a neighbouring house occupied by the Eastern Telegraph Company) and is mentioned under that name in the diary kept by Lady Green during the siege and quoted in Porter's *History of the R.E.* The buildings erected by Green are not those now in existence. The present residence was built between 1797 and 1811 and was considerably altered in 1846.† Green had come to Gibraltar as Major in 1760 to command the Engineers and to fortify the place,‡ having previously seen much service, including the capture of Quebec in 1759 when he was wounded. He retired in 1802 and died in 1811.

During the great siege the well-known galleries were commenced; and the memory of the man who first suggested the idea of their construction is preserved by Ince's Farm. Sergeant-Major Ince belonged to the "Military Artificers." The officer under whom he worked was Lieut. Evelegh of the Engineers.§ Ince began his gallery

* Information furnished by Major Leslie, R.A., and the Gibraltar Crown Lands Office.

† The above information is compiled from records in the possession of the Admiralty.

‡ For his report on the fortifications see No. 17.

§ *Travellers' Handbook.* The name is wrongly given both in this book and in Montero, p. 432, as Evoleth.

(now known as the Windsor Gallery) on May 25th, 1782; and by 14th January, 1783, four guns were mounted in it. The preliminaries of peace were signed on January 20th but Ince's work went steadily forward. By May 11th a little over 200 yards had been constructed with 10 embrasures, and by June 3rd "The Notch" or projecting rock in which is St. George's Hall had been nearly reached, and an approach to it was being constructed. A gallery to connect King's and Queen's Lines was also formed in 1782.* Ince was rewarded after the siege by the gift of the farm which still bears his name though it has reverted to the possession of the War Department and is no longer a farm. He also received a commission as Ensign in the Royal Garrison Regiment dated February 2nd, 1796, in which regiment he was promoted to Lieutenant on March 24th, 1801. The regiment was disbanded in 1802, up to which time Ince served at Gibraltar as an Assistant Engineer. He died at Penzance in June, 1809, aged 72. Evelegh lived to be a Lieutenant-General and died in 1815. Montero states (p. 432) that he was rewarded by the grant of "a spacious site in the central part of the Mountain, to-day covered with buildings," but it is not now known what that site is.†

The complete failure of the tremendous attack of September disheartened the besiegers who however continued to throw about 1,000 shot and shell daily into the place and even opened some new trenches. In October the British fleet under Lord Howe entered the Mediterranean and sent in reinforcements and supplies; and the enemy's camp began to break up but even in December an attempt was made to mine the Rock at a point near the Devil's Tower where a Spanish guard of 300 men was posted. Hostilities ceased on the 5th of February, 1783, when the last shot was fired.

The prolonged and severe bombardments had of course reduced most of the town to ruins. So early as May 9th, 1781, Drinkwater records that "Scarce a house north of the Grand Parade"—(which the plan shows was at what is now called "Commercial Square")—"was tenanted . . . The Governor and Lieutenant-Governor, however, maintained their quarters . . . Both had bombproofs, and the former afterwards had a large tent pitched on a rising situation south of the Red Sands where with his suite he generally remained during the day, returning at night to town; but the Lieutenant-Governor constantly resided in town, having accommodation in the King's Bastion." Perhaps the Governor's bombproofs were those which still exist against the walls of the former western portion of the Chapel and on the east side of the Patio or Court. As to the final state of the place, Drinkwater says that two powder magazines in front of the South Barracks "were the chief, I might

* Drinkwater and Spilsbury.

† *The Travellers' Handbook* states that both these grants of land were long leases.

say almost the only, buildings remaining on the Rock after the late siege; and their preservation was owing to their being kept in constant repair by workmen purposely appointed for that duty."

The destruction of the town was however not quite so absolute as this might lead one to suppose, for he records that when the Spanish commander, the Duc de Crillon, visited the garrison on 31st March the officers were introduced to him at the Convent, where also he dined* and where too a State dinner was held on St. George's Day (April 23rd) to conclude the ceremonies at which General Eliott was invested with the Order of the Bath and the thanks of the King and Parliament were officially communicated by him to the garrison. The peerage was not given to him until his return to England in 1787. Spilsbury sadly records "The Field Officers, etc., and Staff dined at the Convent, and the soldiers, etc., have a bottle of wine and a pound of fresh beef each, gratis, so that the Captains and Subalterns are the only ones not taken notice of in this day's entertainment." He adds, with evident satisfaction "that the lights were blown out, that the rain came in, that the mob were disorderly, that never was a worse salute performed by the artillery . . . a worse feu-de-joye fired by troops, worse weather, worse musick, worse fireworks, or worse entertainment."

The rebuilding of the town was soon taken in hand, but unfortunately, as observed by Drinkwater, the old plan and old foundations were adhered to, so that the grand opportunity for laying out wider and more convenient streets was lost. One of the few new buildings was the quarter for the Chief Engineer which was built on ground shown by the plans of 1736 and 1753 to have been partly vacant and partly occupied by the outbuildings of a house which had been his quarter since 1727, when it was "given to him greatly out of repair," and which stood in the southern part of the present front garden.† A barrack for 94 men occupied the present stable block or its site. The house bears the inscription near the front door "Chief Engineer's Quarter, 1786"; and the pay lists show this quarter as having been "re-established" during 1786 and 1787, while some additional work was done in 1788.

Another quarter which was constructed about this time was that for the Lieutenant-Governor which was formed at some date prior to 1789 out of three officers' quarters.‡ A part of it was afterwards cut off in order to complete the site for the Church of the Holy Trinity (now the English Cathedral) and the remainder forms the present quarter of the Assistant Adjutant-General.

* Spilsbury.

† W.D. Bill Book No. 228 at the Record Office states that the quarter was "entirely destroyed at the commencement of the enemy's fire from their batteries upon the Isthmus."

‡ Nos. 10, 11, 12 in a MS. notebook in R.E. Office containing a list of quarters.

The bastions and curtains of the town had been so much damaged that a great part of them had to be taken down and rebuilt,* the new line being thrown further out into the sea. In several places however the old wall still remains, as at Prince Albert's Front where the old shot-marked wall and the "Main-Guard Sallyport," constructed in 1787,† may still be seen behind the new wall.

* Drinkwater, p. 28.
† Garrison Orders July 30th, 1787.

(*To be continued*).

ENGINEER HOUSE, GIBRALTAR,
October 5th, 1910.

The Editor, R.E. JOURNAL.

SIR,

There is an error in my paper on Gibraltar on p. 246 of the last *Journal*. At the end of the "King's Chapel" section the words "which were in the north corridor of the patio but had in 1844 been covered over by the plaster" are misplaced. They do not refer to the doorways but to a Franciscan coat of arms which formerly existed in the north corridor.

Also in all the references to Montero in the October instalment of my paper "Don F. M." should be deleted. The error has arisen from a correction which I sent you for a later portion of the MS., where reference is made to Don F. M. Montero, the son of the historian.

Yours faithfully,
E. R. KENYON,
Colonel.

1.—The Frozen Lake, Hor Nag.

4. Above the Eastern Glacier of Kolahoi; showing its extent.

3.—The Survey Peak of Rajdain—from the Low Base Camp at Hor Nag

5.—The Icefall at the East End of the Snow Plateau.

2. High Base Camp, about 14,000'.

6. Kolahoi North Peak from the East.

CLIMB ON KOLAHOI

A CLIMB ON KOLAHOI.

By Lieut. Kenneth Mason, R.E.

Kolahoi, the "Matterhorn of Kashmir," rises to a height of 17,839′, and is one of the highest peaks in Kashmir proper. It rises out of a snow plateau, at a height of about 14,800′ or 15,000′, and exposes nearly 3,000′ of precipitous rock, gashed here and there by snow couloirs.

This peak was fixed by the Survey of India and named "Kolahoi," from the district to the north-west; but the villagers now call it "Harbagwan."

It is the northern of four peaks which rise out of the plateau, and the highest by some 800′. Dr. Neve, the well-known missionary and climber, distinguishes them by the names,—"North," "South," "Buttress," and "Roof" Peaks. They are all "peaks" in the truest sense of the word, and are detached from one another.

The North Peak ends in a knife-like "arête," studded with "gendarmes," and capped with a somewhat nasty-looking snow cornice; a 3,000′ or 4,000′ precipice faces the north side, and there is a slope of some 70 or 80 degrees on the south.

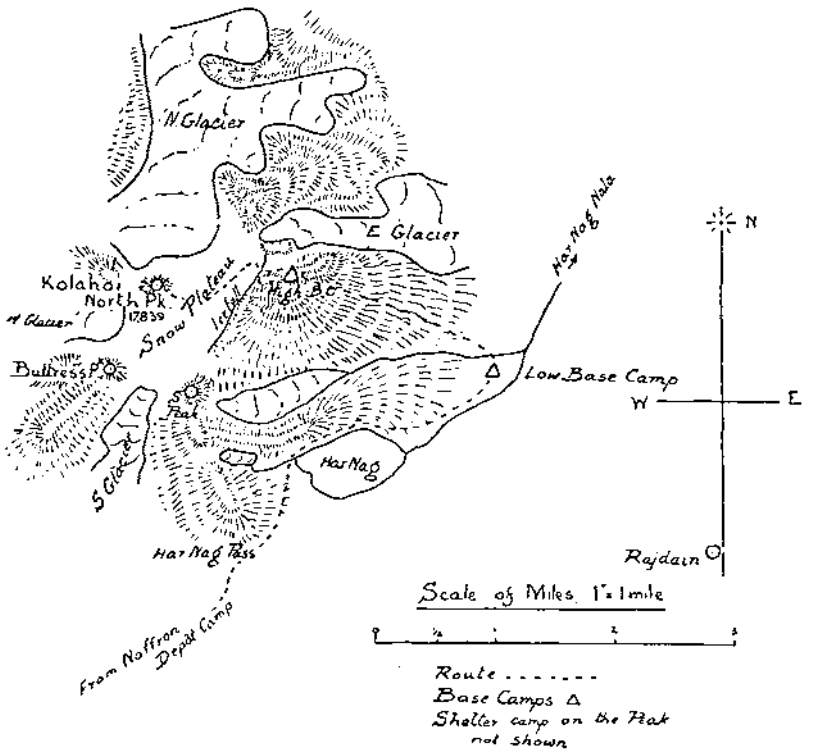
The snow plateau is probably some 200′ thick, and of consolidated ice for the greater part of its thickness. This plateau probably feeds all the glaciers of the district.

On the invitation of Dr. Ernest Neve, Professor S. G. Dunn of the Indian Educational Service and a member of the Climbers' Club, and I moved up the Lidar Valley, with the intention of meeting him at Aru on the 24th June, 1910. A "parwana" from the Governor was sent on to the Tehsildar of Pahlgam ordering him to supply 15 coolies, from whom we intended to choose. Mention of Dr. Neve's name in connection with the trip, procured excellent men, though one member of the party found "Keating's" absolutely necessary to procure him even a doze!

The weather was bad, and threatened to be worse, so, on our arrival at Aru, we found a note from Dr. Neve saying that he was pushing on, and that he would await us at Naffron. On the following day we reached Naffron, and met him.

Leaving our baggage ponies and a depôt camp here, we crossed the Har Nag Pass, about 12,500′, on the 26th, (see sketch map).

SKETCH MAP OF KOLAHOI.—JUNE, 1910.



From the top of the pass, (*Photo* 1), we looked down on Har Nag, a high lake covered with broken ice and snow. On our right and left, glaciers fed the Nag, and snow streaked the lower slopes of the mountain sides. We encamped north-east of the Nag, amidst wild flowers—amongst which Dr. Neve discovered a "yellow poppy"—and the warning notes of the terrified marmots, which scuttled into their holes on our approach.

In the afternoon we sent coolies out to collect wood (juniper bush) for fuel for the high camps. A musk deer came to within 30 yards of the camp to inspect the intruders, and decided we were dangerous. Musk deer are protected by law in Kashmir, so his alarm was unwarranted. Dunn also saw a couple of pine marten but did not get a shot.

On the 27th, the party moved up the eastern spur of the mountain mass, leaving a low base camp at Har Nag. From here we moved light, and observations were taken with a pocket clinometer and prismatic compass.

We ascended some 2,000' on the spur, mainly on grass and snow, going nearly due west, and about tiffin time reached a saddle near by which we camped (*Photo* 3), at about 14,000. Our view from here gave us some idea of the strenuousness of the work to come. We

could not yet see the North Peak, but just north of us the Eastern Glacier of Kolahoi, divided at its upper end by an isolated ridge, tumbled down in numberless séracs and icefalls, (*Photo* 4). Due west of us we had a glimpse of the formidable-looking icefall which we still had to encounter before reaching the great plateau. To our south-east, the Survey Peak of Rajdain (*Photo* 2) stood up very finely, and Panjtarni and the Kohenar Peaks near the Sheshanag showed up occasionally through the ever-increasing clouds. About this time we all developed headaches.

Our camp consisted of two Whymper tents, one Mummery, and two small ones. A Whymper tent weighs about 16 lbs., and a Mummery only about 5 lbs.; the latter is pitched with ice axes and can be carried in the pocket.

In the evening a couple of ibex crossed the ridge to our south, and, after a magnificent sunset which seemed to promise well for the morrow, we turned in.

During the night a thunderstorm raged over Rajdain and Sheshanag, and some rain fell. We arose early in the morning, and leaving a high base camp we moved off with a very light camp,—one Mummery and one Whymper—at 6.15 a.m. The party included about a dozen coolies and two shikaries, Abdulla Bhat and Ahmdu; both these men were trained by Dr. Neve, and the former accompanied the Duc d'Abruzzi on his K2 climb last year when he reached a height of 24,500′, while the latter was with Drs. Neve and Longstaff on their expedition to the Saichar Ghainri Glacier. Our route lay round the snow bordering the south branch of the Eastern Glacier, and after traversing this, at 7 a.m. we reached the foot of the icefall at the east end of the Great Snow Plateau (*Photo* 5).

The snow was in excellent condition, and with boots well nailed it was easy to kick steps the whole way, and easy for the coolies, who wore grass shoes, to follow. Another musk deer crossed our tracks behind us, and bounded over the snow towards our camp; one could not help envying him his agility.

The icefall (*Photo* 5), about 150′ high, was climbed, Dr. Neve cutting steps and leading on the rope; the top was reached about 7.30 a.m., when Dr. Neve instructed the coolies how to anchor an ice axe at the top and let themselves down on the rope.

From the top of the icefall we saw a curious phenomenon;—the sun was up and shining through light clouds. A very fine sleet was falling, and round the sun was a rainbow! The rainbow was not a small halo, but its diameter subtended an angle of about 45 degrees at our position. I do not know the explanation of this. Is it possible that the rainbow was caused by a reflected sun on the snow behind us?

After traversing the snow slope, we came in full view of Kolahoi North Peak. Dr. Neve pointed out his high shelter camping ground

of a previous expedition, and some coolies collected the wood that was not used on that occasion. Here we halted to take photographs (*Photo* 6), and then traversed the plateau. The foot of the peak was about a mile away, as the crow flies, from the point from which we took the photographs, but owing to crevasses the party had to make occasional détours on the rope. As a matter of fact, the crevasses, even where covered with snow, were always easily distinguishable, as they were always indicated by a concavity in the surface of the snow which was much furrowed by the action of the wind.

On our left the mass of the South Peak loomed up out of the snow to a height of 17,000′, and about halfway up the north face was a large bergschrund. Lower down were some fine ice cliffs. Beyond it to our south-west, was the Buttress Peak. We reached the foot of the North Peak about 9 a.m. and climbed the lower slopes on to rock for breakfast. It was with some difficulty that I could eat any as I was having a taste of mountain-sickness. However, I managed to eat a piece of sheep, which was smoked, and a hard-boiled egg, after which I felt better. Mountain-sickness is like being in a small open boat, with a taste of liquorice in one's mouth. If we could not get the coolies up with the camp, we intended to come down and camp here.

After breakfast we traversed on snow to a couloir and began a steep ascent. As the snow became steeper, we crossed it on to rock, traversed the main couloir, and again reached rock.

We then had some 700′ of rock at an average slope of 50 or 60 degrees, some being steeper. The difficulty was to get the coolies up, and more than once they all but refused. However by dint of persuasion and encouragement, aided by a friendly ice axe, they came up. Dr. Neve selected a place for a shelter camp,—the best under the circumstances,—and the coolies built up a platform composed of ice and snow retained by a wall of rocks. There was no room for either of our two small tents on the level, and on this small platform we pitched the Whymper tent. It seemed a very precarious position but served its purpose.

With us we retained Abdulla, Ahmdu, and two specially selected coolies; the remainder we sent down with the spare rope and ice axes, and we then had tiffin. The Mummery was pitched just above us.

Snow fell during the afternoon and about 6 o'clock we dined,—the three of us in the Whymper tent, packed like sardines.

In the evening we had a beautiful glimpse of our position, and all the distant mountains, including the Nun Kun Peaks, showed up a perfect red in the setting sun. Again it almost seemed that the morrow must be a glorious day; but even if one could get no further, one felt that that panorama compensated for all the efforts of the day, and justified the attempt. This camp was about 16,000′.

We turned in about 7 o'clock, and tried hard to get some sleep. The two shikaries and the coolies passed the night in the Mummery. There was just room for the three of us in our tent abreast. None of us slept much; and about 2 a.m. I got up to tie back the tent flaps, as it had become too stuffy; I looked out, and could hardly see a yard in front of me. We were in thick cloud, and shortly afterwards snow began to fall.

At 4.30 a.m. when we had intended to make a start, the snow was still falling, and we had to clear the snow off the tent from within. The occupants of the tent above us did the same, with the result that their discarded snow fell on our tent.

About 7 a.m. matters began to improve, and Dr. Neve and I had breakfast. Dunn was unable to touch any food, owing to mountain-sickness, and reluctantly had to remain behind in the shelter camp, with a coolie. At 7.30, the remainder of the party started. The rocks were very wet and slippery, but the sun shone out for a short time, and helped to dry them. The angle of ascent averaged 70 degrees. For some distance the rope was not used, as it was Dr. Neve's intention to try and get up as soon as possible, and on rock of this description, the rope is liable to become entangled with projecting parts and cause unnecessary delay. The formation was "trap-rock" and as a rule afforded good hand and footholds, but great care was necessary to avoid displacing large masses of loose rock, and every hold had to be tested.

After some time I had an attack of mountain-sickness and had to stop. Dr. Neve, Abdulla, and Ahmdu went on with the rope, while I descended to the camp. Eventually, Dr. Neve, after encountering continual bad weather, reached a point some 300 to 400′ from the top,—the same point he reached on a previous attempt in 1902. The weather had become vile, and on the arête leading to the summit, he found it impossible to proceed.

In the meanwhile, the coolies, who had been sent down the day before, returned to the shelter camp, and, leaving provisions for Dr. Neve according to his wishes, we packed up the camp and moved down the peak, across the snow plateau and down the icefall, to our high base camp. Dr. Neve, after some time, joined us here, as arranged. His breeches were torn right across the leg, and Abdulla's had suffered to a less extent. We then returned to our low base camp, as we all wanted sleep very badly, and the weather was still disgracing itself. In addition, it was a good thing to be able to get down to altitudes where one could change into different clothes for the night,—and have a wash. As my bearer had omitted to pack certain bifurcated garments of mine, it was pleasant to reach a spot where their absence was less felt.

The next day the party broke up, Dr. Neve continuing down the Har Nag Nala, while the remainder of the party recrossed the

Har Nag Pass, *en route* for Srinagar, "the City of the Sun," (as opposed to "Clouds").

