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The following are on Sale at the Royal Engineers Institute, Chatham:—

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

Bridge 124½ ft. span built by a detachment of —— Field Co., R.E. Clear span of main girders, 65 ft.

Bridge Construction on the Field

BRIDGE CONSTRUCTED IN THE FIELD TO CARRY MOTOR LORRIES, ETC.

THE bridge was built by a detachment of the —— Field Company, R.E., to take the place of a steel bridge, carrying a road and tramway, that had been destroyed by the Germans. The damage done to the steel bridge can be seen from the accompanying photograph. Communication had been restored at first by a pontoon bridge at another site 200 yards away, but as the approaches were very bad in wet weather and there is a considerable amount of heavy motor traffic a better bridge was needed.

A timber yard containing plenty of deals, 9 in. by 3 in. and under, was close at hand and an engineering shop with a small stock of steel bars and plate was available in the town, so a timber bridge with steel ties was decided on.

At the bridge site the canal runs through a cutting there being a towpath on each side in the cutting. The waterway had to be kept clear and the French Engineers laid down 2·20 metres as the minimum headroom between water level and the bottom of the booms. A little more has actually been given. The total span is 124½ ft. and the bridge is made in five spans, thus leaving a passage along each towpath and avoiding the necessity for big girders in the approach spans. The bridge was designed to take a motor lorry with 13-ft. wheel base, 17,000 lbs. on one axle and 7,000 lbs. on the other.

The cross-bracing in some of the panels is unnecessarily strong, but it was simpler and quicker to use the same section of flat bar steel throughout, as only a few men were available for the steel work. The local shops had not got a large stock of any particular size of bolt, etc., so the bolts and coach-screws in joints vary somewhat in size, and accurate fitting was impossible. 1½-in. camber was given to each girder.

The bridge was within easy shell range of the enemy, but shelling was considered unlikely so the girders were built on the south towpath. German aeroplanes came over once or twice, but the working party took cover and no shelling followed.

Each girder was built lying flat. It was then shifted till one end was near the crib pier and turned up on edge. The weight at the end next the pier was taken by a differential tackle attached to a derrick placed just behind the pier. A strutted " shoe " was fixed about 18 ft. from the other end of the girder to assist in

keeping the girder upright. This end was then slid out on to a barge on the end of which a small level platform had been prepared for the shoe to rest on. The barge was then moved across the river, the girder pivoting on the shoe which moved easily on the platform. Arrived at the other bank the projecting end of the girder could be easily reached and lifted by another derrick placed behind the north crib pier. Only a small working party was available and delays therefore occurred owing to squads having to be shifted from one tackle to another, but otherwise no difficulty was encountered in moving the girders. Each weighed 2 tons.

Work was actually in progress for 20 days. The working party, except a few men, was withdrawn for one whole day to rebuild the pontoon bridge and on three afternoons besides for other work. The derricks had also to be dismantled in the middle of the work and re-rigged again as the tackles and some of the guys were urgently required for other work. The time-table worked out approximately as follows :—

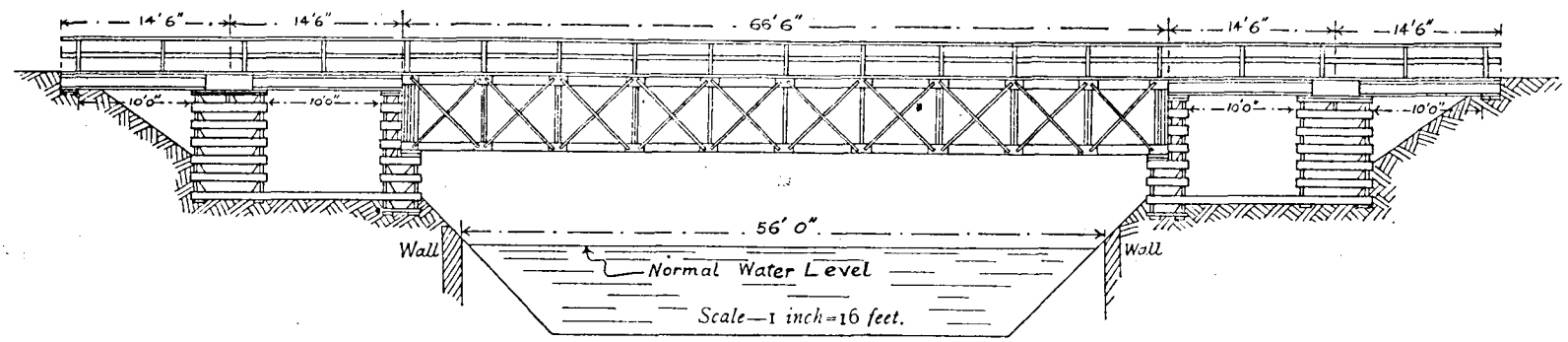
		Time Occupied from Commencement.
1st day.	Work commenced.	
9th ,,	First girder in position	700 man-hours.
10th ,,	Second ,, ,, ,, ...	1,000 ,,
12th ,,	Third ,, ,, ,, ...	1,300 ,,
13th ,,	Fourth girder in position and roadway part done	1,500 ,,
16th ,,	Bridge ready for foot traffic ..	2,000 ,,
17th ,,	Bridge ready for wheel traffic ..	2,000 ,,
20th ,,	Handrail completed	2,000 ,,