This is Dr. Ernest Neve's sixth attempt on Kolahoi, and it still remains unconquered! He decided that the only hope of succeeding, at any rate from the east, lay in crossing the plateau, and putting a shelter camp as high as possible on the peak, so that the mind and body should be as free as possible from fatigue, for the somewhat sensational arête finish. Even on a snow slope at this altitude one has to stop every few steps, and rock climbing is much more fatiguing. The decreased pressure affects the head and extra corpuscles have to be formed in the blood to counteract the rarity of the atmosphere.

What with the heat of the sun, even when shining through clouds, the rarefaction of the air, the extra exertion entailed, added to the absence of comfortable hotels as bases, and the conveniences of civilization close at hand, climbing in the Himalayas and climbing in Switzerland are as far apart as their respective fields of operation. In addition to these difficulties of climate and situation, Kolahoi would be reckoned a difficult peak from a technical climbing point of view, even in Switzerland.

One point stands out in favour of climbing in these parts; at an absurdedly low scale of pay, it is sometimes possible to get two of the best shikaries as guides, well trained in climbing craft, accustomed to living their lives in the open, and willing to go anywhere a sahib takes them. It is possible, too, by encouragement and fair treatment, to take coolies lightly laden, and it almost passes comprehension how these villagers and Gujars, whose pay on a trip of this sort does not exceed six annas per diem, will go as well as they do.

MAJOR-GENERAL SIR WILLIAM REID, R.E., G.C.M.G., K.C.B., F.R.S.

(Continued).

By Col. Robt. H. Vetch, c.b., late R.E.

Lieut.-Colonel Sir William Reid embarked for Malta on the 3rd November, 1851, in the P. & O. steamer *Indus*. He was accompanied by Lady Reid, four daughters and his son-in-law, Capt. E. G. Hallewell, who was on his staff. Sir William had lost his daughter Lucy at Woolwich in October, 1850; and the daughters who sailed with him were Mrs. Hore, whose husband was at sea, Mrs. Hallewell, Charlotte and Grace.

On the 11th November, 1851, a week after he left England, Sir William Reid was promoted to be Brevet Colonel in the Army. He was then over 60 years of age and had served for nearly 43 years. During his term of office in the Government of Malta he received two further promotions in the Army, viz., to a Regimental Colonelcy in his own Corps on the 17th February, 1854, and to be Major-General on the 30th May, 1856.

Colonel Reid's position when he arrived at Malta was anything but a bed of roses. Like his immediate predecessor, the Rt. Hon. Richard More O'Ferrall, he was Civil Governor and Commander-in-Chief, that is the military command and administration was entirely distinct from the Government and under a general officer, although, of course, the General was subordinate to the Governor as Commander-in-Chief. In the Army the new Governor was junior to the General Officer Commanding the Troops, and also to the Colonels Commanding the Royal Artillery and the Royal Engineers, and there was some soreness and jealousy on their part on this account.

As regards the civil community Reid arrived at a critical time in the political history of the island. In succeeding Mr. Richard More O'Ferrall in the Government, he succeeded one who, in spite of his being a Roman Catholic and therefore in religious touch with the inhabitants, who are of that persuasion, did not succeed in ingratiating himself with the Maltese, as had been hoped and expected when he was appointed. Unfortunately the impression existed among them that the previous Governor, Sir Patrick Stuart, had been recalled on account of a riotous demonstration during the carnival of 1845. This

impression, however erroneous, infused into the disaffected an exaggerated self-importance. They strove for political power, and agitated for reform. A patriotic association was formed and great excitement prevailed in the islands. The local press fanned the flame by articles of frenzied antagonism to the Government. The Colonial Office met the agitation by concession, and the year before Reid's arrival the constitution of the Council of Government had been amended to admit members who should represent the people on an elective franchise. The number of elected members was not, of course, sufficient to enable them to have a majority of votes at the Council Board. This made a new grievance and, when Reid arrived, there was still considerable agitation on the subject.

The period that followed formed a striking contrast to the months that preceded his coming. The new Governor arrived on a quiet autumn day. He was not fêted like his predecessor. There were no rejoicings, no processions. But from that day gradually the heat and violence of party, which had pervaded all classes of the Maltese community, began to cool down. The Patriotic Association showed unmistakable signs of collapse. The patriots soon went back to their schools or their trades, while the press grew daily more and more moderate. To what was this stilling of the political tempest due? It was that Reid brought to his new Government the same tact and firmness that he had displayed in other spheres, and the same unostentatious activity which had distinguished him in Bermuda and the West Indies.

By always consulting the General and the Admiral, and never interfering in military administration he succeeded in establishing proper relations with the Services, while, as the late Sir Adrian Dingli, who was his Advocate-General, has recorded: "Sir William, as President of the Council, with his great sagacity, prudence, and firmness conducted the legislative business of the Council in such a manner as to give general satisfaction. His attention was chiefly directed to the improvement of the educational establishment, erecting new primary schools in various localities in Malta and in Gozo, and improving those which he found. By his effective moral support to his legal adviser the codification of the civil laws of Malta was commenced and carried out to a great extent. He caused an ordinance to be enacted for the creation of a Maltese Militia, he himself personally superintending the formation of a small Volunteer Artillery Corps."

It seems strange that Reid, brought up in a Presbyterian manse, nevertheless always managed to maintain those amicable relations with the Roman Catholic bishop, priests, and people of Malta, which his Roman Catholic predecessor had been unable to do. They saw that he had the good of the people at heart for he carried out the same homely designs for their benefit which had been so successful in

his other governments. He took an immense interest in education and started a secondary school for girls of the middle classes, somewhat in advance of what was then usual in the education of girls, for the study of Euclid was included in the curriculum. He also founded a botanical and agricultural school; he imported agricultural implements, and new kinds of seeds suitable to the climate and soil; he introduced a new species of cotton plant; he established barometers in public places to warn the Maltese fishermen of impending gales. As regards material improvements it is enough to mention the two principal gates of Valetta, viz., Porta Reale and Lascaris Gate, and St. Anne's Gate in Floriana, works which have immensely facilitated the traffic between the town and the country; the improved water supply; and the dredging of the harbours. He also brought the library of the old Knights of Malta into a state of efficiency and usefulness more in accord with its name of "Public Library," and by the introduction of modern literature fitted it to serve the large community for which it was required. As Lefroy says: "Whatever attainable practical object commended itself to his judgment, that he undertook with the same quiet determination, which, in 1851, enabled him to falsify adverse predictions and attain the object to which he was pledged, in the punctual opening of the Great Exhibition."

How rapidly, after that same Exhibition, which was welcomed so loudly as the herald of universal peace, had become a thing of the past, did the storm clouds of war gather, and the political sky become overcast and threatening! If Reid showed his ability as a Governor in the peaceful achievements I have mentioned, he rendered more eminent services to his country during the war with Russia and while that conflict was approaching.

In February, 1854, Sir William wrote to a friend in the United States: "We are preparing for the Russian *storm*, the first portion of 10,000 men from England having just now entered the harbour. I must in charity believe the Czar to be mad, thus to compel mankind to begin anew to destroy each other."

In a time of extraordinary difficulty when Malta was becoming an *entrepôt* of the first importance to the British Army in the east, and all its resources were strained to the utmost, it was fortunate, indeed, that there were two men in authority at Malta capable of appreciating the position and not afraid to assume responsibility. The Governor and the Admiral, Sir Houston Stewart, worked shoulder to shoulder with untiring zeal, and to them it was due that so much was done, and promptly done, to lend the help so urgently needed, which could not be obtained without the greatest difficulty from home.

We have a glimpse of Sir William Reid when the war began, seen from a French standpoint, in the "Memoirs of Marshal Canrobert," by Germain Baptiste. General Canrobert accompanied by his staff

and the brigadiers under his command, touched at Malta in March, 1854, on his way to the east to take command of the 1st Division of the French Army in the war with Russia.

"At the landing place we found several officers of the Governor's Staff, and we drove in His Excellency's carriage to the old palace of the Grand Masters, where Sir William Reid received us in the kindest manner. As an officer of Engineers he had served in the wars of the Empire and was several times wounded. In 1854 he still carried a ball in the right leg, received in the Peninsula; he limped slightly, and a wound received at Vittoria (? St. Sebastian) had caused a stiffness in the neck.

"The cordiality with which he received us proved that he bore no grudge against our countrymen.

"Like all the high British officials I have met he was essentially 'the gentleman'; tall, with a large high forehead, bright eyes, and hair of snowy whiteness, whilst his wounds added to the attraction of his well-bred manners.

"Sir William was an Engineer officer of repute, and devoted his leisure to mathematics and natural science, and became subsequently President of the London Academy of Science (*sic*); he was then engaged in the rearrangement of the Old Library of the Knights, of which fresh catalogues were in course of preparation.

"He spoke French perfectly, having been quartered in Paris from 1815 to 1818.

"His Excellency first introduced General Sir William Bentinck, commanding the Brigade of Guards, and then we went into luncheon, after which the Governor took us to the Race Course to see the Guards on parade.

"After the march past, we heartily congratulated His Excellency and the General on the fine appearance of the troops (big men averaging about 6' in height), and their steadiness under arms.

"'General,' replied Sir William Bentinck, 'I should now like to show you a square of British infantry. If you will come to this rise, gentlemen,' pointing to one a few paces from us, 'the Grenadiers shall form round you.' The movement was carried out with wonderful precision, and we found ourselves enclosed in a redoubt of giants in red, four deep, the two front ranks kneeling, the standing ranks at the ready.

"Bosquet, Martinprey, Trigier, Brady and myself exchanged glances to note the impression made on us by these living walls, and I whispered to my neighbours, 'Now do you understand Waterloo?'

"The French Generals saw in the person of Sir William Reid the ideal type of the British General, realized that cool determination was the leading characteristic of the private soldier; moreover they gathered that the British Army, true to its old traditions, had not altered in the last 50 years.

"Our Generals, therefore, formed the opinion that they would find themselves on excellent terms with our allies, and that, even should they not always see things from the same point of view, their pleasant relations

would not only prevent any coolness in the alliance, but would always ensure co-operation in working out and executing any plan which might finally be adopted.

"Sir William kept us to dinner; everything was well done, and we were charmed by his conversation.

"Retiring from the Active List on account of wounds, he had served as Governor in several colonies. In 1851, at the time of the Great Exhibition, he had been President of one of the principal committees. Well informed, he was considered one of the leading officers of the Engineers and had been President of their Academy.

"In short he was an amiable, simple, and most interesting personality, and we left him with the happiest impressions of the first of our Allies we had come across."

With troops and stores of all kinds daily arriving at Malta and, after a brief stay, departing for the seat of war the Governor and the Admiral had their hands indeed full; and when tidings reached Malta —there was no telegraph—of the glorious victory, after desperate fighting, of the Battle of Inkerman, and the British loss of 2,000 men, nearly half the number engaged, the Governor rose to the occasion. Without waiting to consult the Home Government he took upon himself the responsibility of at once despatching to the Crimea a similar number of troops from the then small garrison of Malta, though it reduced the garrison to such an extent that it became necessary to leave much of the military duty to the police. For this important service he received the thanks of Government and his name was honourably mentioned in Parliament.

The following letters from Sir William Reid at Malta to Sir John Burgoyne in the Crimea have been preserved. They give a good idea of the kind of work which so much occupied both the Governor and the Admiral, and on the 15th November, 1854, Sir John Burgoyne wrote from the camp before Sebastopol to Colonel Matson, Assistant Adjutant-General for Royal Engineers on the Headquarters Staff in London :—"Reid, from Malta, is taking the course you have been occasionally adopting with so much advantage to us, of sending up matters that he judges will be of service, before receiving any absolute demand, and has thus frequently forestalled the application. He has thus just sent off two 13″ mortars with ammunition. . . ."

From Colonel Sir William Reid to General Sir John Burgoyne.

"Malta, 22*nd November*, 1854.

"My Dear Sir John,

"Before this reaches you, you will have received by the *Golden Fleece*, the 24-pounders and 10″ mortars which you wrote about, as well as 18-pounder shot; and ten or eleven 13″ mortars and their shells went also. I wrote by the French steamer to the Duke of Newcastle a private

letter, advising that some more 18-pounders on *travelling* carriages should be sent to you from England without delay.

"I beg of you to continue to let me know by private letters what you most want, for such letters relieve us from doubts as to what may be useful. I believe troops are what you want most, and we have sent all our Malta Garrison, excepting one British battalion and the Malta Fencibles. I have written to the Duke of Newcastle about steam transport, for we must have transport in order to keep you supplied. Fuel you can get best within the compass of the Black Sea.

"I hope you will begin hutting in the Tartar mode, by cutting into the sides of hills. In that way the soldiers would get more warmth, as the deeper they sink the nearer they get to the mean temperature of the climate.

"We are getting platforms made, and I think have now 30 or 40 ready to send you. We are pressing the Malta clover for forage for you. General Torrens is with me, doing well and going to England. Colonel Gambia, R.A., in bed with the contusion by a cannon-ball, and goes home. Your son[a] is here. I have sent him your letter, and he will take this. I may perhaps go on board the *Swallow*.

"Yours, etc.,

"WILLIAM REID."

MALTA, *4th December*, 1854.

"MY DEAR SIR JOHN,

"I received to-night your letter of the 19th November; and as you only mention one as received from me, several others could not have reached you. They related to guns, mortars and ammunition sent to you. I feel it useless to wait until Lord Raglan asks: it is for us to send all and everything which we think may help you in your difficulties. I shall see if I can send you some warm clothing.

"Along with Admiral Stewart I am contriving trousers, and trying the Malta-Nankin blanketing for this purpose. At the Dockyard he is making stoves, and camp cooking furnaces to burn common coal. He has bought up all the planks and boards in Malta for hutting you, and sending tools and nails. To-morrow I am going to get him to make you some *chevaux-de-frise*. I have recommended the Duke of Newcastle to send you a large supply, to help you to render a few points in Lord Raglan's position strong points of support. A single line may be got through; but two or three deep, entangled together, and put in places covered from cannon, they form an obstacle very difficult to be overcome.

"Forage we know you want much, and I am always urging as much as possible to be sent. If you had more forage we should send Lord Raglan more mules and carts.

"I perceive that the sick and wounded officers carry away a number of effective soldiers from Lord Raglan. You had better mention this

[a] Capt. Hugh Burgoyne, R.N., V.C., who went down in H.M.S. *Captain*, turret ship, in September, 1870.

fact to his lordship, although I do not know that it can be helped. It is certainly right to give sick and wounded officers all the care that can be bestowed on them; but still this is a great evil, as it abstracts from the army many of the very best soldiers. I do not remember what was the Duke of Wellington's rule on this point.

"I hope you may be able to close your investment on your right to the harbour when the reinforcements arrive; for I cannot see what chance of success you have until this can be done.

"I am astonished at the ships not putting to sea when the gale of the 14th was setting in. I believe the wind was southerly, which would have enabled them to gain an offing on the *port* tack.

"Yours sincerely,

"WILLIAM REID."

"MALTA, *9th December*, 1854.

"MY DEAR SIR JOHN,

"I have received your letter of the 26th and Lord Raglan's note of the 29th November.

"Will you thank Lord Raglan for his lordship's note to me? We indeed think incessantly of your position. I would have sent the 62nd earlier, and on Admiral Houston Stewart's first suggestion (for he first suggested its going), but I am cautious not to overact the Governor, but consult with the General and Admiral. Although this mode of acting is sometimes painfully slow, it is best upon the whole for the public service.

"I have written both officially and privately to Sir Robert Gardiner (the Governor of Gibraltar), begging him to send on gunpowder, projectiles, etc., by every possible opportunity to us in Malta, to fill up our void by supplying you.

"And I have written to the Duke of Newcastle, advising His Grace *to send you four or five miles of tram-road.*

"Yours very truly,

"WILLIAM REID."

During the war with Russia officers who had been wounded, or suffered from illness, and in convalescence required a change, frequently visited Malta to recoup, and were always sure of a welcome from the Governor. The late Major-General E. R. James, R.E., who was a distant connection of Sir William Reid, records the great kindness he received when after his imprisonment in Russia he obtained a short leave of absence to visit Malta, in order to get a new kit, as he had no clothes but the old worn ones he was wearing. The Governor not only invited him to stay at the Palace, but knowing him to be short of money, insisted on his accepting a considerable sum of money and would not hear of any repayment.*

* I had this from General James himself in a letter dated 29th May, 1909, a few months before his death.—R.H.V.

But, indeed, Sir William's generosity was wonderful. He was never able to put by anything in any one of the three Governments he had administered. He told a friend this, and said that if he had not possessed private means he might have lived the greater part of his life in a palace and have died in a garret in his old age; this was before the day of pensions to ex-Governors.

When the war was over and the troops left the Crimea to return home, Malta again became a halting place and depôt. Both the British and French Armies passed through and, in the month of November, 1856, over 10,000 men were encamped on the island. The harbours were full of men-of-war, and of transports, and the Governor had a very busy time arranging with the Admiral for the transport home of so large a body of troops and such a collection of stores. For his eminent services during the war with Russia Sir William was created a Knight Grand Cross of the Order of St. Michael and St. George.

In the following year Sir William began to feel the necessity for a change. Since he arrived at Malta in November, 1851, he had not been out of the island; and for the last three years he had been too fully occupied with most responsible work in time of war to think of such a thing as taking leave of absence. Now, however, that the aftermath of the war was over and politically everything quiet, he had come to the conclusion that he would resign the Government. This step was pressed upon him by the state of his wife's health and the need he himself felt for repose.

Lady Reid had been in bad health for some years. She had a severe illness at Cheltenham in the winter of 1848, shortly after her return from the West Indies. This illness was attributed to the change of climate after 10 years of the tropics. But since then she had experienced several relapses and had never completely recovered her former good health. In fact for some time at Malta she had not been well enough to take her place in society and her daughter, Mrs. Hore, had to represent her.

In May, 1857, Sir William Reid tendered his resignation, but the Queen would not accept it and he was pressed to remain on another year. Some correspondence ensued and he consented to withdraw his resignation, and in August he took two months' leave of absence to take Lady Reid to England.

Sir William and Lady Reid were accompanied to England by their two unmarried daughters, Charlotte and Grace, and, on the expiration of Sir William's leave of absence, leaving them all at St. Leonards, the Governor returned to Malta alone to await the arrival of his successor, Sir Gaspard le Marchant, in the following year.

Lady Reid's health did not improve and she died rather suddenly at 17, Marine Parade, St. Leonards, on the 19th of February, 1858. On the day before her death she dictated a letter to her husband

which just caught the weekly mail to Malta and no doubt prepared Sir William in some degree for the sequel. But when the next mail arrived the sad news reached Sir William in a very distressing way. The letters by the English mail were taken to him just before entering the Council Chamber and it so happened that the first letter he opened contained condolences on Lady Reid's death from her sister, Lady Bolland. It was certainly very characteristic of the man that under such circumstances he did not postpone the Council meeting. Sending for the chief messenger he told him what had happened, and directed him to wait at the door and inform each member, adding a request that they would not speak to the Governor. But the blow was a very heavy one and one from which he never recovered. He wrote to his daughter, Mrs. Gambier: "It is an event I was constantly looking for, yet I feel it a severe blow. Although wasted to a shadow and her strong mind weakened, I respect even that shadow."

The young lady who, so many years before had captivated Mrs. Grant of Laggan by her noble countenance and mental qualities, had proved a tower of strength to her husband during the course of their married life. She had won all hearts by her gracious manner and kindly sympathy both in Bermuda and in Barbados, and it is touching to read how well they remembered her and how sincerely they seem to have mourned her death. As a sample of the tributes paid to her memory by the Colonial press the following extract is taken from a Bermudian newspaper, published just after the news of her death had been received:—

"The announcement of the death of this estimable Christian lady will cause deep regret in these islands. From the station which she filled here she was universally known; and from what is about to be stated, it must be added, as universally appreciated.

"The qualities of her mind were such as could not fail to inspire respect. Gifted by nature with great quickness of apprehension and a strong understanding, she exhibited in her remarks considerable originality of thought, and often threw much light upon the various topics of conversational discussion.

"She was a strict enforcer of propriety in every respect; but at the same time her intellect was of too high an order to be entrammelled by mere unmeaning conventionalities. She judged persons by their worth and things by their utility. Liberal in her sentiments she regarded with favour every enlightened plan, and zealously seconded every earnest endeavour for the general good. Nor was she impatient of contradiction—candid herself she thought highly of candour in others.

"It was not, however, so much her mental endowments that endeared her to the inhabitants of these islands, as her kindness of heart. Her path was literally the track of charity and benevolence. The cottages of the poor were familiar with her presence. There her hand was seen

open for the relief of the feeble and helpless, and there her voice was heard reproving the able but indolent. The industrious always met with encouragement from her; it was her delight to speak approvingly to them, and in praise of them to others. The writer of this article was often the medium of her charitable bestowments—nor was he the only one, many can bear like testimony to her beneficence.

"In the care of her family she was most exemplary, and her attendance upon public worship in the parish church was unfailing; she took interest in the Sunday School and in all benevolent institutions.

"Such was Lady Reid. She has occupied a place in the kindliest recollections of Bermudians since her departure from the country. She will still long occupy it, now that she has been removed from earthly scenes. . . ."

Information in detail about the last period of Sir William Reid's life has not been easy to get. I am indebted to the kindness of Mrs. Basil Hall, youngest daughter of Sir William Reid, for some particulars I have given of the Malta period; she was then Miss Grace Reid. Some years ago the late Colonel H. L. Hallewell of the Royal Scots, a grandson of Sir William, and son of his staff officer, Capt. Hallewell, endeavoured to get together materials for a life of his grandfather which he proposed to write. These materials, scanty enough, he was never able to make use of, as he was seized with illness and died in June, 1908. Through the courtesy of his widow I have had access to these papers. But in regard to Malta I find only some doggerel verses by Admiral Sir Houston Stewart and two letters from the Rev. George Wisely, for so many years Presbyterian minister at Malta. Mr. Wisely is, no doubt, well known to a great number of officers of the Corps, as he was Officiating Chaplain to the Forces at Malta for over 40 years; moreover, he is connected with the Corps through his son, Capt. G. A. K. Wisely, who retired from it 20 years ago. The two letters from the Rev. George Wisely were written in answer to applications for any information that the venerable minister might be able to give about Sir William Reid during the years he was Governor of Malta.

From the Rev. George Wisely to Mrs. Ogilvy.

"MALTA, *11th December*, 1906.

"MY DEAR MRS. OGILVY,

"I wished to write at once by return mail with reference to your enquiry about Sir William Reid; but I thought I should read up a little first of Seddall's *History of Malta*, and I found it so interesting that I read on till past post time.

"He has only about four or five pages on Sir William Reid, . . .

"Mr. Seddall speaks highly of Sir William Reid and rightly. I will only give you a sentence or two:—

"'1851.—The new Governor, Sir William Reid, had already distinguished himself both as Governor of Bermuda and as the discoverer of

the Circular Theory of Storms. In the scientific world he was widely known; in private life he had gained the esteem of all who had the privilege of knowing him; and as Governor of Bermuda he had earned the reputation of being "firm but impartial."'

"After giving a brief history of Sir W. Reid's administration, Mr. Seddall closes it with these words:

"'Failing health compelled Sir William Reid to resign his office in the spring of 1858; and he left Malta carrying with him the respect, amounting almost to affection, of everyone who had the pleasure of his acquaintance, or the honour of being officially connected with him.'

"I can certify from personal knowledge that this statement of Mr. Seddall's is the simple truth.

"Sir William Reid was a man greatly loved and respected. I came to Malta in May, 1854, and I have now been under twelve Governors of Malta; and I can safely say that I never knew a better Governor than my first Governor, Sir William Reid. He was a good man, as well as being a good Governor. He was not like some, whom I have known, who could not do a good deed without letting it be known. He was utterly removed from anything like self-advertising.

"As an illustration of this I may mention a little incident which you will not find in *Seddall's History*, or any other history. In Sir William Reid's administration Porta Reale was opened—a magnificent gate, the chief entrance into the city. The inscription to be put on it was laid before him for his approval; it contained the usual formula: 'Erected under the administration of His Excellency Sir William Reid (with all his titles), etc.' He simply drew his pen through the whole and said: 'You can put up that it was erected "Pro Bono Publico," if you like, but you are not to put in my name.'

"Sir William had great tact; the previous Governor, although a Roman Catholic in religion and a Liberal in politics, and, at first, hailed as if he were an angel from Heaven, before he left Malta was execrated by the priests as well as by the popular agitators, whereas, as Seddall truly says, Sir W. Reid by his amicable temper, his benevolent projects, and his conciliatory manner, did much during his residence in Malta to allay the discontent that had been manifested a few years before.

"Very soon after I arrived in the island, he sent for me and asked me to become a member of the managing committee of a cemetery which he was to form that should be open to all. There should be liberty for whatever religious service the parties wished. This put an end to a state of matters which had caused many scandals, and much bad feeling. And yet no Governor was ever more beloved by the Roman Catholic priesthood in Malta. Without sacrificing his own principles, he won their affection and esteem. When I commenced building our Presbyterian Church, he sent for me and gave me a donation of fifty sovereigns towards the building.

"No one ever did so much for the tillers of the ground. It was Sir William Reid who established the Agricultural Society, which continues to this day.

"I doubt not your friend is aware that Prince Albert held Sir William

Reid in high esteem. I cannot speak of this from personal knowledge, but I know from well-informed sources that this was the case, and knowing what I do of the two men, I can quite understand it.

"I should mention that Sir William Reid did his best to promote education. He had to work under great difficulties, but although there was not much apparent success, he began a work which has gone on increasing. He added much to the Public Library, and put it on a better footing than it was before; and while he encouraged education among the higher classes, he did what he could among the children of the poorest villages. He deserved the name which was given him of 'Our Good Governor,' and which I have never heard applied to any other as it was to him.

"I shall close with one little incident. When Sir William was on his death-bed, he asked that his gold pencil-case should be sent to Don Filippo, an old Italian teacher. To his dying day, Don Filippo could scarcely speak of Governor Reid with dry eyes.

"I conclude with a wish that your friend may produce a work worthy of the subject.

"Ever yours,

"GEORGE WISELY."

(To be continued).

MEMOIR.

MAJOR-GENERAL EDWARD RENOUARD JAMES, ROYAL ENGINEERS.

(Continued).

By Col. Robt. H. Vetch, c.b., late R.E.

Continuing their course along the undisputed frontier line to the Araxes River, the International Commission arrived at Hadji Bairam, at the confluence of the Arpa Tchai and the Araxes, which, at this point, becomes a wide deep stream only fordable here and there. James records that the temperature was 100° Fahr. at midnight at the camp, which was 3,456′ above sea level, and that the mosquitoes were very troublesome.

From Hadji Bairam the frontier line ascended the Araxes to Parnaout. Near this place it was arranged to go southward to the point where it reached the watershed of the Ararat range. While in this part James and some others made the ascent of Perli Dagh, a peak on the Ararat range 10,500′ above the sea. They had a magnificent view from the top, Mount Alagos (13,500′) to the north, and to the east, the crest of the mountain chain terminating in the snow-covered cone of Ararat (17,000′). Alagos was 57 miles away and Ararat 40.

At the first examination of the frontier line to the east it was considered enough to describe it as the watershed line and to leave the marking it out to be done later by the surveyors. The proceedings were therefore adjourned to give time to reassemble the Commission at the Sardar Boulak Pass in the col between Great and Little Ararat, which, in a military and commercial aspect, was the only pass of importance across this section of the frontier.

"On the 22nd July a ride of 33 miles took us," says James, "to our camp which we found ready pitched on the Sardar Boulak Pass. It was easy of ascent on both sides; at the top it was a wide level and green valley, very suitable for the camp, at an altitude of about 8,000′, lying exactly between Great and Little Ararat. These mountains seemed to tower above our heads; the former, with its everlasting cap of snow, rising to a height of 17,000′, and the latter, free of snow in the middle of summer, 12,875′."

Between the 18th June and the 22nd July the Commission had travelled 188 miles at altitudes varying from 3,456′ to 8,000′ above the sea.

Of the grand mountains of Ararat where the Commission was encamped James writes:—

"It is rarely that any mountain can be seen for nearly 100 miles round, standing up as an isolated cone, from the summit of which there is a sheer descent, visible to the observer, of 14,000′ to the plain below. Throughout the summer season, when the whole region, except the summit of the cone, is free of snow, and the valleys round it are green, some 4,000′ are everlastingly crowned with a white cap, shining in the sun's rays, which are reflected from it, and mark the mountain at the enormous distances from which the summit can be made out. Then the sky all through the hot weather is of such a pure brilliant blue, and the atmosphere so devoid of haze, that the effect of great distance is lost to the eye, and objects appear so close as to make the distance deceptive. On the mountain itself there is no vegetation, and nothing but bare rocks where the snow does not lie; but in deep valleys, which are hidden from the view in general, there are green pastures frequented by the Kurdish tribes in summer. This absence of verdure from the ordinary views of the mountain makes its desolate grandeur the more impressive, and when I say that for several continuous weeks the mountain top was a distinct object in our daily view, it may be easily understood that the impression left on our senses was deep, and has been lasting."

Both Gordon and James tried to reach the top of Great Ararat, but, after getting some way up the snow-covered cap, were obliged to relinquish the attempt. The ascent of Little Ararat was so easy that they were able to make it on horseback. At its peak the boundaries of Russia, Persia, and Turkey meet. This point is at the eastern extremity of the mountain chain, with the great River Araxes and the small confluent of this river surrounding the position on three sides. "The view from it," says James, "with the river winding below 10,000′ down, in less than 10 miles, is a magnificent one, and well repaid us for our ride."

Leaving Sardar Boulak on the 2nd August the party descended to Aralyk on the Araxes, and made its way to Etchmiadzin, and thence, passing round the base of Mount Alagos on its eastern side, towards Alexandrapol.

During a two days' halt at Etchmiadzin, the most interesting of places, they visited the cathedral and monastery, marking the site of the foundations of central government of Armenian Christianity, where they were welcomed by the Patriarch Nerses. As the track to Alexandrapol, some 65 miles away, running round the base of Mount Alagos, has a rise of about 4,000′ in the centre it was necessary to allow the heavily laden pack animals four or five days to make the journey. The English officers utilized the time in visiting

Erivan, the old capital of the Persian province, which had become the seat of the Russian Governor and had a strong garrison. They rejoined the caravan at Kazafar at the foot of Mount Alagos at 9 a.m. on 8th August, having ridden 50 miles during the previous evening and early morning. The Commissioner, with Lieut. Helsham-Jones and Capt. de Norman, had gone on to Tiflis and, as there was no immediate necessity for an early arrival at Alexandrapol, James, Gordon, Woodfull, and Stabb decided to stay at Kazafar for a couple of days. They found Jaffar Agha, the Kurdish chief whom they had already met in the Ararat range, encamped close to them. They again dined with him in his black tent, and exchanged a gun and some powder and shot for some Persian and Kurdish carpets. Next day they made the ascent of Mount Alagos 13,500′ high. James says: "Accompanied by some Russian officers and some Cossacks we started at 6 a.m. We followed a steep and rugged, but by no means difficult path, reaching the top with tolerable ease; but notwithstanding this the three Englishmen of the party, and one Cossack, who carried the scientific instruments and had to obey orders, were the only climbers who persevered to the end. We took an observation to determine the altitude with the boiling water thermometer, and the Cossack fired his musket as a signal to show the watchers in camp that we were at the top. We were rewarded for our exertions by a magnificent view of Mount Ararat, 60 miles from us, and of the Araxes, looking like a thread of silver, extending as far as the eye could see. On the precipitous cliffs round the mountain, veins of pure rock-sulphur jutted out in inaccessible places, but the local peasantry obtained blocks of the mineral in a curious way, by firing bullets at the cliffs, and collecting the sulphur which fell. Our descent of the mountain was most exciting, as Gordon had a very narrow escape from losing his life. Exhibiting his characteristic impatience at the slowness with which we were descending, he seated himself on a snow slope, there being a good deal of snow on the mountain still, and commenced sliding down before we could prevent him from performing such a very rash act. We held our breath in awe while he sped down to a point which seemed a thousand feet below, and when, at length, we saw him turn over helplessly and disappear beyond a hump of snow, we lost all hope of seeing him again alive. The climb down to the spot at which we saw him last was tedious; and I can never forget our anxiety, or the joy we experienced, when Gordon met us smiling, looking as if nothing unusual had happened. After turning the somersault we had witnessed, his further descent had been providentially arrested by his tumbling on to a smooth rising surface of soft snow, and, beyond being slightly bruised, he was little the worse for the adventure."

On arriving at Alexandrapol a stay was made for a few days and a protocol drawn up of the progress made in the work of the Com-

mission. The route of the Commission was now along the northern section of the frontier. Leaving Kurdistan and Armenia they experienced, in the course of a few days, an entire change of scenery, population, and to some extent also, of climate, for the summer is very short in the high altitudes in which they travelled and they began to feel the chills of autumn.

Ascending the Arpa Tchai nearly to its source their successive stages were: Bandevan (5,900′) 14 miles; Tchishtapa (6,175′) 8 miles; Bogdanovka (6,474′) 15½ miles. To reach the last-named place, which is the basin of the River Kur, a mountain ridge, at an altitude of 7,515′, had to be crossed, and then they suddenly entered the lovely forest region of Georgia, known under the general name of Adjara. Descending rapidly they reached Akhakhalakha (5,720′), having diverged from the frontier line to avoid difficult hill marches through dense forest. The Commissioners thought it unnecessary to see the frontier line for themselves, as after following the "thalweg"* of the Arpa Tchai from Alexandrapol to the river head, the frontier was to be along a well-defined watershed line; besides there were no political difficulties at this part similar to those connected with the local tribes, which had been experienced on the Ararat range. It was therefore deemed sufficient to record the position of the frontier line by protocol, and to leave the actual delimitation to a Sub-Commission to carry out in the following year.

Leaving Akhakhalakha on the 15th August they reached the point Khaweth (5,798′), in the Ardahan branch of the Upper Kur, where it was proposed to fix the frontier. James writes: "We stayed three days at the camp at Khaweth, the Commissioners riding out each day to examine the various ridges before they fixed on the line. There were beautiful views of mountain scenery from the hilltops, and many lovely dales were exposed to our sight, in which lay the most charming lakes, amid forests of virgin timber; and we all remarked that if this region were made accessible to the tourist, it might compete with the most celebrated resorts in the attractions it would offer."

From Khaweth they followed the proposed frontier to Kharsameti Tchai, and along a series of ridges, Gampet Tepi at 9,730′, and two others each of 8,626′. At Khona, a village at 4,860′, near which was the Akhaltzik branch of the Kur, the Commission remained nearly a week for the purpose of examining the ridges and deciding on the line of frontier. A day was spent in visiting Akhaltzik (3,295′), the most important town between Alexandrapol and the Black Sea, and the chief place in the Adjara district; "but," says James, "we did not

* A convenient term to denote the central line of the flow of water in a valley, or the reverse of the "watershed line."

care to waste time in a town in this lovely autumn season, when the alternative was the beautiful Adjara country; a newly-found Switzerland, with valleys like those of Bavaria; a Killarney, as it may have been a century ago; or the highlands of Scotland before the '45 and the military roads of General Roy. In none of the countries named are there such forests, such splendid virgin oaks, ashes, and beeches. Sometimes there were open glades, where the trees grew singly, as in an English park, sometimes the woods were dense, and the only track the wayfarer could follow was the level space between the patches of forest running along the watershed line; and this was a peculiarity, never observed by me elsewhere. I had not time for painting, but my artistic soul was continually moved at the beauties of the landscape.

"Game, as may be supposed, was in abundance, and we furnished our table with that we were able to shoot with small trouble. I have a sad memory in connection with our sport: my favourite Sapper servant, Crompton, having lost his life by an accident with the gun I had lent him. It was not known precisely how it happened as he was out alone. He was carried into camp on a stretcher made with boughs by his comrades. He was then unconscious. It was thought he had followed a wounded bird, with one barrel of the gun at full cock, and had tripped and fallen over it as it exploded. . . . He was taken into the military hospital at Akhaltzik, where we were obliged to leave him in charge of Sapper Semple, when we resumed our march. Judging from my experience of a Russian hospital at Sebastopol I was not surprised to hear a few days later that the surgeons had not the skill to save him. Sapper Crompton was a fine soldier, and an excellent man in every way; he had followed my fortunes for two years, and was as devoted to me as I was fond of him, so it may be believed I felt his loss most acutely."

Mounting to the ridge again, on leaving Khona, and camping still amid forest scenery at heights varying from 6,500′ to 8,000′ the Commission came within sight of the Black Sea on the 3rd September. On the following day they descended to Gourni (657′) and, on the 5th, reached Osurgeth (182′) in the province of Guriel, only 12 miles from the coast. "We stayed a fortnight," says James, "in a Russsian house at Osurgeth to complete the protocols, and to close the main operations of the Commission. It was decided that a Sub-Commission should be appointed to undertake the surveying and demarcation of the frontier line, and should assemble in the following spring. It was notified to Gordon and myself that we were recommended as the English representatives."

The work of the Commission came to an end in 1857 with the pleasant fortnight spent at Osurgeth. The English Section gave a grand entertainment to their colleagues and to the families of the Guridian gentry. After paying farewell visits to all their associates

the English party left Osurgeth on the 16th September and marched to the Black Sea port of St. Nikolas. From this place, where they encamped for the night, the distance to Batoum along the coast is 25 miles and it was resolved to cover the distance *in* one day. They crossed the river, which formed the frontier. It was wide and deep, but putting the loads into boats and swimming the horses across, they were once more on Turkish ground and reached Batoum without further adventure.

James estimated that between May and the end of September, 1857, he had ridden over 1,130 miles.

The caravan was discharged and the horses, surplus stores and equipment were sold off at very small prices. A small dirty trading steamer carried the party to Trebizond, where they took passage by the regular Turkish mail-boat and arrived at Constantinople on the last day of September. Here the English Section separated and returned to England by various routes. James embarked in charge of the detachment of Sappers in the Cunard steamer *Alps* and arrived at Liverpool on the 9th November. Having been on foreign service for nearly three years and a-half he had no difficulty in getting two months' leave of absence. He visited his aunt, Mrs. Ponsonby Moore, in Devonshire and subsequently went to Dresden where his own people were living.

On the expiration of his leave of absence he was quartered at Woolwich to be in touch with Colonel Simmons, who was in London, and although he was not going out to Asia Minor again, was superintending the arrangements for James and Gordon to carry on the work of the Commission. Colonel Walpole was the Commanding Royal Engineer at Woolwich at that time, and the only other Engineer officer at the station beside James was Lieut. W. D. Marsh.