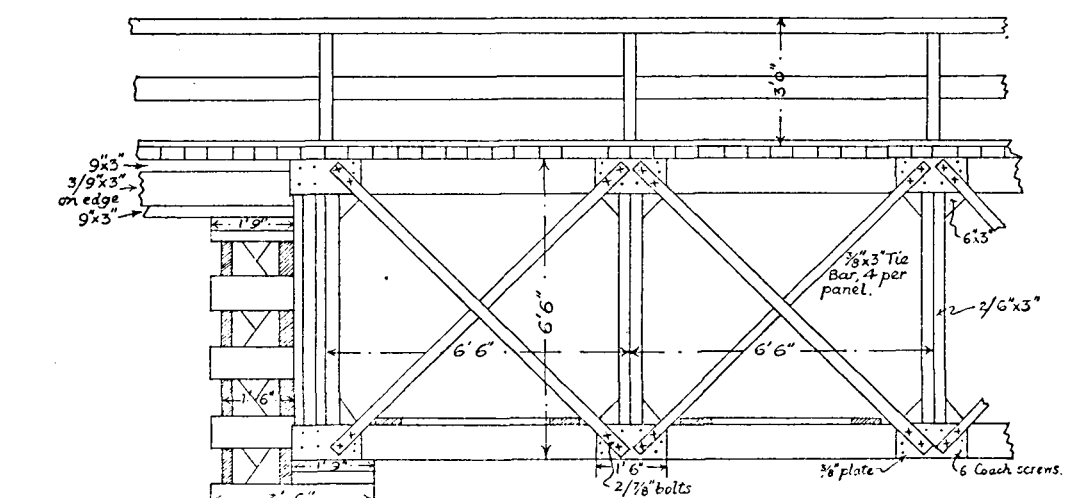
Since it has been built the bridge has been loaded at different times with an 8-ton dray and infantry in fours at a check and has proved quite stiff.

Experience with this bridge suggests that in similar circumstances a bridge having only two girders instead of four and the roadway borne on the lower booms would be preferable as the steel work in the girders would be easier to make and adjust and the time spent in launching girders would be reduced, provided of course that there was tackle available which could deal with the heavier girders. In the present case the differential tackles used could only just manage to lift the 2-ton girders, so heavier girders were out of the question.

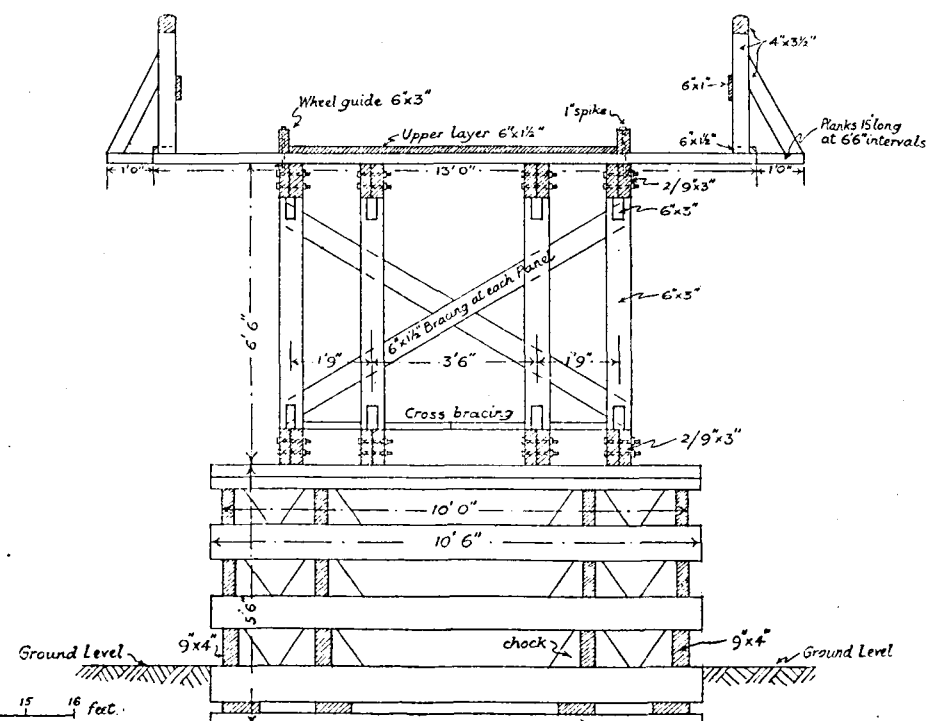
BRIDGE CONSTRUCTED IN THE FIELD TO CARRY MOTOR LORRIES, ETC.

WOODEN GIRDER BRIDGE (SPAN=124 FT. 6 IN.) ERECTED BY A SECTION OF A FIELD COMPANY, R.E.





ELEVATION.



SECTION.

Scale—½ inch=1 foot.

Inches 12 6 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 feet.

ENGINEER TRAINING OF THE JAPANESE ARMY.

By the courtesy of the Japanese Military Attaché we have been enabled to reproduce extracts from the translation made by Capt. F. S. G. Piggott, R.E., of the above important work.

(*An instalment appeared in the R.E.J., Feb.*).

Technical Training.

General Rules.

167. The object of technical training is to train officers and men, to inculcate a strict observance of discipline, and to develop a martial spirit, so that all ranks may be able to carry out their technical duties accurately and rapidly, and with mutual co-operation.

168. During technical training individual engineers will often be employed on different work, and it will often happen that the men are divided into squads and parties, scattered over a wide area. Even on these occasions, engineers who have strict discipline and strong spirit can rigorously observe the various regulations, and carry out their work in a reliable manner.