In a letter from the Foreign Office, dated 17th April, 1858, addressed by Lord Malmesbury, the Secretary of State, to Lieuts. James and Gordon collectively, they were informed that, at the request of the Russian and Turkish Commissioners, supported by their respective Governments, they were appointed to act as absolute umpires between the topographical officers to be employed in marking the frontier line between Russia and Turkey in Asia Minor. They were instructed to proceed to Constantinople forthwith and report themselves to Mr. Allison, the British *Chargé d'affaires*, who would place them in communication with the Russian Minister and the Porte, with whom they were to arrange their future proceedings. Lieut. C. G. Gordon, R.E., and Dr. Woodfull went by sea with the detachment of Sappers to Constantinople; while James travelled overland. He paid a visit to his mother at Dresden, *en passant*, and then went to Vienna and Trieste where he embarked in an Austrian Lloyd steamer, *Neptune*, for Constantinople.

Arriving at Constantinople on the 12th May he lost no time in seeing Mr. Allison, the British *Chargé d'affaires;* he secured the services of Mr. Stabb as interpreter again, and also those of their former cook, Francesco. On returning to Missiré's Hotel he found that Gordon, Woodfull, and the Sappers had arrived. Then he and Gordon went to see M. Boutineff, the Russian Ambassador, Mehmet Pacha, the Turkish Minister for Foreign Affairs, and Ali Pacha, the Grand Vizier. It was arranged that Gordon, with one Russian and one Turkish officer, should take the demarcation of the northern half of the frontier; while James, also with a Russian and a Turkish officer, took the southern half. The Sappers were divided, and Dr. Woodfull was to accompany James, though, in case of need at any time, he was to be sent to Gordon. Mr. Stabb acted as interpreter for James and Mr. Moravski for Gordon. It was further arranged that Gordon should begin work at St. Nikolas and James at Little Ararat, working towards one another, and meet at Alexandrapol to compile the "Cahier de Specification."

Gordon left Constantinople with his section for the east coast of the Black Sea on the 26th May, and James left with his section two days later for Trebizond, in an Austrian Lloyd steamer, and got there on the 31st. Pursuing much the same route as in 1857, James and his section reached Erzeroum on the 16th June, where they found that good quarters had been provided for them by Mr. Hughes, the British Consul. Before leaving Erzeroum on the 24th June, James had to arrange for special runners to bring the letters on to the Commission, as it would be out of the regular lines on which there was a postal service. He entered into a contract with two Turkish messengers to bring the mail to wherever the Commission might be on the frontier. They were to go on foot at the rate of 36 miles, or 12 hours a day. The nearest point on the frontier was about 120 miles from Erzeroum, but the runners occasionally walked half as far again before they found the camp, and, with the unavoidable delays at each end in waiting for mails, they took about a fortnight from the day of their leaving Erzeroum until their return there. They went alternately once a week and arrived with the letters and papers with the greatest regularity. The wonderful feats of pedestrianism performed by these men were paid for at the rate of eightpence per diem apiece! "They used," says James, "to bind their feet with strips of raw cowhide in the Turkish manner, which appeared to give them wonderful power of accomplishing the long daily marches. One of them, quite an old man, had distinguished himself during the war in carrying despatches through the Russian lines into Kars, having done so, we were told, eight or nine times."

The route from Erzeroum to Kars was the same taken in the previous year, and the caravan arrived there on the 30th June. After a five days' halt the journey was continued to Alexandrapol. Here

after the usual interchange of civilities with the Russian authorities the British Commissioner was supplied with a Cossack escort, and marched with his section on the 8th July for Aralyk, where he was to meet the Russian Section of the Commission. The route taken was the reverse of that taken the previous year when proceeding from the Ararat range to Alexandrapol. Passing through Karavanserai, Kazafar, Ashtarak, Etchmiadzin, and Erivan, James and his party reached Aralyk on the 16th July. Here they found Effimoski in camp with an escort of 60 Cossacks. With Effimoski were Mirza Jaba, a Georgian, as interpreter, and Count Cassini, a Russian officer of Italian origin, an agreeable man with whom they became very friendly.

The Russian party were heartily pleased to greet James for they had been waiting a month at Aralyk not daring to move as their orders were stringent to await his arrival. Early the next morning the combined parties started on the long and difficult march along a rough track to Sardar Boulak, on the pass between the two Ararats. James entertained his Russian colleagues on arriving at camp. They were not a little astonished at the mock turtle soup, salmon, and other delicacies provided from his Fortnum and Mason stores, which with the roast lamb, vegetables, and fruit from the neighbourhood, and a good English pudding, made a dinner that was a record performance of Francesco under the shadow of Mount Ararat.

The Turkish Commissioner, Souliman Effendi, not having arrived, an expedition was made to Bayazid some 33 miles distant, and other excursions into Persia. Attached to James's party was Corpl. Lawson, R.E., a trained photographer from Chatham with a complete set of apparatus, so that he was able to obtain photographs of all places of interest and his MS. book is illustrated with many of these. At last Souliman joined them, bringing with him an escort of 50 Turkish dragoons and some young officers from the military school at Constantinople.

The first piece of work was the erection of a pyramid, or "marque de bornage," on the water-dividing level of the Sardar Boulak Pass, fixing the position by compass bearings to prominent objects in view, and recording the names of the "temoins" on the part of Russia and Turkey respectively. This was done on the 31st July, and James, having been obliged to begin so late, had much difficulty in persuading his colleagues to work hard enough to get the work done before the season was over. He managed, however, to finish it by the 16th September when the whole party of the southern boundary reached Alexandrapol having fixed all the boundary marks along a line of 230 miles.

James had a very trying time as arbitrator; disputes between the Russian and Turkish representatives were frequent. He says referring to these cases: "I had no power of enforcing my arbitrament,

and had no other course than to make a report of the circumstances to our Foreign Office. . . . My colleagues had become very bitter towards each other, and Effimovsky was overbearing and would scarcely speak civilly to Souliman. The latter was of a weak, undecided nature, suspicious not only of Effimovsky but of me, although I was more often on his side than against him. Effimovsky was the better educated, but Souliman was more of a gentleman in manner and dignity."

When the Sub-Committee, of which James was the head, reached Alexandrapol the town was very full in anticipation of a visit from the Grand Dukes Michel and Nikolas. The Governor of Erivan received him courteously and in spite of the crowded state of the town he was provided with very good lodgings. The members of the Northern Section were a week later in finishing their work. James writes: "On the 24th September the entire Southern Section rode out to meet our colleagues, who had completed the demarcation of the northern half of the frontier, and did so about 9 miles from Alexandrapol. As we approached, the Cossack escort performed wonderful feats of horsemanship of a circus nature, galloping backwards and forwards, firing off their muskets, and so on; or they sung in chorus as we marched, in the manner I had so much admired with Russian troops before. On our arrival at Alexandrapol Effimovsky entertained the whole party with a *vin d'honneur*.

"Gordon was given quarters next to mine. We had a great deal to tell each other about our experiences on the frontier; he had had to reconcile differences between his colleagues similar to those which had arisen on my side. But, fortunately for him, the disputes had not been so acrimonious as in the south, for Ogranovitch was a more genial fellow than Effimovsky, and Harif Bey was easier to manage than my own suspicious Turkish colleague. I think the greatest grievance on the north side was the extraordinary energy displayed by Gordon, which had been often complained of by his colleagues, but was good-humouredly alluded to now that the work was over. They declared he used to keep them in the field for such long hours, that they became so tired as to be scarcely able to sit on their horses. They said they had never known such a man, for when they reached camp, and lay down from sheer exhaustion, he would take his gun, and stay out in search of game until dusk. They added that Gordon's horses were as fatigued as they were, and that, one day, one of them actually fell down and died on a mountain side as the section was at work. . . . I can readily conceive that a complaint might with more reason have been made by Gordon of the laziness of his easy-going comrades. If one of the sections had been composed of English officers only, and work had been commenced at Ararat on the date intended, the entire work of both sections could easily have been finished in the one season."

Nothing remained to be done at Alexandrapol but the completion of the fair copy of the "Cahier de Specification," or record of the frontier, the boundary marks erected, their distances and bearings from each other and from prominent objects, the names of the local witnesses, etc. This record, or journal of operations, for the Southern Section of the boundary was signed by James and his colleagues on the 2nd October. Then followed farewell dinner parties, and the Commission broke up, each nationality going its own way.

The English Section's first move was to Kars and James sent his interpreter, Mr. Stabb, in charge of the caravan to that town, while he, Gordon with his interpreter, Mr. Mouravski, and Woodfull made an expedition to Tiflis before starting on the homeward journey. The party travelled by tarantasse and were fortunate in finding at Tiflis their old friend, Baron Finôt, the French Consul, who had been their guest on the frontier in the previous year (1857). He accompanied them in making formal visits to Generals Kratka, Krusenstein, Leli, Melutin and other dignitaries, entertained them most hospitably and took them to the theatre, to which they went in full-dress uniform; "Lucia di Lammermoor" was performed by an Italian company "tant bien que mal." After a very interesting and pleasant time they left Tiflis on the 9th October, having visiting Prince Heraklea on the last day of their stay. This Prince was the representative of the former Kings of Georgia. "He lamented much," says James, "that his country was under Russian domination. He would not have dared to speak as he did in the hearing of Russians, but to Baron Finôt and ourselves he was not afraid to assert that the Russian position in Georgia had been gained by intrigue and bribery, and not fair conquest."

Arrived at Kars they decided to reach the sea at Batoum by a new route, by which they were told they could get to Constantinople sooner than by Erzeroum and Trebizond. The stock of stores was so much reduced by this time that the size of the caravan could be much diminished. The party consisted now of James, Gordon, Woodfull, Stabb, three Sappers and three servants. The march as far as Ardahan was uneventful. At Ardahan a fire occurred in the town and the Sappers distinguished themselves in helping to put it out.

On leaving Ardahan they entered a district into which foreigners had seldom penetrated, but they found the English name was held in high respect, and they received the greatest attention. From Ardahan the route turned westward, nearly at a right angle, and gradually ascended the course of the Ardahan Tchai, one of the principal affluents of the Kur. On the 18th October they marched to Agaschan, next day to Kinsithamar, and on the 20th, leaving the river, made a very rough march across the mountain ridge forming a continuation

of the Saghanli Dagh and Kanli Dagh, and the dividing line between the Caspian and Black Seas.

Descending to Chevan Ailassi, on the west side of the ridge, the country got more and more wild. They advanced into a deep basin surrounded by mountain crests. From this basin only one narrow outlet existed, between summits scarcely 5 miles apart ; through this outlet the heaped-up waters of a network of torrents forced their way by a narrow gorge and fell into the Tchoruk Sou. "So densely," says James, "is this curious formation of land covered with wood, that, except along the one track from Ardahan through Ardanoutch to Artwin, it is quite impenetrable to horses, the only access to its inner depths being by footways difficult to find, and the only clearings being the slides down the steep slopes, used for bringing timber down to points for transportation by the water courses to the sea, or to some track on which it can be carried to the large towns."

From Ardanoutch to Artwin was a two days' march, and the track became increasingly difficult. On reaching the Tchoruk Sou, they were unable to get across and followed the right bank for some 7 miles to Livana, opposite Artwin. Here they found that there was practically no way in which they could reach Batoum on horseback, and the only route was by a hazardous passage down the Tchoruk Sou in canoes. The 25th and 26th of October were occupied in selling their horses and camp equipage, discharging the caravan and disposing of all stores which could not be carried in the frail craft.

James's account of the descent of the river is too interesting to be omitted. He writes :—

"The boats we embarked in were very frail constructions, being simple canoes dug out of large tree trunks, but we were astonished to see how well they withstood the constant shocks they were exposed to in our perilous voyage. We engaged two canoes, and as our party was ten in number and there were six boatmen, each took eight persons, and this was a pretty tight fit. The boats were mere shells and we lay close together in the bottom. They were also rudderless, but were steered by two men, one in the bow and the other in the stern, with surprising skill. The strong current carried us along at railway speed and it was not necessary to row. Immense rocks jutted from the river bed at every yard, and as the torrent dashed and swirled in foam between them, we seemed every moment destined to be wrecked on some sharp projection. But when it seemed impossible for us to escape, a dexterous twist of the oar by the boatman's wrist would carry us into a safe channel, and it appeared often as if there had not been an inch to spare. The slopes of the hills, which were clothed with trees to the very water's edge, came down precipitously on each side, and had we been fated to upset, in such a rush of water, we could not have hoped to escape with our lives. Until we gained assurance of the great expertness of our boatmen, the excitement of this mode of travelling kept our nerves at a high tension,

but we got used to it by degrees, and then it became a very pleasurable experience. . . .

"We stopped at Botscha for the night, a village 25 miles or so from Artwin, and made the boats fast near the bank. . . . Soon after daybreak we recommenced the voyage to Batoum, the experience of the first day being repeated. The distance remaining to Batoum, allowing for the bends in the river and the distance by sea from the mouth of the Tchoruk Sou to the port, was about 30 miles. The swift current bore us along so fast that we were soon at the sea, but it then became necessary to pull, and it was hard labour to propel the unwieldy craft from the mouth of the river to Batoum. The velocity of the river is so great that a volume of mud is projected out for some miles into the sea, and the water on each side of the brown stain thus made, being intensely blue, a rather curious phenomenon presented itself."

The party reached Batoum on the 28th October, and after a few days took passage by steamer to Trebizond and thence to Constantinople. Gordon took the Sappers home by sea. James, after discharging Stabb, who had proved himself most valuable, travelled home with Woodfull, *viâ* Trieste, Vienna, and Dresden, and reached London in the middle of December. He was given leave of absence until the 1st February which he spent at Dresden with his people.

(*To be continued*).

TRANSCRIPTS.

HYDRAULICS OF THE CHAGRES RIVER.

By GENERAL HENRY L. ABBOT, *U.S. Army.*

(From the *The Engineering Magazine*).

The real problem of the Isthmian Canal is one of hydraulics—not, as very generally assumed, merely one of navigation or finance. General Abbot's exact and authoritative studies, published in THE ENGINEERING MAGAZINE, were among the most important arguments leading originally to the selection of the right project. We are glad to be once more the medium of giving publicity to this paper, prepared at the instance of the National Academy of Sciences (April, 1910) answering affirmatively and emphatically the question, lately raised, as to the sufficiency of the water supply even with the huge locks provided by the present plans.—THE EDITORS.

IN projecting a canal across the Isthmus of Panama, the dominating element is not the volume of excavation at the Continental divide, but rather the hydraulics of the Chagres River whose valley must be traversed throughout the greater part of the route. The failure to appreciate this fact largely contributed to the disaster of the first French Company, and it is through the elaborate investigations of the New French Company, supplemented by those now in progress, that the problem has become perfectly understood. The climatic conditions are of primary importance in a study of the hydrology of the river, and they are so different from those of the United States that it is not without interest to contrast them.

The average annual temperature is about 80° F., differing only about $2\frac{1}{2}°$ in winter and summer. Ice and snow are unknown. The rainfall is much less irregular than with us, being largely governed by the motion of the sun in declination. The latitude of the Isthmus is about 9° north, and as the sun moves north and south between the tropics it carries with it an ascending current of moist air which, condensed by cold, forms a rain-belt varying in latitude from month to month. Its passage over the Isthmus forms two well-marked seasons; three comparatively dry months, February, March and April, when the sun is far south; two intermediate months, January and May; and seven very rainy months forming the rest of the year. The absence of frost and the comparatively normal rainfall in this region greatly assist hydraulic studies.

It may naturally be asked what river in the United States, where the climatic conditions are so different, most nearly resembles the Chagres in respect to volume of discharge, and thus illustrates the effect of these differences. The Roanoke River of North Carolina affords a good standard of comparison. Above Neal its drainage basin covers an area of about 87,000 square miles with an annual rainfall of about 51″. The studies of the New French Company included the basin of the Chagres

above Bohio where the projected dam was located, and where the stream at extreme low water nearly attains the level of mean tide. Above this point the drainage area is about 700 square miles, and the annual rainfall is about 112". In respect to volume at ordinary stages the two rivers are very similar. Simultaneous gaugings in 1896, made respectively by the U.S. Geological Survey and the New French Company for five consecutive months, indicated almost identical discharges—about 5,800 cubic feet per second. The maximum recorded floods of the two rivers indicate 113,000 feet-seconds for the Chagres and 83,000 for the Roanoke, the height attained above low water being respectively about 40' and 30'. At low stages the Roanoke carries the larger volume—as might be expected since its drainage basin is more than twelve times as large.

The topography of the Isthmus also exerts a controlling influence upon the hydraulics of the river. The stream heads in the Cordillera de San Blas forming part of the Continental divide, which is here composed of ridges about 2,000' in height with peaks from 1,000 to 2,000' higher. The river is formed by two main branches, the Pequeni heading near the Atlantic coast in a massive limestone region, and the Chagres in the Continental divide where hard trap rock abounds. The upper tributaries flow through canyons cut deeply in the rock, with numerous rapids and falls. The two branches unite at Dos Bocas about 19 miles above Gamboa, where the line of the Canal is reached. In this distance the fall in water surface at low stages is about 80', with many rapids. The channel is often bordered by limestone bluffs undercut by the torrents and passing gradually below the stratified sandstone of the lower river. The entire region is covered with a dense tropical forest. Near Gamboa the general direction of flow changes nearly at right angles, from south-west to north-west, and the river joins the route of the Canal. Here the low-water surface is about 46' above mean tide. At Bohio 20 miles below it hardly differs from that of mean tide, although the distance to the sea is about 27 miles. The tidal range on this coast is insignificant, varying between 6" and 2'; but the fact that the river in the last 27 miles of its course has little or no energy in reserve to transport its water to the sea, is one of the most important of its hydrology for canal purposes. The accumulation of water to supply the needful head causes Bohio to be the point where is noted in great floods the maximum rise, about 40'. Such natural conditions near the mouth are phenomenal. At New Orleans, 100 miles above the head of the Passes, the total range is only about 14', to compare with 51' at Cairo, more than 1,000 miles above.

Another peculiarity of the Chagres, which attracts the attention of an engineer, is the nature of the river bars—especially in the 11 miles of channel next above Gamboa. They differ widely in composition; some are of fine sand, others of pebbles, others of rounded stones three or more inches in diameter; there is little or no mixing of materials. The explanation will be found in the peculiar regimen of the river. In the dry season the Chagres is a gentle stream which, as we shall see, is largely fed by water percolating from the soil. In the rainy season its character is quite the reverse. The sudden cloudbursts upon the

mountains, often lasting two or three days, create torrents in the smaller tributaries which uniting in the river bed pass downstream like great waves. In the narrow canyons of these headwaters the elevation of the water surface often attains heights of 40 or 50′ in four or five hours. Several times the surveying parties were endangered by these rises, and indications were not lacking that in great floods they are largely exceeded. In the main stream the heights attained above low-water level are of course much less, but even here the volume carried may range in 24 hours from 2,000 to 40,000 or more cubic feet per second, with corresponding variations in transporting power which easily explain the sorting of the materials forming the bars.

Since 1883 automatic records have been made at Gamboa, showing hourly water levels, and their study has developed interesting facts. The normal height in the rainy season is about 10′ above extreme low water, and the number and duration of the freshets above this height year by year, afford a trustworthy estimation of the relative volumes carried and hence of the relative rainfall producing them. The annual average shows 19 freshets lasting 221 hours, ranging from 5 freshets lasting 37 hours in 1902 to 46 freshets lasting 709 hours in 1887. Furthermore the grouping of consecutive years is suggestive. From 1883 to 1894 inclusive, 12 years, the average annual number of freshets was 28, lasting 354 hours, while for the next 12 years it was only 10 lasting 86 hours. During the last two years the average has again increased, being 20 lasting 298 hours. It may be added that studies of the rainfall records and measured discharges of the river are in perfect accord in confirming this progressive variation in annual rainfall and stream flow. During the operations of the first French Company the most unfavourable conditions were the rule. Heretofore the American engineers have been specially favoured, but the latest records suggest that a change may perhaps be apprehended in the near future. Excessive rainfall of course is unfavourable to rapid excavation and concrete laying. During last year the number of freshets was considerably above the average, being 27 lasting 466 hours, but it may be noted that they did not materially retard progress.

Aside from these considerable freshets, great floods are a characteristic feature of the regimen of the Chagres. They also occur periodically. The first of record since the opening of the Panama Railroad in 1855 occurred in 1879, and inundated all the low lands of the valley. Four more occurred between 1885 and 1893, these nine years being included in the period of excessive rainfall; 12 years of exemption followed; since then two great floods have occurred, one in 1906 and the other in 1909. These floods are always of short duration, hardly exceeding 48 hours, but they carry immense volumes and submerge large areas in the lower valley.

The close vicinity of the route of the Canal to this turbulent river; the fact that near Gamboa its bed is about 45′ above mean tidal level, demanding a complex system of dams and artificial channels to protect a sea-level canal against inundation, and the further difficulties caused by the excessive tidal range in the Bay of Panama, which may equal 20′

twice daily, early convinced the engineers of the New French Company that a sea-level construction was out of the question, and that the Chagres must be regulated by a great artificial lake to be entered by shipping by means of locks, the only manner by which the torrential neighbour can be perfectly controlled. This decision entailed an elaborate study of the hydraulic conditions on the Isthmus in connection with the question of water supply for lockage in the dry season. The discharge of the river was regularly gauged, beginning in 1890, and a fund of information now of great value to American engineers was collected. Space does not permit even a summary of these hydraulic investigations, but one matter of interest from a scientific point of view may be considered, namely the ultimate disposition of the rainfall.

As is known to everyone, of the rain which falls upon the surface of the earth one part flows directly to the sea through the channels of the rivers; another part soaks into the ground, of which much the larger portion gradually percolates to the river beds and thus reaches ultimately the same destination while the remainder is consumed in the subterranean chemical changes in progress; the third part is returned to the atmosphere by evaporation, either directly or through the medium of plant consumption. The relative percentage of these three parts has an important bearing upon the question of the water supply of a canal with locks, and was the matter to be elucidated. Many streams are known to receive large volumes of water by percolation through the ground, the amount depending largely on the geological character of the soil. The absence of frost and the exceptional regularity of precipitation on the Isthmus specially favour the study of this element of the problem.

The daily outflow at Alhajuela, Gamboa, and Bohio had been carefully gauged during about six years. The catchment basin above the latter covered an area of about 700 square miles, divided into three sub-basins of known area in which the average rainfall varied somewhat, but where a sufficient number of observing stations had been occupied to afford a fair knowledge of the relative and absolute precipitation in each. These data permitted a satisfactory analysis of the ratio between downfall and outflow throughout the entire district—the gauged outflow being of course transformed from the usual unit of cubic feet per second to the height in inches to which 1 square mile of surface would be covered by the flow, thus giving figures directly comparable with the rainfall in inches.

The resulting values of the ratio month by month revealed the laws governing ground-water flow. It was found that the minimum value about 0·3, occurred in May; and that from that date the ratio regularly increased month by month to about 0·75 in November, when both rainfall and outflow are at their maximum. It then rapidly passed to fictitious values above unity, indicating an outflow larger than the rainfall; and so continued, reaching a maximum of about two units in February, to a date between March and April when it dropped rapidly to the minimum in May.

The explanation of these figures is manifest. The soil acts like a sponge; at the end of the dry season the subsoil water reserve has nearly or quite drained out adding little or nothing to the river flow;

during the following rainy months its volume gradually augments, discharging more and more through the river bed, until when the dry months arrive its contribution constitutes by far the larger part of the entire flow. The determination of the numerical values of the ratio, month by month, permits an easy computation of the actual volumes of the ground-water flow. The annual average represents about one-third of the total rainfall. In round numbers the general results of the study indicated for each square mile of this tropical river basin are an annual rainfall of 111″; a total outflow including ground water of 73″; and a surface evaporation, represented by the remaining rainfall of 38″. As compared with the north-eastern portion of the United States these figures indicate about two and a half times the precipitation, three and a third times the outflow, and one and a half times the surface evaporation.

Since the American operations began, the same system of careful observations has been continued, with a large increase in the number of the rainfall stations; another six years have now passed, and it is not without interest to submit the records to the same analysis and thus to compare the results. This I have done, and find the accordance to be so extremely close that it suffices to present in tabular form figures showing the average results for the past twelve years. As all but the last year or two pertain to the minimum period of the progressive variation in rainfall, deductions from them in respect to the water supply of the Canal are certainly safe and conservative.

The available volume is demonstrated to be more than adequate, even with the immense locks provided for the accommodation of modern shipping.

RAINFALL AND OUTFLOW ABOVE BOHIO, 700 SQUARE MILES. TWELVE YEARS, 1898 TO 1909 INCLUSIVE.

Months.	Rainfall inches.	Outflow inch-mls.	Ratio.	Outflow in feet-seconds. Total.	Direct-flow.	Ground-water.
January	4·55	5·74	1·26	3477	828	2649
February	1·18	2·40	2·03	1612	238	1373
March	1·16	1·61	1·39	979	211	768
April	3·77	2·05	0·54	1284	713	571
May	11·45	4·13	0·36	2509	2090	419
June	11·30	5·73	0·51	3592	2114	1478
July	13·75	7·29	0·53	4425	2504	1921
August	13·47	8·14	0·56	4940	2646	2294
September	11·27	8·07	0·71	5055	2136	2919
October	13·63	10·01	0·74	6074	2463	3611
November	18·25	14·19	0·78	8904	3425	5479
December	8·13	10·70	1·31	6499	1488	5011
Year.	111·91	80·06	0·71*	4113	1738	2374
Dry (3)	2·04	2·02	....	1291	387	904
Rainy (9)	11·76	8·22	....	5053	2188	2865

* Quotient of aggregates.

Having by actual measurements and by deductions therefrom, reached a precise valuation of the probable monthly downfall and outflow

from the catchment basin above Bohio, ground water included, it remained to consider the third element of the lock canal problem—the probable evaporation from the projected lakes. No direct observations to determine evaporation from exposed water surfaces had been made on the Isthmus; but they had been made on Lake Nicaragua for 94 months by the Walker Commission, indicating an average of 0·18″ per 24 hours. That evaporation from the general surface of the country must be less than that from exposed water surfaces is certain; but the fact that rain falls at Bohio on 254 days out of the 365 days of the year, and at Gamboa on 204 days, (averages based on 11 years of records) would indicate that the difference between the two is probably not very material in this tropical region. At any rate a check upon the Nicaragua observations might be had by assuming that the residue of the rainfall after deducting the total outflow would represent the evaporation from the general surface of the country. This computation could not be made month by month, because the rate of flow of the ground water in reaching the river bed is unknown; but the mean annual figure representing a complete cycle is not affected by this circumstance. It indicated a loss by evaporation per square mile over the entire surface of the catchment basin above Bohio of 0·11″ per 24 hours.

During the last three years direct evaporation measurements on exposed water surfaces have been made by the Commission—for two years at Bas Obispo near the middle point of the Isthmus, for two years at Cristobal on the Atlantic coast, and for two years at Ancon near the Pacific coast. The figures differ but little at the three stations, and may be thus summed up, expressed in inches evaporated per 24 hours.

	Annual.	Dry months (3).	Rainy months (9).
Atlantic coast	0·114	0·228	0·100
Central district	0·141	0·185	0·122
Pacific coast	0·117	0·178	0·091
Averages	0·124	0·197	0·104

The general accordance between figures reached by so different methods is certainly striking; and the fact that the new measurements show that evaporation in the three comparatively dry months is nearly double that in the rainy season is a further confirmation of their accuracy, and incidentally of the value of the method of analysis by the use of the ratio between rainfall and outflow. It may be added that the latter when applied separately to the catchment basins above Gamboa and Bohio indicated a small escape by percolation under the dam site at the latter place, a fact confirmed by borings. Unfortunately the application of this method in temperate regions is rendered difficult by reason of complications introduced by ice and snow, and by the more irregular rainfall. In fine, on the Isthmus it may be considered as well established that of the total volume of the rainfall about one-third escapes directly through the beds of the streams, another third finally reaches the sea by the same channels as ground water, and the remainder returns to the atmosphere by evaporation.

NOTES ON PHOTOGRAPHY IN THE TROPICS.

By Capt. H. G. Le Mesurier, R.E.

Reprinted by the kind permission of the Editor, *Photography and Focus.*

The experienced amateur nowadays who remains at home, usually employs a first-rate hand camera for his negatives, and enlarges in the long winter evenings, and a more commendable method of passing his time would be hard to find. But, transplant him. Assume that he accepts an engagement in Bombay or Singapore and attempts to continue his English practice; what will be the result?

Well, if a man of a certain type, he may keep it up for a time, but in the end, in nine cases out of ten, the latitude, the climate, and, perhaps most of all, the social habits of the tropical Briton, will force him to modify his methods.

In the first place he has lost his winter, and to a great extent his evenings. When he has finished his work for the day, he will not find himself with the residuum of energy necessary to ensure the production in a stifling room of half-a-dozen twelve by tens. If he does not obey the call of nature for exercise in the open air in the cool of the evening, he is likely ere long to cease altogether to take an interest in photography, or any other earthly subject. Having taken the exercise necessary for his health, he will finish the evening up to dinner time (8.15 p.m., or later in the East) with his family, or at the club—an institution to which the most "unclubbable" man takes in the tropics. As to enlarging after dinner—Heaven forbid.

I am quite aware that in many places in the East it is quite *possible* to work on English lines for a few months in the cold weather, but the average amateur will find that the physical and social life he leads will probably prevent him from doing so. As there is no object in taking out apparatus he will rarely use, I recommend, therefore, that the Eastward-bound photographer should sell his enlarger before starting.

A Large Size Field Camera.

If he wishes to make pictures of a reasonable size for framing, my advice is to bring a field camera of the largest size he is likely to use, and have the dark slides nested with carriers. This is preferable to sending his hand-camera negatives home for enlargement, owing to the

expense and risk such a course entails, while, on the other hand, the inconveniences attendant on the use of a large and heavy camera do not exist in a land where the cost of porterage is nominal.

At the same time, he should bring his hand camera with him if of a suitable type, as he will find almost unlimited opportunites for its use. If only one camera can be afforded, I recommend the 5 by 4 size as the best compromise, particularly for work in Indian cities. I have found this a better all-round size than the newer "postcard" shape, and the plates are more easily procurable. If, as I advise, a field camera of large size forms part of the amateur's equipment, I should be inclined to recommend the purchase of a stereoscopic hand camera of the 45 by 107 m.m. size for those who are interested in stereoscopic work, or else of a quarter-plate.

As to the best class of field camera for use in trying climates, I think there can be no two opinions among experienced workers. The square bellows solid-fronted type stands alone. The modern flimsy folding camera is designed for the man who has to carry his own gear, and is consequently as light as possible; to this quality everything is sacrificed, and the result is a rickety unstable contrivance which, after a few months' use, or a few weeks' neglect, in a really bad climate, can be relied on to fall to pieces. It is true that the higher-priced cameras of this type by the best makers will render a better account of themselves if looked after, but, however well made, they are never as rigid or accurate as those of the heavier class, and are far more affected by climate.

My experience is that a 10 by 8, or whole-plate square form camera, is best bought second-hand, after careful inspection of course. Such cameras by the best makers, and in good working condition, can usually be bought for a mere song nowadays.

CONCERNING THE TRIPOD.

The tripod is at least as important as the camera, and should be carefully chosen. I found Ashford's stands excellent in India for ordinary work, but for telephoto work in exposed situations a heavy solid-legged stand of the type, used formerly for levels, cannot be improved on, though it may necessitate an extra coolie to carry it.

SO-CALLED "TROPICAL" CAMERAS.

Of late years "tropical" patterns of thin cameras have been introduced by several makers, made of teak, and brass bound, tongued, and pinned. I have had the opportunity of comparing the behaviour of one such with another by the same maker, but of his "regular" type. The former was far the better, and perceptibly more rigid. Why teak should be considered so much better than mahogany for the tropics, however, is not very clear; nor why an extra charge should be made for using this wood, a fine quality of which costs about 7s. a cubic foot in Calcutta. Thoroughly well-seasoned mahogany is more easily procured than a

similar quality of teak, and will stand a uniformly dry or damp climate better, though the latter wood is superior where hot and damp and cold and dry seasons alternate. I have seen a camera of the old sliding box type, made of mahogany by hand and properly dovetailed, though without any brass binding, which was in perfect order after being 30 years in Darjeeling, with a rainfall of about 100 inches per annum.

To sum up, the field camera for the tropics should be of strong heavy build, of the very best workmanship, and of thoroughly seasoned best quality wood. If the joints are properly designed, as they were 20 years ago, brass binding is unnecessary, though never harmful. The bellows should be joined to the camera with brass plates, and all the screws should be brass. A turntable is almost certain to give trouble in very damp weather, even when well made, and is better done without. A useful precaution is to take a duplicate bellows in case of accident.

The dark slides should be of the best quality book form, with double rabbeted hinged shutters. If bought second-hand, the cloth hinges should be renewed. Of all the "plate-holders" (solid form dark slides) on the market I only know one, the "Xit" pattern, which will stand the tropics, and this, unfortunately, is not, I believe, made in the larger sizes. Metal single plate-holders are particularly unsatisfactory, as the plush cut-offs rapidly deteriorate from damp and insects.*

The Hand Camera—A Specification.

The best form of hand camera for extreme climates is, unfortunately, one of the bulkiest; I refer to the magazine-changing type. This method of changing plates is more reliable than dark slides or changing boxes, and, if well made, never gets out of order. The commercial hand cameras to which this changing arrangement is fitted are, as a rule, of inferior manufacture, and cannot be recommended. A specification of such a camera which would stand the worst climates and could be produced at a reasonable price would be as follows:

Size.—$4\frac{1}{4}'' \times 3\frac{1}{4}''$ [or $5'' \times 4''$ if no other camera is used]. To carry 12 plates.

Body of Camera.—Best thoroughly seasoned teak, brass bound—edges and corners rounded. Highly french polished.

Back Door.—Undivided, brass tongued, secured to body by "port-hole" fastenings on both long sides; the door should be removable.

Shutter.—Compound; latest pattern.

Lens.—Focussing Cooke, Series III., 5" focus. Lens to be mounted on rising front panel for horizontal way of camera.

Changing Arrangement.—Approved type hand-made in brass. Plates to change horizontally.

Finders.—Two large best quality ground-glass type for horizontal way, one set to show full rise of front, the other the view with lens

* This is not the case with the excellently-designed plate-holder issued with Messrs. Butcher's Stereolette camera.—H. G. Le M.

central. Finders and rising front to be marked with corresponding horizontal lines. One finder the vertical way of plate.

Levels.—T form, set flush, tripod socket and leather-covered chain handle.

The sheaths should be of rustless metal, not aluminium. All screws should be of brass. The finders should have brass folding hoods. A circular brass cap screwing into a brass ring should be fitted over the lens and shutter. An Antinous release should be provided, and a leather sling case. For the most extreme climates, such as that of Central Africa, the camera should be lined internally with thin sheet brass, and the lens should be mounted on several thin brass washers, one or more of which could be removed in case of any swelling of the woodwork of the camera.

Folding hand cameras, in which the base board drops on opening the camera, give trouble sooner or later from climatic causes or more commonly from accident. It is a simple matter to get a camera repaired at home, but quite another thing when the accident happens on the Burmese frontier; and the less complicated the apparatus the better, therefore. Many cameras of this type have refinements which are only rarely of use, and a positive source of danger unless the workmanship is of the very best quality.

A REFLEX IN THE TROPICS.

Reflex cameras, if of the very best workmanship, stand a moderately bad climate much better than might be expected; but cannot be relied on in excessively damp localities. Their most vulnerable point is the silvered mirror, and after that the shutter blind. Those taking these cameras to the tropics should carry with them a replica of the mirror in an air-tight case; it is easy to fix in a well-designed camera. If specially ordering such an apparatus, brass screws throughout should be specified, as makers are in the habit of using blued steel screws, which rust very rapidly.

A twin-lens camera, in spite of its bulk and other disadvantages, is a more reliable apparatus for the East; they can be picked up second-hand at astonishing figures.

I have yet to meet an experienced worker who has a good word to say for roll-film cameras in the tropics. They are all very well for the tourist, in fact almost essential, but it must be remembered that the globe-trotter visits the East in the cold weather only, and has everything in his favour. I have been told by an explorer that in parts of Central Africa the life of a film is about *six hours;* that is to say, he found it necessary to develop his spools within six hours of their removal from their air-tight tin cases, and even then his results were not always satisfactory. Cameras using flat films give trouble either from the films curling in a dry atmosphere or sticking to their neighbours when the air is saturated with moisture.

Lenses and Finders.

In the tropics the light is usually so good, when outdoor work is possible at all, that considerable stopping down is possible with "instantaneous" exposures; a good rapid rectilinear lens of reasonably long focus is therefore by no means to be despised, particularly for street work where curvature of field is an advantage.

"Brilliant" finders are to be avoided in the East; the glare is too much for them. Well-made ground-glass camera-form finders are the best, and should be provided with folding hoods. An auxiliary concave finder with a blue glass magnifying lens is a valuable addition to any camera, but it is not everyone who can use it.

Shutters and Climate.

A simple type of focal plane or other roller blind shutter, stands a moderately bad climate better than might be supposed, and is more regular in speed than the cheaper metal "between-lens" shutters; there is, however, no question that the best shutter for the tropics is one of the very high quality examples of the latter type now obtainable.

Plates and Films.

If kept in hermetically sealed metal cases, most modern plates will keep almost indefinitely, which was by no means the case 10 or 15 years ago; but once exposed to the humid atmosphere of the tropics their behaviour varies considerably. The best keeping plates in my experience are made by a well-known American firm; they are, however, so badly cut that over 10 per cent. are useless, and I do not propose to give their producers a free advertisement. My own practice is to import plates in closed cases, and seal them up on arrival in separate tins, the lids of which are closed with sticking plaster, and can be used as often as required. Isochromatic plates do not keep nearly so well, and should be used within three months of receipt; the same applies to backed plates. The relative speed of plates has little or nothing to do with their keeping qualities.

Flat films keep very fairly well if treated as just described, and I find that isochromatic films keep considerably better than plates of a similar type. I have kept Austin Edwards's films for two years in hermetically sealed tins, and "Kodoid" plates are also reliable, though, owing to the fact that they stretch unequally in some climates, it is advisable to stop down to f/11 when using them to ensure sharpness.

Printing Processes.

Carbon and platinum printing can only be indulged in certain parts of the tropics, and then, as a rule, only in the drier seasons. This is particularly unfortunate, as not only are the results permanent, but these papers are also less liable to attack by insects than any other. Bromide

papers are little trouble to work at any time, but the results are not permanent, and insects, particularly the distinctive "silver fish," seem to prefer this paper to others. A well-fixed and washed P.O.P. print is far more permanent than a bromide, but many brands give endless trouble in working if ice cannot be procured; so-called "hardening" baths are a very poor substitute. A brand of "Solio" P.O.P. recently issued is free from this defect, and can be worked in water at 85° F.