169. In technical training it is important that all ranks are thoroughly trained to complete their work rapidly, so that it is of practical use in accordance with the object in view. Everyone must be warned against embellishing their work unnecessarily, and against wasting time.

170. As regards the details of technical training, the rules of the handbooks concerned will be followed.

171. In technical training, the assembly, dressing, and movements follow the rules laid down for dismounted training, the parade march will not as a rule be employed. When bulky stores are being carried, the intervals and distances between the men may be increased as necessary, and the words of command used in skirmishing drill employed for marching and halting.

Section 1.—Individual Training.

General Principles.

172. The object of individual training is to make each individual man proficient in carrying out his work correctly, as a member of his squad, and so lay the foundation for unit training.

173. Each branch of fieldworks should always be taught independently; as the work which engineers have to learn, however, is very varied, special efforts must be made to render all ranks proficient and to raise the standard of training, in the most important branches, bearing in mind the demands of war. Paragraphs 183 to 215 of this section are framed on this principle.

174. Individual training in fieldworks will be begun when the men have acquired a fair knowledge of dismounted individual training. At first old soldiers should be made to carry out the work, and the principles inculcated by explanations given by means of the actual materials, or models.

175. The way in which each individual soldier carries out his work has a very close connection with the progress and result of the whole work; for this reason it is essential that instructors should fully explain to each soldier his heavy responsibility, at the same time as they are carefully and thoroughly carrying out the training.

176. In carrying out individual training, it is essential that the men should first grasp the functions of the tools and stores, and learn thoroughly the methods of carrying and using them.

177. A certain amount of latitude should be allowed to the men as regards their positions, attitudes, and methods of handling the tools and stores; work will thus be made easier, and the carrying out of the duty facilitated.

178. The men must keep their ears and eyes especially alert at night, and must be able to work quietly and accurately, even to temporarily improvised signals; for this reason the various kinds of operations must be frequently taught at night, and the men made thoroughly proficient in them.

179. To cause the men to take up their positions for work, the positions will, if necessary, be pointed out, and the following word of command given: "Take Post." The men will then take post as directed, carrying their tools and stores, and stand to attention.

180. To commence work, after the necessary instructions as regards methods to be adopted, etc., have been imported, the following word of command will be given: "Commence Work." The men, if carrying rifles, will place them near by, and immediately begin on the work entrusted to them.

181. To cease work the following word of command will be given: "Cease Work." The men will cease work, and come to attention in their positions, with their tools, or stores, in their hands.

182. When attacked by the enemy while at work, if it is desired to cause the men to take up their rifles which are lying near, the following word of command will be given: "Take Up Arms." The men will cease work, lay down their tools, take up their rifles, and proceed to the positions previously ordered.

Field Fortification.

183. When training in field fortification, the principal subjects in which the men must be made proficient are digging, the construction of shelter and fire trenches, and of machine-gun emplacements, and the preparation of shelters and obstacles.

184. As regards digging, the men should be exercised in the excavating and heaping of earth, and the grading of slopes; their digging powers must also be thoroughly developed.

185. As regards shelter and fire trenches, the men should excavate them of various sections, and should be especially trained in the formation of the superior slope, the elbow rest, the interior slopes, and other important parts; they should also be practised in the methods of enlarging the trenches.

186. As regards machine-gun emplacements, the men should be trained in constructing them inside fire trenches, and also in isolated positions.

187. As regards shelters, usually some simple type should be selected, and the men trained in its construction inside a fire trench, during the digging of the latter, and also after its completion.

188. As regards obstacles, the principal ones are wire entanglements and abatis. In the case of the former, the men will be practised in the driving of posts, and the stretching and fastening of wire; and of the latter, in the preparation, arrangement, and fixing of the trunks and branches of trees.

189. Training should be carried out at first on simple terrain, and in good soil; the excavation of shelter and fire trenches, and of machine-gun emplacements, and the construction of shelters, should be carried out after the men have become generally proficient in digging.

Bridging.

190. When training in bridging, the principal subjects in which the men must be made proficient are rowing, connecting up, casting anchor, and the use of the trestles, baulks, and chesses of a bridging train.

191. As regards rowing, the men will be practised in the propulsion of pontoons, and wooden boats, by means of oars and poles; the men should be able to propel a boat freely even in a swift current.

192. As regards connecting-up, the men will be practised in the various methods by means of rope, cord, wire, and dogs.

193. As regards casting anchor, the men should be practised in throwing the anchor, and in the handling of the anchor-cable; this training should be carried out after the men have acquired some skill in rowing.

194. As regards the use of trestles, baulks, and chesses, the men should be practised in their transport and arrangement: the latter should be carried out after the men have acquired a general knowledge of transportation work.

195. Training should be carried out at first in slow currents: also, in the case of those things which can be practised on land, the men should have the main points inculcated there.

Demolitions.

196. When training in demolitions, the men must be made proficient in the preparatory work, and also in the actual carrying out of demolitions.

197. As regards the preparatory work, the men will be practised in the packing of explosives, in the adjustment of the system of ignition and detonation, and in the connection of the latter with the fuze, electric wire, etc.

198. As regards the actual carrying out of demolitions, the men will be practised in the conveyance of the charge, in placing it in position, and in igniting it.

To place the charge in position, the instructor will indicate the place and method, generally on some simple object of wood, iron, concrete, etc., and then cause the men to carry it out.