Collodio-chloride paper can, of course, be worked at any temperature, but in dry weather it rolls up into nothing and cracks all over.

Self-toning papers are absolutely useless except for purely temporary purposes, as they will not keep either before or after fixing. Gaslight papers are, as a rule, less permanent even than bromide; to this rule "Velox" is an exception.

The new phosphate papers after a sea-voyage, arrived stuck tight together; those I have been able to separate and print are mottled and discoloured at the back after development.

Photographs one wishes to keep in the tropics should not be mounted or placed in an album, or they will be destroyed by damp and insects. My own practice is to store them loose in a specially made air-tight tin case. If mounted and framed, the back of the frame and the inner side of the rebates should be covered with paper which has been steeped in a solution of corrosive sublimate or similar poison and carefully dried; this is a necessary precaution against insects.

ACCESSORIES.

A large stock of chemicals should be brought out with one, as they are very expensive abroad. Eightpence a pound is quite a common price for "hypo," for instance. It is particularly advisable to bring any chemical required which is not in common use.

Printing frames should be of the best quality, and screwed at the corners. Developing dishes should be of enamelled iron. Spare focussing screens should be brought out. A valuable accessory is a daylight developing tank, with a corresponding changing bag. The tropical darkroom is a favourite resort of centipedes, scorpions, and other "small deer," not to mention snakes, and the less time spent in it the better; I personally have done without one for some years. In conclusion it may be said that while photography in the tropics is certainly a little more troublesome than at home, the difficulties are by no means insurmountable, and are as nothing compared to those our immediate predecessors in the study of the black art had to encounter: I can only hope that what I have written may serve to indicate what the difficulties are, and assist brother photographers proceeding abroad to avoid them.

The writer of the above makes the following specific recommendations for R.E.'s:—

Dealers.—Serious disadvantages that often occur when dealing with the

export departments of many London houses, are well known to professional photographers in the East. There are exceptions, and such a firm as "The Westminster Photographic Exchange, Ltd.," 119, Victoria Street, can be relied on to carry out an order with common sense and expedition. This firm is run by practical men, who can be trusted to choose a new or second-hand camera to meet one's specification.

Hand Cameras.—Watson's field cameras are excellent. Meagher's cameras were the best some 10 or 15 years ago: the firm is no longer in business, but their cameras are well worth buying second-hand.

Among cheap portable half-plate sets, of which there are so many on the market, about the best is the Thornton-Pickard "Imperial" with Aldis lens—priced at 85s. complete. Such an apparatus however would not compare in durability with a high quality square bellows camera bought in good second-hand condition: it is given merely as a good example of value for money. For those who wish to do difficult architectural work the "Tropical" Sanderson is about the best made, but not so rigid for outdoor work as the square form.

Hand Cameras.—Besides those mentioned in the text Voigtländer's "Alpine" camera (quarter-plate) is specially suited for the tropics; it should be ordered without leather covering and with German silver dark slides. One or two extra of the latter should be carried as they are of metal with plush cut-offs and sometimes get out of order. This is about the best of "double extension" hand cameras, and is usually fitted with "Collinear" lenses.

Among the smaller stereoscopic cameras, now deservedly popular, is the "Stereolette" made by Butcher for 45 × 107 m.m. plates, which, while very well suited for the tropics, is astonishingly cheap (£3 10s.). The body is of metal throughout. For this class of work it is more important that the lenses should be accurately paired than of very fine quality, and those supplied are quite good enough. The two cameras of this type mentioned in the text cost about £20 each.

Plates.—"Imperial" plates are specially recommended for their keeping qualities and general excellence. For use with the "Verascope" and similar 45 × 107 m.m. cameras, [which necessitate very accurate cutting of the glass], "Imperial Flashlight" plates are the best made.

Developing Tanks.—The "Standa" is the simplest, and should be bought made in *nickel*; the zinc pattern corrodes.

Developers.—For men who are often "in camp" a developer, such as pyrocatechin, which does not suffer from the accidental presence of a little hypo, is useful, as development is often carried out under difficulties.

Printing Papers.—Of P.O.P. Ilford seems about the most permanent, but requires the use of ice in the hot weather. The writer has a framed Ilford P.O.P. print made at Karachi in April, 1900, which has been hanging up in various parts of India and Mauritius ever since, and might, from its present appearance, have been toned and fixed yesterday.

The best bromide papers for bad climates seem to be "Wellington" and "Kodak," and the best developer for them amidol.

Isochromatic Screens.—Although, for the same result, they are much slower, tinted glass are better than gelatine screens, as the latter fade rapidly in strong light. Those made by Aldis Bros. are excellent.

Accessories.—The best dishes for the East are best quality real enamelled steel. Unbreakable celluloid measures are useful, but cannot be used for certain chemicals. Any mounts wanted should be brought out; it is difficult to get tasteful ones abroad. If much mounting is done it is worth while to purchase a small size "dry-mounting" machine; the adhesive tissue is much more likely to stand the climate than starch paste.

THE FORTIFIED POSITION OF NAN SHAN AND THE KUROPATKIN REDOUBT.

(Continued).

II.

The Kuropatkin Redoubt.

(*By* Major Don Augustín Scandella in the April number of the *Memorial de Ingenieros*).

In writing the following pages the works of the undermentioned authors, who were present at the Siege of Port Arthur, have been consulted, viz. :—Messrs. Ashmead-Bartlett, B. W. Norregaard, David James, and Lieut.-Colonel von Schwartz. Note has also been taken of the monograph published by the German Great General Staff; of the conferences held at the Centro del Ejército y Armada by Major Herrera de la Rosa, Spanish Attaché with the besieging army; of the lecture delivered at the Engineer Academy at Guadalajara by the Japanese Major Tsunoda, who was on the staff of General Nogi during the siege; and lastly use has been made of the information and plans contained in the official report of Major Sir Alexander Bannerman, R.E. who was attached to General Nogi's Army.

Ground outside Port Arthur.—The extraordinary influence which ground exercises in warfare, compels the chronicler of every feat of arms to describe first of all the district in which it took place so as to enable the reader thoroughly to understand it. The nature of the country and the relative position of the localities occupied by the belligerents will be seen from *Plate* III.

The attacks against the Kuropatkin Redoubt, which form the subject of this article, were some of the numerous episodes which contributed to the surrender of the fortress and logically cannot be disunited from the series of operations which formed the Siege of Port Arthur.

An army which endeavours to invade the Kuan-tung Peninsula from the east is met by three mountain barriers normal to its line of march, and which can be used as lines of defence by the besieged garrison.

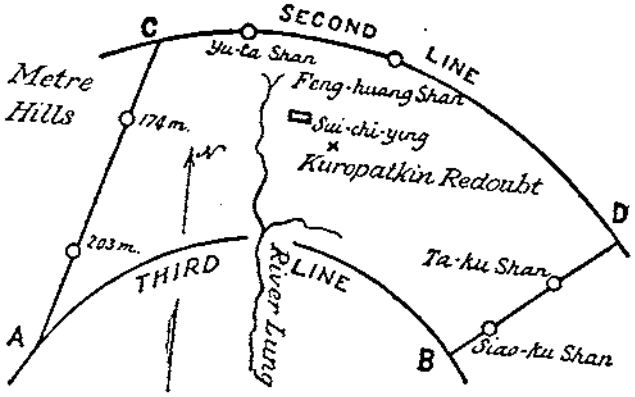
First Line.—The general direction of this line is from north to south, and the hills which form it are very precipitous, rising to a height of nearly 1,000′. It is traversed by three roads which start on the east from the Isthmus of Kin-cho, and join in the west at Port Arthur. The first of these roads runs along the north coast as far as the Bay of Ying-cheng-tsŭ, where it turns south towards the fortress. Parallel and close to it is the railway. The second and central road crosses by the Pass of An-tsu (Anchirei) and ends in the valley of the River Lung.

Second Line.—If an arc is described with the middle of the Bay of Port Arthur as centre and a radius of 9 or 10 kilometres, this curve will represent the general direction of the second defensive line, which commences on the south on the right bank of the River Tai, and ends on the north close to Luisa Bay.

Third Line.—Another arc, struck with a radius of 4 or 5 kilometres follows approximately the crests of the hills which surround the Bay of Port Arthur from east to west. This range is cut from north to south by the valley of the River Lung. On the numerous spurs which run out from it towards the front, the Russians had constructed a series of forts and batteries, connected by trenches and entanglements or by the old Chinese wall, which formed an almost continuous line, especially in the sector east of the River Lung.

Two mountainous masses jut out from the extremities of this Third Line, approximately from south-east to north-east. The eastern mass is formed by Ta-ku Shan (Taikosan) and Siao-ku Shan (Chokosan), and the western by the series of hills which are jointly known as the "Metre Hills," on account of each of them being usually called by its height in metres. These masses close on the east and west the circular valley between the Second and Third Lines. The ground in this valley is undulating and with little vegetation.

The accompanying figure shows the relative position of the principal topographical features which have frequently to be referred to in this article.



Line AB represents the third defensive line of the Russians and the two sectors into which the River Lung, shortly before falling into the Bay of Port Arthur, used to divide the line of the principal forts will be noticed. The eastern sector contained three permanent forts which served as pivots of defence, and which were called, after the hills on which they were built, viz., Ki-kuan Shan (Kitajodai), Er-lung Shan (Niriusan) and Sung-chu Shan (Soyusan). There were numerous intermediate works which were, for the greater part, built or remodelled after the outbreak of hostilities, and which were connected with each other and with the forts by trenches or by the old Chinese wall, and all were provided with a profusion of accessory defences. This continuous line presented a small salient to the north-east of Wang-tai (*Plate* III.) formed by the two earthworks, known as Pan-lung Shan (Banliusan), which played such an important part during the siege. Wang-tai (Bodai) was the first and principal objective of the Japanese. The forts in the western section did not intervene in so active a manner as the western ones.

Line CD represents the second defensive position of the Russians, which when once in the power of the Japanese was used for their siege works.

The spurs of Yu-ta Shan and Feng-huang Shan (marked on the sketch by two small circles) were utilized by the besieger as the sites of numerous batteries, camps, etc., defiladed from the enemy's view.

The line BD passes through Siao-ku Shan and Ta-ku Shan, and AC represents approximately the general direction of the Metre Hills, but only 203 and 174-Metre Hills are marked.

The chief events of the Siege of Port Arthur took place in the area ABCD.

Situation and Description of the Kuropatkin Redoubt.—With the double object of closing the valley of the Lung and of protecting the springs which provide the fortress with water (see *Plate* III.), the Russians constructed in the centre of the area ABCD two lunettes and two redoubts. The most advanced and most important of these works was known by the Japanese as the Red Redoubt on account of the colour of the ground around it. The Russians called it the Kuropatkin Redoubt, and it is known by this name to all the writers who have written about it. When this work fell into the power of the besiegers the Russians hastened to bombard it with their heavy artillery, whilst the Japanese destroyed its shelters and made various alterations so as to make it defensible. In consequence, the redoubt was so changed that in order to obtain sections of it and to ascertain certain details of the assault, Major Sir A. Bannerman had to get the assistance of his Japanese colleagues who had contributed to its destruction. The following observations may serve as a complement to the plan and sections given in *Plate* IV. The work was built round a rocky hillock and the ditch was excavated in very hard ground, the result was, that in spite of the great amount of work that was expended on it, the parapet had an exaggerated relief. The ditch of the gorge was flanked, as was also the face marked 2—3 on the plan. The trenches which started from the salients 3 and 6 were deep, and were provided with sandbag loopholes, and their trace was such as to enable them to flank the glacis. The whole of the parapet of the redoubt was provided with head cover, and at every 20′ there was a traverse, not shown on the plan (see section CD). The timber of the shelters was generally square in section, with 10″ to 12″ side. Iron plates, 9·5 m.m. thick, were used in the construction of the blindages, in the sections CD, EF, LM and NO.

The garrison and armament of the redoubt consisted of one company of infantry (200 men), a small Hotchkiss gun mounted in the eastern salient, and two machine guns to flank the ditches.

The besiegers penetrated into the work by the breach which had been made in face 1—2. It is stated that a considerable difference was found in the state of preservation of the different shelters, those that were protected by sheet iron being in a better condition than the others, though even these latter had not suffered great damage. It should be remarked that the blindages provided with iron cover were smaller than the remainder.

The artillery employed by the Japanese against the Kuropatkin Redoubt consisted of 3-inch Arisaka field guns, 4·7-inch howitzers, and 3·5-inch mortars, the former at a range of 3,100 yards and the rest at 3,550 yards. After the work had been captured, the Russians fired at it with 6-inch and 8·7-inch howitzers which caused much damage.

Neither the mine gallery which ran out from face 2—3, nor the mines prepared by the Russians in the ditch, proved of use in the defence. None of the mines exploded. Hand grenades were used in large quantities by the Russians.

Operations of the Japanese.—Immediately after the Battle of Nan Shan on the 26th May, General Oku effected one of the most interesting manœuvres of the campaign, by changing front with the 3rd and 4th Divisions which had taken part in the battle, and moving them northwards, in union with other troops which had disembarked at Pi-tsu-wo, to fight and win a fortnight later (15th June) the Battle of Te-li-tsu or Wa-fan-go (Tokuriyi); and meanwhile the 1st Division, commanded by Prince Fushimi, captured Dalni, and awaited in the neighbourhood of Nan Shan the incorporation of the other divisions to form the army to besiege Port Arthur under General Nogi.

The siege may be considered as being divided into two principal parts, the first from the Battle of Nan Shan (26th May) to the 31st July, on which day the Japanese occupied the Second Line (see *Plate* III.), and the second, which commenced on the last-named date and ended with General Stoessel's capitulation on the 5th January, 1905.

First Part of the Siege.—The following is a list of the chief engagements between the 26th May and 31st July and of the losses suffered by the Japanese in them:—

(*a*). 26th June. Occupation by the Japanese of Wai-to-Shan (Witosan) to the west of Dalni. Losses 250 men.

(*b*). 26th June and 3rd to 5th July. Hard-fought engagements on Ken Shan (Kensan). This mountain which commands the whole district forms an advanced position of the 1st Line. Losses 760 men.

(*c*). 26th to 28th July. Defeat of the Russians holding the 1st Line. Losses 4,900 men.

(*d*). 31st July. General Nogi's troops captured the 2nd Line and the Russians retired to the 3rd Line. Losses 1,200 men.

During the months of June and July the Japanese, at the same time as they were invading the Kuan-tung Peninsula, were concentrating in it the troops and material necessary to commence the

Second Part of the Siege.

(*e*). 7th to 9th August. The Japanese attacked and captured Ta-ku Shan (Taikosan) and Siao-ku Shan (Chokosan). Losses 1,200.

(*f*). 13th to 15th August. Capture of 174-Metre Hill (Takasikayama). Losses 1,500 men.

(*g*). 19th to 20th August. First general attack. The principal objective of the Japanese was to gain possession of the hill of Wang-tai (Bodai), situated in the eastern sector, from which the bay is commanded. The secondary objectives were the lunettes of Sui-chi-ying (Suisi) and the Kuropatkin Redoubt. The Russians retained all these positions, except the two fieldworks Pan-lung Shan (Banliusan), sited on the northern slope of Wang-tai. Except for this partial success the attack was a failure. Losses 16,000 men.

(*h*). 19th and 20th September. Second general attack. The principal objective was the capture of 203-Metre Hill and the neigh-

bouring works at Sui-chi-ying. The latter fell into the possession of the besiegers, but 203-Metre Hill continued in the hands of the Russians. Losses 6,000 men.

(*i*). 26th and 27th October. Third general attack. Its objectives were Wang-tai and 203-Metre Hill. A failure, losses 7,000 men.

(*j*). 26th November to 5th December. Fourth general attack directed against both the sectors of the defence. On the east no success, losses 7,000. On the west the Japanese captured 203-Metre Hill. Losses 7,500.

(*k*). 7th to 13th December. 203-Metre Hill served as an observatory for correcting the artillery fire of the besiegers, whose projectiles destroyed the Russian squadron in the Bay of Port Arthur.

(*l*). 18th December. The Japanese captured the permanent fort of Ki-ku Shan (Kitajodai). Losses 1,900 men.

(*m*). 28th December. Capture of Er-lung Shan (Niriusan). Losses 1,500.

(*n*). 31st December. Capture of Sung-chu Shan (Soyusan). Losses 350.

(*o*). 1st January. General Nogi's troops occupied Wang-tai. Losses 400.

General Stoessel proposed a capitulation, which was commenced on the 4th January.

It is proposed to deal very summarily with the engagements under (*e*) and (*f*) above and to consider (*g*) and (*h*) only in their relation to the Kuropatkin Redoubt.

Engagements of Ta-ku Shan, Siao-ku Shan and the Metre Hills.—As soon as the Japanese became masters of what we have called the Second Line, they commenced in the beginning of August to make the necessary preparations for undertaking the assault, but when they began to prepare their encampments, to arrange their communications and to site their artillery, they found that the Russians were observing their movements at close range from Ta-ku Shan and Siao-ku Shan, and were interfering with them by their fire; and in consequence they decided as a preliminary operation for the general attack to capture these two positions. This they succeeded in doing on the 7th and 9th August with a loss of 1,200 men. Ta-ku Shan was admirably suited for defence, all its slopes, except those on the south which were swept by fire from the work, were almost inaccessible. The Russians occupied it with two companies of infantry and eight field guns. Siao-ku Shan was held by one company. The Japanese attacked with 6 battalions, 36 mountain guns, and 12 9-c.m. mortars. The fire of a Russian flotilla on the 7th held back the enemy's advance; a similar result was achieved on the following day against a vigorous attack; but on the night of the 8th the assailants gained Siao-ku Shan, and as a result the Russians retired from Ta-ku Shan. The whole of the fortifications of the eastern sector were commanded from this hill, as well as the roads leading from the fortifications to the town and a great part of the bay. This was, no doubt, the reason why the Russian fleet left the port and engaged in the naval battle of the 10th August. The Russian vessels which returned to harbour after their defeat took care to alter their original moorings. Lieut.-Colonel Schwartz, in order to show the importance of Ta-ku Shan as an observatory for correcting the fire of the Japanese artillery, says that a 28-c.m. howitzer at its second discharge obtained the correct range of the artillery of the defence. Finally Ta-ku Shan in the hands

of the Japanese formed a traverse which defiladed the left flank of the attack from the view and fire of the defence.

Everybody knows to-day the extraordinary importance of Ta-ku Shan; but we can see from definite facts what was the opinion of the Russians. The war began on the 6th February, 1904, and four and a-half months later on the 19th June the defenders decided to occupy the position with two companies and a battery. As labour was scarce, and the rock very hard, the progress of the defensive works was very slow. The siege began on the 31st July. On the 2nd August it was decided that closed works should be constructed on Ta-ku Shan and Siao-ku Shan, and an engineer officer named Raskevski was ordered to take charge of them. On the 9th of the same month, after three days' hard fighting the attack gained both positions.

During the year 1897, when the present General Velisko was the commanding engineer, he reported that the security of the fortress required the construction of permanent works on Ta-ku Shan and Siao-ku Shan; but the question of finance came in the way and the report remained forgotten until the 19th June, 1904.

At the extreme right of the line the Japanese found that Takasakiyama (174-Metre Hill) exercised a similar effect on them to that which Ta-ku Shan did on the left, and they accordingly decided to seize it. This they succeeded in doing after three days' fighting with a loss of 1,500 men. The attacking force consisted of one brigade of infantry and 60 field guns. The fortifications of Takasakiyama were semi-permanent. The works constructed on the two hills (Namakoyama and Akasakayama) which lay between it and 203-Metre Hill were of the same nature.