Ignition, especially ignition by means of safety fuze, must be frequently practised, so that the men may be able to execute it calmly, and with absolute certainty.

199. Delicate handling is necessary in all demolitions; consequently the men should be accustomed to execute them with the greatest care, and be made to understand that when the explosive, and system of ignition, are properly handled, no danger can arise.

200. Training should at first be carried out with dummy explosives, detonators, fuzes, etc.; next the detonators only should be real, and finally a small charge should be used; in this way the main principles will be instilled into the men.

Work during an Assault.

201. When training in work in connection with an assault, the men must be made proficient in the demolition of obstacles, and in the use of appliances employed in an assault, and of hand grenades.

202. As regards the demolition of obstacles, the men will be chiefly practised in the destruction of wire entanglements and abatis, by means of tools, and also of explosives.

203. As regards the use of appliances employed in the assault, the men will be chiefly practised in the handling of leaping poles, ladders, and portable bridges.

204. When destroying obstacles by means of appliances employed in the assault, it is important that the men should attain proficiency in avoiding being seen and heard by the enemy, and in working as silently and rapidly as possible.

205. When using a hand grenade, the men must choose a suitable spot and attitude, so that they may be able to hurl it at the desired point.

206. Training with hand grenades should be carried out against works with a ditch and flanking support, and provided with other kinds of obstacles.

Sapping.

207. When training in sapping, the men must be made proficient in the construction of shallow, deep, and underground saps.

208. As regards the shallow saps, the men will be practised in their excavation, and in pushing forward the head of the sap, keeping as near the sap-head as possible, and working in a stooping position; they must be made to work so that they can conceal from the enemy's attention as much as possible both the throwing out of the excavated earth, and the advance of the sap-head.

209. As regards the deep and underground saps, the men will be practised in their excavation, and must be made to work in such a way that they will not be discovered by the enemy.

210. Training should be carried out at first as much as possible on flat, open ground, and a skeleton enemy should always be provided.

Mining.

211. When training in mining, the principal subjects in which the men must be made proficient are the construction of galleries and shafts, and the use of the boring machine.

212. As regards mining, the men should be practised in the excavation of as wide branch galleries, and shafts, as possible, and in the fixing of the frames and boards sheeting. The construction of branch galleries will be principally practised, when working straight to the front, and horizontally.

213. When driving a mine, it is of the first importance to preserve the direction, and level, accurately, and to place the frames and sheeting securely; for this reason the men must work with very great care, even as regards the smallest detail, in connection with these points.

214. In using the boring machine, the men must maintain the desired direction accurately, and be able to bore as deeply as possible.

215. Training should usually be carried out in favourable soil.

SECTION 2.—COMPANY TRAINING.

General Principles.

216. The company is the unit as regards technical work. The object of company training is the maintenance of firm co-operation, so that the company may be able, whatever the circumstances, to carry out its various technical duties with accuracy and dispatch, and in accordance with the wishes of the company commander. When a company is well trained, it will be able, by applying the methods it has already learnt, to carry out work in a suitable way, even though it has not yet been exercised in this particular work.

217. In carrying out any work the company is usually divided into detachments, and if necessary special squads and a reserve detachment are told off. A detachment is subdivided into squads, and if necessary a reserve squad is again told off. The squads may be again subdivided into parties, according to requirements.

Detachments are commanded by officers, and squads by N.C.O's. When there is a shortage in these ranks, the commander of a detachment may be the special sergeant-major or a senior N.C.O., and the commander of a squad may be a superior soldier. For a party, a commander is not usually detailed.

According to the situation, when there is no necessity to divide the company into detachments and squads, the normal organization of sections and groups will hold.

218. In order to prepare for company training, every part of the work will be taught by squads or detachments, in accordance with the regulations laid down in this section.

219. The company commander, in order to direct his company, makes use of orders, or words of command.

220. When beginning work, the company is usually assembled in one place and makes all preparations; this place must be chosen as near as possible to the working area, covered from the view and fire of the enemy, and at a spot convenient for the unloading and distribution of tools and stores from first-line transport. First-line transport, however, may, according to the circumstances, be located at a spot separated from the company's place of assembly.

221. On arrival at the place of assembly, accoutrements and equipment will usually be discarded, and, should the situation permit, arms also will be laid down; such of the portable entrenching tools as may be required will then be taken, and stores and tools distributed from first-line transport. When the position of the latter is at a distance, however, stores and tools will be distributed there beforehand.

222. The issue and receipt of tools and stores from the first-line transport will usually be made to each detachment and squad in rotation.

223. To move the company to the working area to start work, the whole company may be moved simultaneously, or by detachments or squads, according to circumstances.

224. When it is necessary to arrange for protection by the unit itself, during any work, patrols should be sent out, or look-out men posted, in the direction from which danger threatens.

The Duties of Officers, N.C.O.'s and Men.

225. When about to carry out any work, the company commander, with such officers and orderlies as he may require, should go forward and carry out any reconnaissance necessary. On these occasions the command of the company will usually be delegated to a section commander, who will be given instructions as to the place of assembly, direction of march, etc.

226. In carrying out a reconnaissance the company commander should employ the officers he has with him, in addition to working himself; for this reason he must clearly point out to these officers the object of the reconnaissance, their duties, if necessary any special points to which they should pay special attention, and the time and place at which he will receive reports.

227. The company commander, basing his plans on the result of the reconnaissance, will determine the type and extent of the work to be carried out, the order in which it is to be begun, the *personnel* required, the time allowed, and the distribution of tools and stores.

228. The company commander will consider the convenience of control, and the difficulty of the work, based upon his scheme; when the whole company is carrying out practically identical work, he will divide up the area in his charge, and split up the company into several parts; when every one is carrying out different work, he will usually organize detachments to meet with the several requirements of each different type of work.

When identical work is carried out continuously for a long time, the maintenance of the working power of the company should be chiefly considered, and the company organized into several detachments, to relieve one another.

During the course of the work, when there is anything requiring special technical knowledge, men with these qualifications should be collected, and organized into a special squad.

229. The company commander should issue his orders at the place of assembly, in the working area, or, at times, on the line of march; having told off the company, allotted tasks, distributed tools and stores, and, if necessary, pointed out any important points in connection with the actual carrying out of the work, he will cause the men to begin work.

When the company commander has told off the company, the special sergeant-major, the company-sergeant-major, the quarter-

master-sergeants, and buglers will remain with the company commander. The special sergeant-major will, according to circumstances, be detailed for the distribution of tools and stores, and the buglers will be attached to detachments as required.

230. The company commander should post himself in the most convenient place for directing the whole of the work, and endeavour to complete it rapidly and accurately.

He will report to the superior commander at suitable times the progress of the work, and, if necessary, the condition of the enemy; he will also inform the commanders of any other units concerned, and it is essential that he should notify the detachment commanders of his own unit as to the enemy's condition. Commanders of detachments and squads should follow the same procedure.

231. When continuing work for a long time, the company commander, if the situation permits, must stop work at convenient times, assemble the whole company, either together, or by detachments, give them the proper amount of rest, and take steps to restore their *morale* and strength.

232. It often happens that orders from the superior commander do not arrive at the proper time, consequently the company commander must be experienced in dealing with things on his own initiative, in accordance with the situation.

233. Detachment commanders will carry out their work accurately, in accordance with the company commander's orders, and are responsible to the latter for its progress, and result.

A detachment commander will, if necessary, subdivide his detachment into squads, assigning to these their duties, detailing them to their posts, and giving them the order to begin work; he should supervise the actions of all ranks, from squad commanders, downwards.

234. A squad commander will, if necessary, subdivide his squad into parties, he will set the men to work, and see that they follow the regulations for the particular work upon which they are employed, and that they use their tools and stores properly; if he should specially notice the necessity, he will himself join in the work.

235. Whenever difficulties are encountered, officers and N.C.O.'s must still further redouble their efforts, and always stimulate and stir up the spirits of their men; especially when they are engaged in work upon which the final issue of an engagement depends, they must bring to bear all their strength of mind and body, take a leading part themselves, and exert themselves to the utmost of their power to achieve the object of the work in hand.

236. During the progress of any work, the transmission of orders, messages, and reports must be extremely accurate and rapid, consequently it is essential that officers and N.C.O.'s in particular

should consider the various methods of transmission and their efficiency.

237. Work may be carried out after a long march, after excessive exertion, and when suffering from want of food and rest; there are also many occasions when the work lasts for several days and nights. The men should therefore be sturdy and calm, with plenty of self-reliance and patience, so that they can perform their tasks quietly and coolly even in the most dangerous and difficult conditions.

238. When a soldier is wounded, and unable to continue work, or loses the unit to which he is attached, he should act in accordance with the principles of paragraphs 117 and 118.*

Field Fortification.

239. During training in field fortification, the preparation of the various kinds of works used in the attack and in the defence must be mastered.

240. The principal arrangements for defensive fortification are the preparation of infantry, artillery, and machine-gun positions, clearing the field of fire, and the construction of obstacles. Work is generally carried out in this order; according to the situation, however, there are times when it is necessary to clear the field of fire first, before the construction of cover.

241. In the construction of infantry, artillery, and machine-gun positions, the company commander should select a defence line, which will, in the first place, enable him to develop fire effect, which will not be observed by the enemy, and which conforms to the general configuration of the ground.

242. In an infantry position, fire trenches, and if necessary, shelter, and communication, trenches will be constructed.

Fire trenches should usually be constructed for firing standing; therefore, if a simple cover trench has been constructed when time presses, it must be at once improved as soon as the situation permits. When there is plenty of time available, however, and also in the case of *points d'appui* of the position, enlarged fire trenches will usually be constructed in the first place.

* 117. Men wounded, and unable to continue in action, will hand over their ammunition to their comrades, and, waiting for the order from their commander, slowly withdraw from the firing line.

118. A soldier may not leave the unit to which he is attached without permission; to leave the firing line independently, when without any special duty, or when slightly wounded and still able to continue fighting, or to tend or carry away the wounded during an action without orders, is cowardly conduct and harmful to the duty of a soldier.

Should a soldier lose the position of the unit to which he is attached, he should at once join a unit fighting in the neighbourhood, report to its officer, and obey his orders; when the action is over, however, he must immediately return to his own unit.

Cover trenches will, according to circumstances, be close to the fire trenches, so that the troops in rear may be able to reinforce the firing line without losing a moment; communication trenches will keep such a direction that they can avoid the enemy's enfilade fire. Both types will be constructed so as to utilize as much as possible local ground objects.

In both fire and cover trenches, a sufficient number of simple traverses, shelters, and if necessary parados, should be constructed, to limit as far as possible the effect of splinters and bullets from the enemy's shells; their number and arrangement must be decided after considering the direction of the enemy's fire, and the configuration of the ground.