General Velisko had also proposed in his report that the Metre Hills should be held by two permanent works.

First Attack on the Kuropatkin Redoubt.—On the 18th August, the Japanese were in full possession of the second defensive line of the Russians and of the advanced positions, which we have just described. The besieging army consisted of 48 battalions, 5 squadrons, 17 companies of engineers, 200 7·5-c.m. guns (72 mountain and the remainder field guns), 150 siege guns of from 9 to 15 c.m., and 24 machine guns. General Nogi, who was in command, gave orders for preparing for a general attack against the two sectors into which the Russian fortified line was divided by the River Lung. This attack was to be carried out in accordance with the principles laid down by Von Sauer, and had as its principal object the occupation of Wang-tai, from the heights of which the bay was dominated. The four lunettes, situated to the south of Sui-chi-ying and the Kuropatkin Redoubt formed the secondary objective. These last-named works formed together an advanced nucleus in the centre of the third defensive line.

At 11 a.m. on the 19th August fire was opened against the Kuropatkin Redoubt by six 12-c.m. howitzers and six 9-c.m. mortars: one hour later two field batteries (12 guns) and three mountain batteries (18 guns) came into action. At the proper time six field batteries directed their fire against the Sui-chi-ying Redoubts and the infantry approached the village of that name (destroyed by the Russians before they evacuated it) and certain undulations of the ground about 300 metres from the

redoubt. At 1 p.m. the Japanese, believing that the artillery preparation was sufficient, detached small groups of sappers who approached the wire entanglements of the Kuropatkin Redoubt and succeeded in opening some passages through it, by which the two companies who followed the sappers were to pass in open order and at the double. A few men reached the ditch, but the remainder of the assaulting force was detained by the entanglement and exposed to a heavy musketry fire which caused great losses.* A few minutes later two fresh companies advanced, but were unable to join the others, and found themselves obliged to throw themselves on the ground in order to get cover from the rifle fire from the work and also from the artillery fire from the inner line, which was both accurate and well timed. At 2 p.m. two more companies were sent to the assault, but did not succeed in covering 200 metres. In this situation the Russian artillery swept a wide zone occupied by the enemy, whilst the Japanese artillery had to cease firing so as not to cause loss to its own infantry. It is clear that under these conditions the attack could not progress. During the night of the 19th the Japanese repeated their attempts, but were repulsed. The searchlights and light balls which were skilfully handled by the Russians contributed to this result. As the same scenes were being enacted before the four redoubts, the Japanese withdrew their troops before daylight so as to leave the ground free for the artillery, which on the following day again bombarded the Russian fortifications. At 1 p.m. on the 20th an impetuous attack was ordered against the north and north-east fronts of the redoubt and against the lunettes. Each assaulting column consisted of nine companies, and the advance was simultaneous. The column directed against the redoubt succeeded in penetrating into the ditch of the north front, but at 3 p.m. an opportune Russian counter-attack put it to precipitate flight.† The troops of General Nogi suffered 2,500 casualties during the 19th and 20th August in these unsuccessful attacks against the Kuropatkin Redoubt.

On the following morning the Russians found themselves in full possession of the redoubt, and had repaired the parapet during the night. The Japanese occupied (*Plate* V.) trench X, 180 metres long, which they could enter in safety from the rear.

Second Attack and Capture of the Kuropatkin Redoubt.—The enormous losses suffered by the besiegers (16,000 men) in their first general attack, conducted on Von Sauer's principles, from the 19th to the 25th August, made them see their error and abandon this rapid method of capturing fortresses, which never leads to good results. In consequence General Nogi decided to revert to the classical methods of siege warfare, and accordingly works were begun at six points, one of which was trench X (*Plate* V.) which, with modifications in its profile, was extended to right and left so as to convert it into a first parallel against the Kuropatkin Redoubt. On the night of the 31st August approaches were started from point X in the form shown in *Plate* V. The third parallel, 60 metres from the glacis, was finished on the 15th September. This work presented two peculiarities of importance, the one being the

* Capt. Yate of the English Army who was attached to the army of General Nogi says in an official report that the leading company attacked with 180 men of whom it lost 150.

† According to Capt. Yate a part of the troops abandoned their arms in the flight.

substitution of zigzags for the straight trench with traverses and blinded cover which joined the first and second parallels; the other, the employment of a great number of sandbags, so that the whole supply in the depôt at Dalni was soon expended, and more had to be made from pieces of coloured calico which were there. The Russians did not interfere with the Japanese sappers to any extent.

Simultaneously with these works, others were begun against the four lunettes and were completed on the 18th September. The assaults on these works were made simultaneously with that against the redoubt, but were to a certain extent independent of one another. The former were carried out by the left brigade of the 1st Division and the latter by the right brigade of the 9th Division.

At 1 p.m. on the 19th September fire was opened against the redoubt by the same pieces as in the earlier attack. Whilst the siege guns were bombarding the shelters and the parapet, the field guns enfiladed front 1—2 and the trenches on the east of the work. Two hours after the commencement of the cannonade all the head cover, formed of sandbags, seemed to have been destroyed, the earth forming parapet 1—2 had fallen into the ditch to a great extent, and signs were to be seen of some shelters having fallen in.

At 5 p.m. the assaulting column of 400 men began to move in the first parallel, and before 6 o'clock it threw itself into the ditch in front of face 1—2 without suffering serious loss except in the 60 metres which separated the third parallel from the redoubt. At the right moment the Japanese made an offensive demonstration from the eastern end of the first parallel against the small redoubt near the railway, and thus distracted the attention and fire of its defenders at the precise moment of the assault. Once in the ditch 1—2, the flanking fire prevented the attackers from rushing round to the gorge, and although the breach opened by the artillery in parapet 1—2 was practicable, they could only move through it on a front of two or three men and these fell sacrificed before reaching half-way on their journey. In this situation the hand grenades of the defence contributed in forcing the greater part of the assaulting column to retreat to their trenches at 6.30 p.m., after having suffered severe loss. At nightfall a few men remained in the ditch who kept waving a small Japanese flag above the crest of the glacis. When the assault began the Japanese siege artillery ceased firing and the field guns directed their fire against the gorge. The help given by the artillery to the attack was very effective and opportune. The guns placed in the forts of the Russian line, especially those of Wang-tai, assisted the defence with an accurate and active fire.

The Japanese made use of the darkness to repeat their attacks, always in the same manner. Finally at 2 a.m. on the 20th they succeeded in dislodging the brave defenders from their works.

The losses suffered by the attack were 1,200.*

The immediate benefits gained by the Japanese by the capture of the Kuropatkin Redoubt were that they cut the water supply of Port Arthur and were able to begin sapping against the forts of Er-lung Shan.

* The different authors who have been consulted are not in accord as to this number.

Conclusions.

(A). On studying the invasion of Manchuria by the Japanese armies under Marshal Oyama, it will be seen that, both in the battles fought separately by the 1st, 2nd and 4th Armies and in those in which the 3rd and 5th Armies took part, the most vigorous attacks and defences, the most bloody encounters, and the moments in which the belligerents suffered the greatest losses were those in which they were struggling for the possession of some hill or elevation of the ground. This was the case in the Kuan-tung Peninsula, first at Nan Shan, afterwards at Ken Shan and the First and Second Lines, later on the northern spurs of the Metre Hills and Ta-ku Shan, and lastly at Wang-tai and 203-Metre Hill, all of which actions show the importance attributed by both combatants to the possession of the hills. Exaggerating the form of expressing this idea, we may say that the Russians and Japanese during the recent war were obsessed by heights; and it is logical to suppose that they had good reason for so being.

General Nogi directed his efforts from the beginning against Wang-tai and 203-Metre Hill, and their possession was the object of a series of sanguinary combats during the Siege of Port Arthur. When the illustrious Russian General Kondratenko, on the 5th December, a few days before his death, saw the Japanese flag waving over 203-Metre Hill he exclaimed "This is the beginning of the end"; and hardly had Wang-tai fallen into the hands of the Japanese than General Stoessel hastened to propose a capitulation. These two heights were the keys of the fortress, but in addition these two and Ta-ku Shan were the three best observatories which the attacking artillery could have for correcting the fire of their guns, and, amongst other things, for sinking the remains of the Russian Pacific Squadron, which was anchored in Port Arthur. Under these conditions it does not seem amiss to consider that if one of General Nogi's principal objectives was the possession of observatories for his artillery, nothing could have been more suitable for gaining this end than the employment of captive balloons, which might perhaps have prevented a good many of the innumerable losses suffered by his troops. Definite data are wanting regarding the form and circumstances under which the Japanese aerostatic service was working, and accordingly it would be rash to attribute to the deficiencies of the Service that which should be attributed to the difficulties imposed by the ground. The facts are that the besiegers did not obtain help of any importance from balloons, and that the besieged lamented their want of them, for according to Von Schwartz they would have lent great assistance in discovering the position of the enemy's batteries.

(B). The fortifications of Ta-ku Shan, to the east of Port Arthur; of the Metre Hills to the west, and the Kuropatkin Redoubt on the north should be considered as three advanced positions in the line of Russian forts. The number of casualties suffered by the attacking troops in capturing these three nuclei amounted to 20,000 men; and this figure, without taking account of other factors, is sufficient in itself to make it understood that these positions complied with their mission of permitting the besieged to dispute the ground foot by foot. On the other side the

partizans of advanced positions will be able to strengthen their arguments in favour of them by putting forward this recent example and enumerating the services rendered to the defence by Ta-ku Shan, the Metre Hills and the Kuropatkin Redoubt, in spite of the deficient state of their fortifications. The Japanese confess that if 203-Metre Hill had been crowned, as General Velisko proposed, by a permanent fort, they would never have been able to capture it. Finally it should be observed that the central advanced position, namely the Kuropatkin Redoubt and the Sui-chi-ying Lunettes should have been sited further to the north, at Fen-huang Shan. The spurs of this mountain were chosen by the Japanese for the emplacements of their siege artillery, parks, hospitals, etc., under cover from view and fire from the Russian line.

(C). The points chosen by the Russians for siting their fortifications round Port Arthur have given rise to various critical opinions, but in general terms they coincide in recognizing that the line of forts was too close to the town. Within the limits of our study we cannot comment on this, and will only allow ourselves to copy the following words of General Nogi:—The lessons learnt during the siege show that a town or bay cannot be protected by a ring of fortifications constructed close to it. Such a ring can only preserve it from destruction if the forts are situated at a distance of 12 k.m. (7½ miles) from the important points which it is desired to cover. To-day forts placed 8 k.m. (5 miles) away are useless. A fortified bay or town without exterior forts placed as above indicated is simply a costly depository for the enemy's projectiles.

(D). Both in the position of Nan Shan and in the siting and nature of the forts round Port Arthur, the superior Russian authorities, for unknown reasons, omitted to take technical advice, and later experience has shown that if they had done so the defence of the place would have been greatly prolonged.

FINAL.

The Russian troops who survived the siege became the prisoners of the Japanese and on returning to their own country had to support the accusations of public opinion. The celebrated trial and condemnation of General Stoessel contributed without doubt to the idea that the defence of Port Arthur was not as energetic as it should have been. Almost all its defenders were overwhelmed with censure. Although we are wanting in authority and in authentic data for reconstituting the truth of what occurred, we will permit ourselves to conclude this study by repeating the names of the following corps and of two Generals who took a very active part in the engagements:—

The 5th Siberian Rifle Regiment was sacrificed at Nan Shan, and later covered itself with laurels at 203-Metre Hill.

General Kondratenko was, as is known, the soul of the defence.

General Tretiakov, a former engineer officer of Plevna, was the colonel of the heroic 5th Siberian Rifle Regiment.*

'M.'

* See *The Royal Engineers Journal*, 1909-10, article entitled "The Final Struggle for 203-Metre Hill at Port Arthur."

REVIEW.

THE CONSTRUCTION OF A HOUSE.

By CHARLES GOURLAY, A.R.I.B.A.—(13″ × 10″. Price, 6s. 6d. bound, or 6s. in portfolio. B. T. Batsford, 94, High Holborn, W.C.).

THIS book illustrates to a remarkable degree the immense advance made within recent years in the production at a moderate price of books on Architecture and Building Construction.

Printed on excellent paper and well bound the book contains 40 clear and carefully detailed plates showing a site plan, plans of three floors, sections, and elevations of a typical country house with full details of the construction and internal finish. The drawings are in good architectural style and are also explained by 22 pages of letterpress.

The site plan shows the arrangement of the grounds and outbuildings, and the scheme for drainage: a design for the motor house and chauffeur's lodge are also given.

The constructional details given are of general application, and the book is one that would be useful for reference in a R.E. Office when designing work is being done.

BOOKS RECEIVED.

EXPANDED STEEL FOR REINFORCED CONCRETE CONSTRUCTION. The Expanded Metal Co., Ltd., York Mansion, York Street, Westminster, S.W.

SEWAGE DISPOSAL WORKS. THEIR DESIGN AND CONSTRUCTION. By W. C. Easdale, M.S.E., M.R. SAN. I. 10s. 6d. E. & F. N. Spon, 57, Haymarket, W.

LA MITRAILLEUSE AIRATRICE. By Capitaine D'Andre. 4 francs. R. Chapelot et Cie., 30, Rue et Passage Dauphine, Paris.

L'AÉROPLANE ÉTUDIÉ ET CALCULÉ PAR LES MATHÉMATIQUES ÉLÉMENTAIRES. By Capitaine du Génie Duchêne. 5 francs. R. Chapelot et Cie., 30, Rue et Passage Dauphine.

NOTICE OF MAGAZINE.

REVUE MILITAIRE DES ARMÉES ÉTRANGÈRES.

June, 1910.

MILITARY NEWS OF DIVERS COUNTRIES.—*Austria.*—The Army Motor Car Department is divided into three sections:—(1). The experimental section, consisting of a field officer, two subalterns, and a retired subaltern and two N.C.O.'s for records. (2). The "cadre" of motorists, consisting of the permanent staff, and a number of drivers varying with the number of cars in use. (3). The officers attached to the district commanders, *i.e.* staff officers. The duties of the experimental section are:—(*a*). To study the technical development of the motor car industry. (*b*). To edit all technical discussions, regulations, and training manuals. (*c*). All arrangements connected with the ordering of new cars, all trials and experiments. (*d*). The compilation of statistics concerning all service and private cars. (*e*). To study the motor car organization employed in foreign armies. The "cadre" of motorists includes the headquarters of the motor car department, the instructional establishment, and the park and workshops. To the headquarters of each territorial district, an officer is attached as technical adviser in all matters concerning automobilism. The motor car department is entirely separate from the corps of motor-cyclist volunteers.

It is proposed after this year to form permanent companies of cyclists consisting of a captain or senior subaltern as commander, 2 officers (4 in war), 30 men per section, a medical orderly, a mechanic, and 4 chauffeurs. A motor cycle capable of carrying 300 kilos. and a tricycle are allotted to every 30 men, and 2 motor cars and 2 light vans to each company.

A course of aeronautics for 11 military and 2 naval officers has been going on at Vienna since the 1st May and will last till the 30th September.

Germany.—Courses for the instruction on the care of arms, bicycles and range-finders, consisting of about 20 subalterns of all arms of the service, each lasting about three weeks, have been established in various towns at different times of the year.

An infantry subaltern is to be attached each year for one year to each railway regiment, and in the same way each telegraph battalion will have attached to it 2 infantry subalterns and 3 subalterns of the cavalry or field artillery. Conversely, each railway regiment will send a subaltern for one year to the infantry, and each telegraph battalion will send a subaltern to the cavalry or field artillery. The officers selected must not have less than 3 or more than 11 years' service.

Spain.—The Corps of Occupation at Mellilla has been placed under the command of a lieutenant-general, with a major-general on the staff to assist him. Its composition is as follows:—4 infantry regiments, *i.e.* 36 battalions of 6 companies each; 3 rifle battalions each of 6 companies, commanded as one regiment by a colonel; 2 machine gun detachments of 4 guns; 1 cavalry regiment of 6 squadrons; 1 brigade of field artillery (3 batteries); 1 brigade of mountain artillery (3 batteries); artillery headquarters; 1 battery of mountain artillery; 1 howitzer battery; 1 ammunition park; 1 mixed regiment and 1 mixed company of engineers; 1 section of administrative troops; 1 mixed company of medical troops; 1 company of sailors. In addition to this there are native troops and the disciplinary brigade; the total strength of the command is 20,000 men.

United States of America.—The United States Army is to be reorganized, and the whole country has been divided into 8 army corps districts. The first army corps, consisting of 3 divisions with headquarters at New York has alone so far been organized. The organization of the divisions is as follows:—Each division is composed of 3 brigades of 3 infantry regiments each, of 1 regiment of field artillery (6 batteries), of a battalion of engineers, of 2 companies of the signal corps, and of medical troops. To each division is also attached a cavalry regiment of 12 squadrons.

July, 1910.

Military News of Foreign Countries.—*Germany.*—A long article is devoted to the "Rang-Liste" and "Dien-alter-liste" of the German, from which the following points have been noted:—(1). The proportion of officers of the middle classes to those of noble birth is gradually increasing in the so-called "aristocratic regiments" such as the Guards and certain cavalry regiments. (2). The periods during which officers retain one rank before promotion is approximately:—Subaltern, 17 years: captain, 12 years: major, 7 years: lieutenant-colonel, 3 years: colonel, 4 years: G.O.C. brigade, 3 years: G.O.C. division, 4 years.

The senior captain of the Prussian Army has held a commission since February, 1884. On the staff, however, several majors have commissions dating only since 1890: this is due to two facts:—(1). The staff officers are sent to corps where there are relatively few senior captains and thus rapidly attain that rank. (2). Staff captains compete only amongst themselves for field rank, and have their own roster above the rank of major. (3). Military rank has just been conferred on the officials of the veterinary department.