243. The trace of a fire trench is the basis of all preparations for fortification, and should therefore be the first thing undertaken; it is usually sufficient to indicate the crest line of the work by some simple method. In the case of a work of large and powerful section, the position should, if possible be surveyed beforehand, and a sketch made, the trace and profile must then be marked out where necessary, in accordance with the sketch.

244. In the preparation of an artillery position, cover for the gunners, observation posts, epaulments for the guns, and, if necessary, shelters for the officers and N.C.O.'s, should be constructed, and arrangements should be made for intercommunication between the epaulments.

245. In the preparation of a machine-gun position, cover for the gun platforms, for the guns, for the ammunition, and for the gunners, should be provided; if possible overhead cover should be constructed also, according to the site of the position.

246. In infantry, artillery, and particularly machine-gun positions, the works should be as much as possible covered, and also disguised. When arranging dummy trenches, special care must be given to their siting and method of construction.

247. In the case of positions which are to be defended for several days, the fire trenches in particular should have a large and powerful section, and there are times when cover for the ammunition carts should be provided for the artillery. If necessary, arrangements will also be made for night firing, and for observation; for communication posts and for dressing-stations, for depôts for ammunition and hand grenades, and for drainage and other accessories.

248. In clearing the field of fire, the company commander should determine the area and extent it is to be cleared, so that as extensive a field of fire as possible is obtained, and at the same time our position not exposed to the enemy, nor our fire obstructed. Work should usually be begun near the firing line, and gradually extended in the direction of the enemy.

Whilst clearing the field of fire, ranges should be taken to

important points; these points, will, if necessary, be marked. A base line, by means of which other ranges may subsequently be taken if required, should be laid down inside the work.

249. In constructing obstacles, the company commander should select places where the enemy might easily approach our position, where it would be difficult for them to detect the obstacles, and where it would be possible to protect adequately the obstacles against schemes for their destruction. They may be suitably sited about 30 metres in front of the firing line, so that even at night, and in fog, they may be fully protected.

The company commander should select obstacles as easy to construct as possible, and of the greatest effect, bearing in mind the configuration of the ground, and the stores available. Wire entanglements and abatis usually meet these requirements, and are, in consequence, often used; but ditches, inundations, stakes, pits, fougasses, etc., may be utilized according to circumstances.

250. In the preparation of infantry, artillery, and machine-gun positions, and in clearing the field of fire, work should be divided according to the particular area; in the construction of obstacles, the tasks allotted to each detachment should be settled according to the class of work.

251. In offensive fortification, the most important arrangements are the construction of the attack position, and the communication trenches.

252. In an attack position, the enlarged type of fire trench will, as a rule, be first constructed; this should subsequently be further enlarged so as to facilitate the defence of the position, the assembly of the troops, and communication; traverses and shelters should be constructed if necessary, and obstacles prepared at important points. In the case of the position from which it is intended to launch the actual assault, in particular, the width of the trench should be enlarged so as to be suitable for the assembly of the assaulting column; places for the tools and stores used in the assault, and steps for egress, should be constructed, and, if necessary, further provision of cover made.

253. Communication trenches should be originally constructed so as to be suitable for the passage of infantry in single file, at least; they should subsequently be enlarged in accordance with the class of troops by which they will be used.

254. A proportion of artillery is sometimes specially placed inside an attack position; a position for them, with ammunition recesses, traverses, shelters, etc., must therefore be constructed, and communication trenches enlarged so as to admit of the entry of the guns.

255. In constructing an attack position, and its communication trenches, the company commander will reconnoitre beforehand the

line of the work, the approaches to it, and the halting places. The line of the work should be traced, as far as possible, at dusk, and, if necessary, the entrances marked.

256. The company commander should tell off the company, distribute tools at the tool depôt, and proceed to the halting place; if necessary he should there issue further detailed instructions, and, when opportunity offers, lead his men into the working area.

257. The distribution of the company along the trace of a work must be carried out quietly and accurately. The company commander, therefore, bearing in mind the situation, and, in particular, the configuration of the ground and the degree of darkness, should advance his men to the trace in column to a flank, either as a whole company or by successive detachments; each file should then be posted in succession, or the company disposed as in extended order.

258. When a company begins to prepare an attack position, some cover by which to oppose a sortie on the part of the enemy should first be constructed, and subsequently an enlarged fire trench should be prepared. When this has been completed, the company will, as a rule, be relieved.

259. The relieving company should continue the enlargement of the trenches, and, as required, construct traverses, shelter and other accessories, either concurrently, or after completing the trenches; the necessary obstacles should also be prepared.

260. When it is wished to prepare an attack position in small portions at a time, unknown to the enemy, the company commander should employ several small working parties; these will each construct a portion of the work, making use of, as far as possible, ground objects in the vicinity, and also works abandoned by the enemy, craters formed by high-explosive shells, etc.: the portions so constructed should subsequently be joined up.

261. Communication trenches should, if possible, be constructed at the same time as the attack position, and be subsequently enlarged by the relieving company.

Bridging.

262. During training in bridging, the construction of bridges by means of column, and improvised, stores, must be mastered, as well as the various arrangements for the passage of a river.

263. Bridging with column stores will usually be carried out when it is necessary to complete the bridge quickly, and especially in the presence of the enemy; it is the usual rule to bridge with improvised stores when there is no urgency in the situation. Auxiliary means of crossing a river will usually be adopted when the bridging stores available are insufficient, or when the number of men, horses, and vehicles to be conveyed across is small.