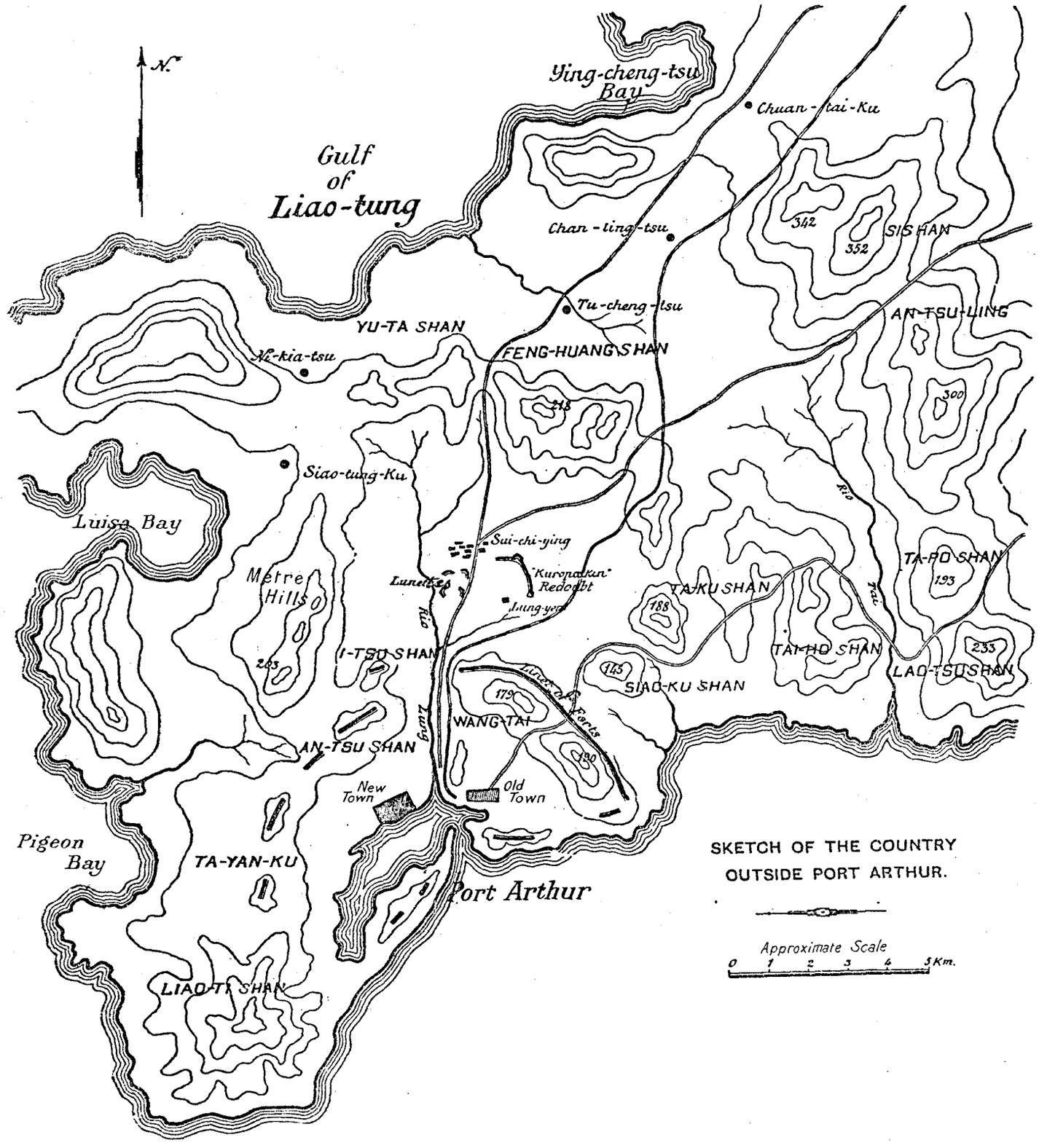
The artillery now possesses 1 observation wagon per battery, and 1 per brigade of artillery. These wagons do not appear on parade. In peace they are drawn by 4 horses, but as in war ammunition will be carried in the limbers which are to be 6-horsed. On the line of march the observation of fire instruments are carried in the wagon, but in action the directors and battery telescopes are taken away and carried by the mounted men of the B.C.'s party. The wagon has a shield fixed on to it, and so have the ladder and seat on top of it from which observations are made. In the heavy artillery, the observation wagon travels in front of

the guns, and thus is in a position to trot on ahead and get into position before the guns, which can thus open fire immediately on arrival.

Switzerland.—In view of the fact that any future campaigns will involve a large number of night operations, the school of recruits at Berne has been making experiments in night firing. Three methods were employed :—(1). Placing the rifles in position during the daytime on rests. (2). Using an intermediary target placed 500 metres away from the firer in such a position that all shots on it must also infallibly fall on the main target. This intermediate target consisted of a white canvas. (3). Illumination of the target, either by hand grenades, star shell, electric projectors, or by a fire lit at some distance away from the target so as to light it up. The results of the three methods were as follows :—Method 1.—This was very efficient; of 398 shots fired against 33 dummies, at a range of 350 metres, 228 hits were registered, and at 430 metres out of 436 shots fired 250 hits were scored on 45 dummies. Method 2.—This was the least successful method; at 150 metres, out of 407 rounds fired by 34 men, there were only 11 hits, 9 dummies only being touched. Method 3.—This was the most effective of the three methods especially at ranges allowing of the use of hand grenades. Ten series were fired in all at ranges varying from 40 to 400 metres against dummies representing men kneeling.

A. H. SCOTT.

A. SCANDELLA.—THE FORTIFIED POSITION OF NAN SHAN AND THE KUROPATKIN REDOUBT.



SKETCH OF THE COUNTRY OUTSIDE PORT ARTHUR.

Approximate Scale

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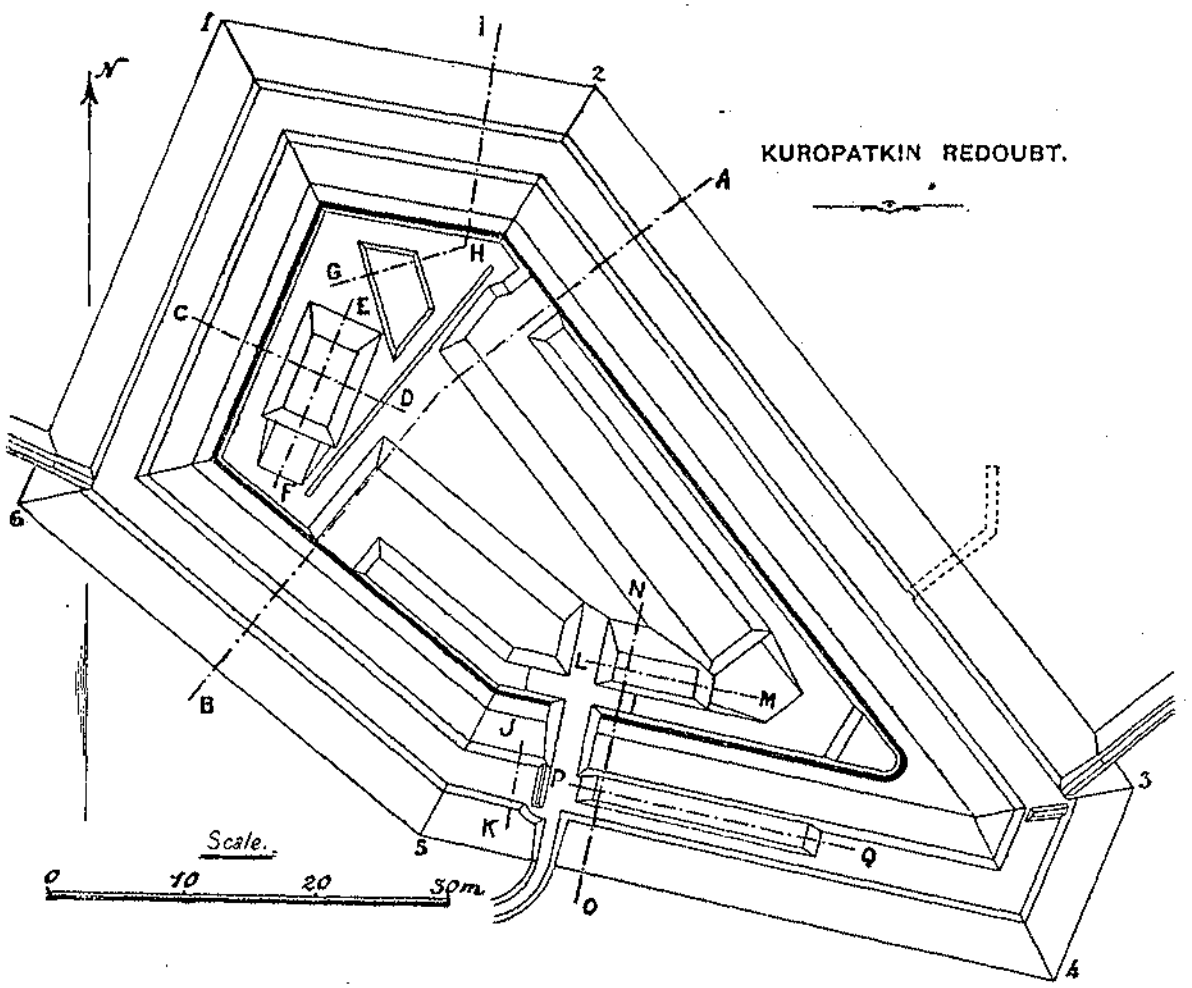
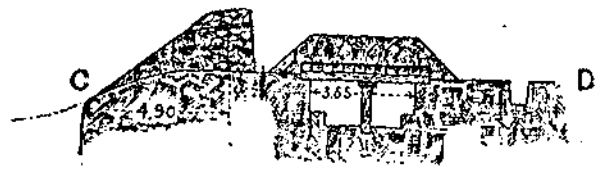
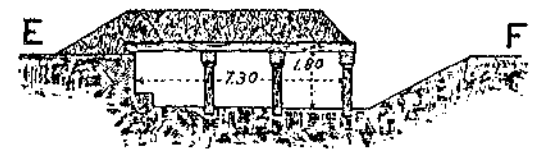
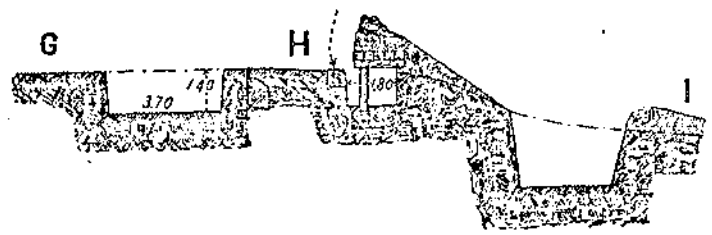
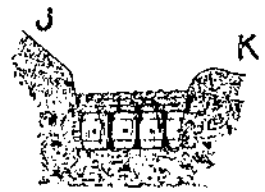
A. Scandella.— THE FORTIFIED POSITION OF NAN SHAN AND THE KUROPATKIN REDOUBT.

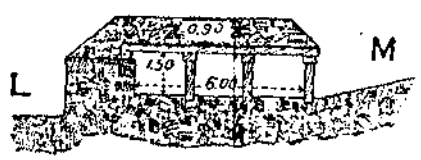


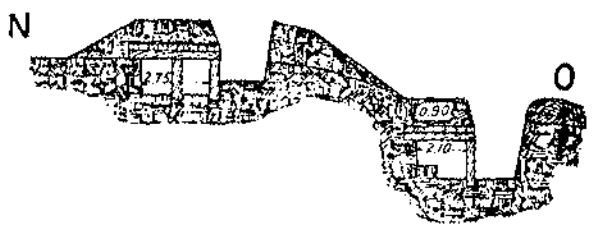


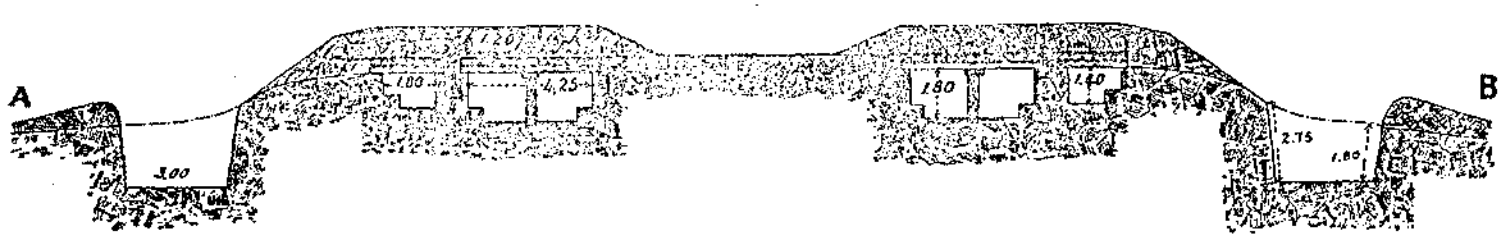


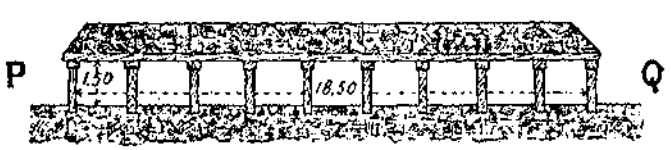












A. Scandella.— THE FORTIFIED POSITION OF NAN SHAN AND THE KUROPATKIN REDOUBT.

APPROACHES.

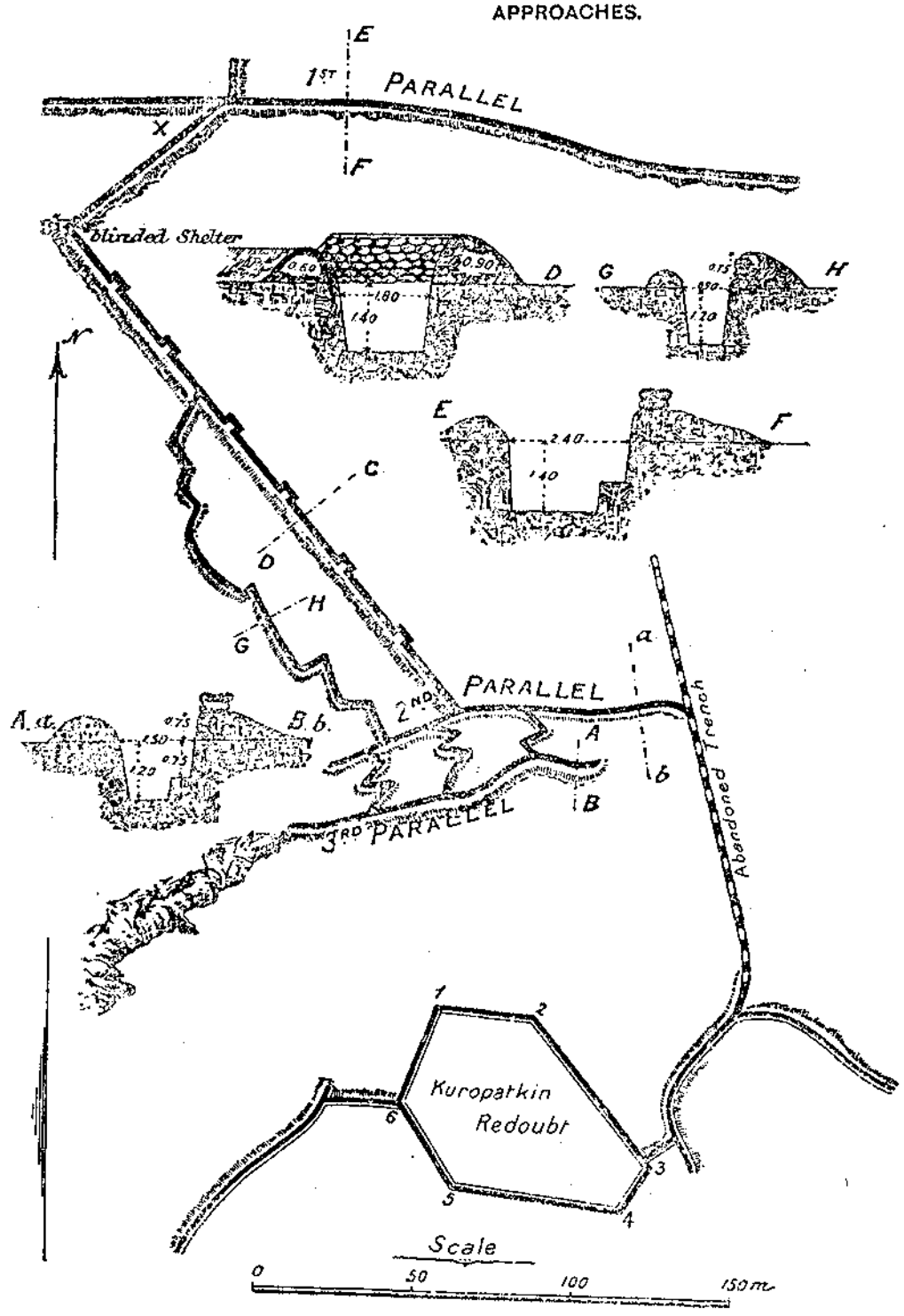
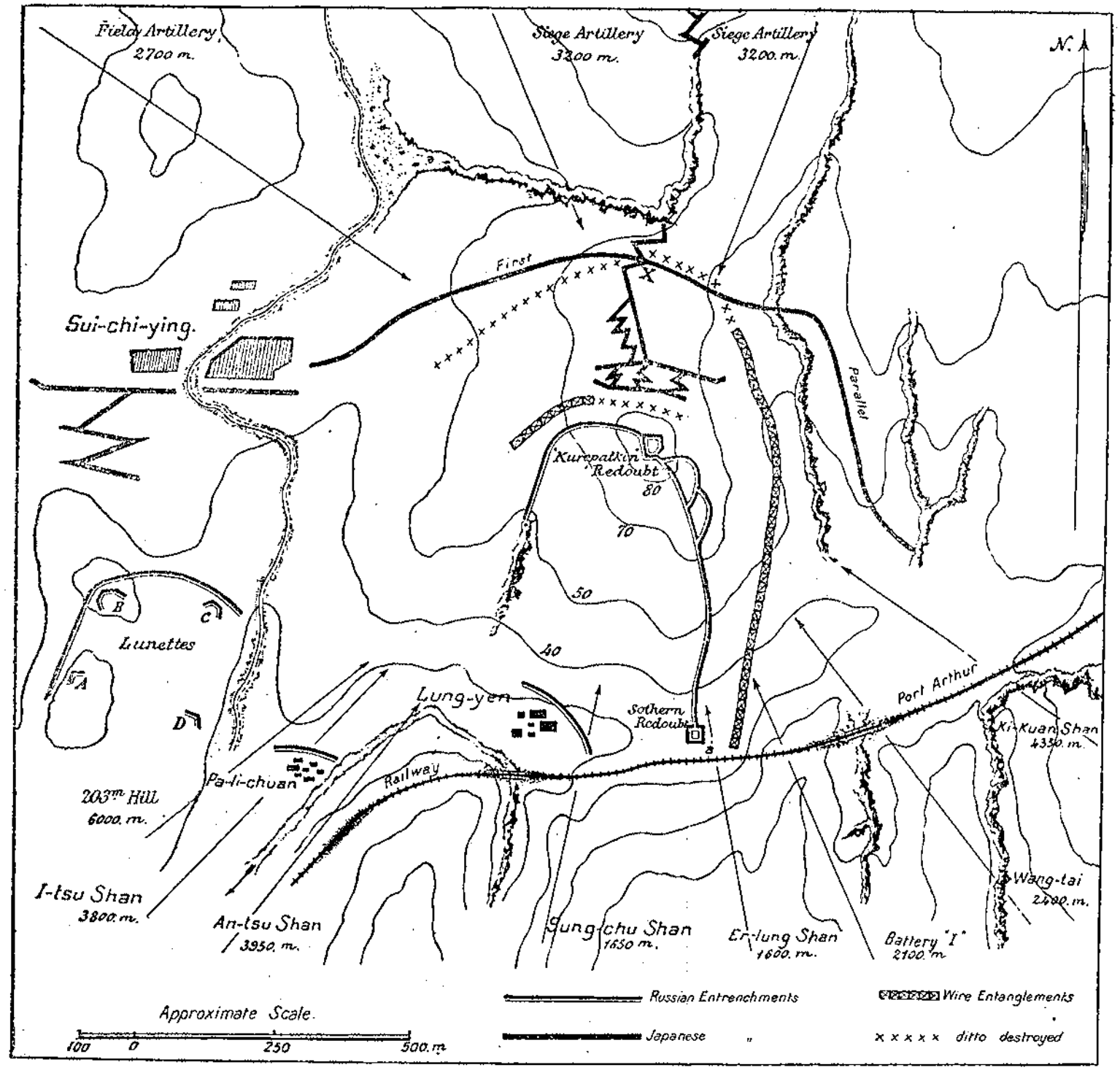


PLATE V.

GENERAL SKETCH OF THE ATTACK AND CAPTURE OF THE KUROPATKIN REDOUBT (19th September, 1904).



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