264. In constructing a bridge it is usual to build each bay in succession from the near bank; when the river is wide, however, or it is necessary to build the bridge quickly, it should be constructed from both banks simultaneously, should the situation permit. In the case of an exceptionally large river, it is advisable to establish several strong fixed points in the stream, and to build from these as starting points.

265. Actual bridging should usually be begun after all preparations have been finished; this is especially the case when in the presence of the enemy. The preparation of the entrance, and especially of the exit, may however be undertaken, even while bridging work is in progress; there are occasions, also, when work may be begun on the bridge although the preparations are not all completed, should there be sufficient men to carry out the preparations, and actual bridging, simultaneously.

266. The company commander should settle upon his plan for bridging, after making a reconnaissance of the site, and carefully surveying the river; he should first decide where the bridging column is to form up, and if necessary prepare an approach to this place.

267. The company commander will organize a certain number of detachments to arrange the bridging stores, to carry out the actual bridging, and, if necessary, to prepare the approaches on either side.

When improvised stores are used, he will, in addition to the above, detail the necessary detachments to collect and transport *matériel*, and he should form special squads for carpenter's, and, if necessary, smith's, work, in order to prepare the material for the piers and superstructure.

268. The company commander will indicate to each detachment commander the position of the bridge, and, if necessary, the measures to be taken to conceal operations from the enemy. To the commander of the detachment responsible for arranging the stores, he will show where the bridging column is to form up, where the stores are to be placed, and how they are to be issued and transported; to the commander of the detachment responsible for the actual bridging, he will show the axis of the bridge, the line of the anchors, the type of piers, and the method of anchoring, etc.; to the commander of the detachment responsible for the construction of the approaches, he will show the base line of the road; after which, work will be begun.

When improvised material is used, he will, in addition to the above, indicate how the material is to be collected and transported, and how the piers and superstructure are to be constructed, and incorporated in the bridge.

269. The detachment responsible for arranging the stores will first receive them from the bridging column, and then bring them to the store depôt ; they should lay out the stores in an orderly manner, so as to avoid confusion and delay when the bridge is about to be constructed.

270. The detachment responsible for the construction of the bridge will first clearly mark out the axis of the bridge, and the line of the anchors ; the shore end will then be constructed, and the pontoon piers, and anchor boats, etc., prepared. During work on the bridge, the axis, in particular, must be carefully maintained, the anchors securely fixed, and the superstructure firmly connected.

271. The detachment responsible for the preparation of the approach to, and exit from, the bridge, must specially bear in mind the passage of artillery, and make the approach and exit of suitable gradient and curve, so that the bridge may not suffer from violent shocks.

272. In order to transport troops across a river by auxiliary means, the following methods should be adopted, according to the situation, and, in particular, the condition of the river, and the quantity of bridging materials available, etc., viz. : flying-bridge, (*keiryū-watashi*, Fr. *pont-volant*), ferry-boat, (*kwakkō-watashi*, Fr. *bac à traille*), hauling a boat along a cable stretched from bank to bank, (*kurizuna-watashi*, Fr. *va et vient*), or rowing, (*kogi-watashi*, Fr. *passage à la rame*). The last-mentioned method is convenient for effecting the passage of large numbers of men simultaneously.

273. To pass troops over a river by rowing boats, the company commander should reconnoitre the condition of the river, and the configuration of both banks ; he should bear in mind the number of boats available, and the time required for a boat to cross and return, and fix upon as many places of embarkation and landing as possible ; he should decide on the intervals between these, in accordance with the speed of the current, and the breadth of the river ; and, so that he can control the crossing with certainty, he will tell off to several of these places one detachment, and allot the necessary boats and rowers. In order to prevent confusion, he will indicate the general course required to be taken across the river by each detachment going and returning ; if necessary he will erect marks for this purpose.

He should also inform the officer commanding the troops who are being sent across the river regarding the number of parties to be taken across at the points of crossing of each detachment, their place of assembly, the method of embarkation, and also any points in connection with the crossing ; and he will see that his instructions are carried out accurately.

Communications.

274. When training in communication work, the construction and repair of roads, the preparation of observation posts, and the cutting (demolition) of roads, railways, and telegraphs, must be mastered.

275. When making a road during field operations, it is generally necessary to complete it in a short space of time; it is limited, therefore, to simple work, and is rapidly constructed, making use of the natural surface of the ground as much as possible. Occasionally there are times when it is sufficient to construct some cover from view and fire, or to erect some marks to show the way. When roads have to be used for a considerable time, however, they must be strongly constructed, and full provision made for drainage. The above principles apply also to the repair of a road.

276. In constructing a road, the company commander should select the shortest possible distance for the guiding line, bearing in mind the purpose for which the road will be used, the difficulty or otherwise of the work, and, if necessary, the extent to which it should be concealed from the enemy's view. On the other hand, there are occasions when, by using a circuitous route, the work is slight, and the passage of the troops easy. In the case of marshy or soft ground, there are times when it may be better to rely on bridges.

277. In order that the whole length of a road may be completed about the same time, the company commander should divide it into sections for work, and allot detachments to these sections. In the case of a very long road, the sections for work will be so divided that portions of the road may be finished successively.

When it is necessary to construct anything requiring special technical skill, special squads for carpenter's and mason's work, etc., will be formed.

278. In making arrangements for observation, the configuration of the ground should be considered, and places selected where there is an extensive field of view, where all important points can be properly kept under observation, and where it is easy to avoid the enemy's notice.

In order to observe accurately one particular point a long way off, several observation posts must be prepared.

279. In cutting roads, railways, telegraphs, etc., the company commander should, to the best of his power, select places extending over a considerable area, and where repairs and deviations are as difficult to carry out as possible.

In the destruction of roads or railways, most advantage is gained if it is carried out at bridges and tunnels. In the case of roads, in addition to the above, roads of steep gradient at the side of a hill, raised and sunken roads, marshy ground, causeways, etc., should

be chosen; and in the case of railways, curves, embankments, cuttings, and stations, should be selected.

In interrupting telegraphs and telephones, it is best to cut the poles, and wires, at a bend in the line; it is particularly effective to cut underground wires, and destroy signal stations.

280. In destroying roads, railways, telegraphs, etc., the company commander will select the method to be adopted, after considering the situation, and, in particular, the urgency or otherwise of the occasion, and the stores available.

281. In the destruction of roads, railways, etc., the company commander should divide the whole length into sections, and allot detachments to each section.

282. In connection with the cutting of roads, railways, and telegraphs, the instructions given in *Field Service Regulations* should be followed.

Work during an Assault.

283. During training in the conduct of work during an assault, the destruction of obstacles and of the arrangements for flanking protection, and the provision of means to cross the ditch, so as to open a path for the assault, must be mastered. It is also very important that officers and N.C.O.'s should be trained in reconnaissance work in connection with the above.

284. Among the various kinds of obstacles, wire entanglements are destroyed by means of tools or explosives; sometimes they may be crossed by covering them over with some suitable material.

The counterscarp, and the arrangements for flanking protection are blown up by means of underground mines; in the case of those of simple construction, however, they may be demolished by means of explosives placed against the surface. In order to render flanking protection temporarily useless, material emitting a dense smoke when lighted may be thrown into the loopholes to hinder the enemy's actions.

In order to cross the ditch, leaping poles, ladders, portable bridges, etc., are usually used.

285. The route for an assaulting party must be made wide, so that they may be able to cross on as broad a front as possible. The minimum width must not be less than 3 metres.

286. The company commander should employ several patrols in order to reconnoitre the state of the obstacles, and of the arrangements for flanking protection, and give to each as simple a mission as possible. When sending them out, advantage should be taken of fog, darkness, or favourable opportunities during the artillery bombardment; each patrol should be made to submit a scheme, based on a careful reconnaissance, showing the places selected, and methods proposed, for demolition, or for crossing.

A patrol should consist of a few men under an officer; but according to the situation there are occasions when a single individual is employed.

287. The company commander, as a result of the reconnaissance, should be quite clear as regards the state of the obstacles, and the arrangements for flanking protection. Bearing in mind the condition of the enemy, the object to be attained, and the degree of light, he should determine the number of routes to be prepared for the assaulting parties, their positions, the time, and the method to be adopted.

288. To prepare a route for an assaulting part, the company commander should organize a certain number of detachments, corresponding with the number of assaulting columns; the position, extent, and method of construction of these routes will be indicated to the detachment commanders, all preparations should be fully made and work begun immediately the moment for doing so arrives.

289. The detachment commanders should organize a certain number of squads, corresponding with the number of lines of obstacles, so that there is one squad to each line; the strength of each squad should not be more than the minimum necessary.

290. A detachment commander should push on ahead, leading the squad detailed for work on the nearest obstacles; when the first line of obstacles has been destroyed, he should advance the second squad, and move it to the front in succession.

291. When intending to clear a route for an assaulting party unknown to the enemy, and being discovered by them half-way, the men must never falter, but boldly continue advancing, even though subjected to a deadly fire. In addition to this, officers and N.C.O.'s should take the lead, and stimulating the men by their intrepid conduct, use their utmost endeavours to accomplish the task.

292. Each squad, when it has attained its object, should immediately report the fact to the detachment commander; the squad remains on the spot, completing its work, and only retire on the order of the detachment commander.

293. When the actual assault is not carried out immediately on the completion of the routes for the assaulting parties, the detachment commander should keep some of his men near the already-completed routes until the arrival of the infantry look-out men, so as to prevent the enemy carrying out any repairs. When it is intended to make the assault by night, the routes for the assault must be clearly marked, but in such a way that they cannot be detected by the enemy.

294. The tools and stores to be used in the assault will be prepared with the greatest care, in accordance with the state of the

obstacles; they will be arranged beforehand inside the position from which the assault is to be launched, so as not to attract the enemy's attention.

Sapping.

295. During training in sapping, the construction of approaches and attack positions, by means of the various types of saps, and also the work in connection with the close approach to the enemy's works, are the principal subjects which must be mastered.

296. In the construction of approaches, various types of saps are used, according to the situation. Usually it is advantageous to depend upon the shallow sap as much as possible, as its rate of advance is rapid; but when in very close proximity to the enemy, as it is difficult to arrange for shelter in the trench, and as the general progress of the attack is very slow, it is often better to depend rather upon the deep sap; when it is necessary to avoid the enemy's observation, it is specially necessary to use this type. When the situation does not allow this kind of work, the tunnel sap is used if the condition of the soil is suitable.

In the construction of an attack position, the shallow sap is generally used.

When excavation is difficult, or it is intended to work secretly, unknown to the enemy, taking advantage of darkness, fog, etc., it is advantageous to use sandbags as a method of forming cover.

297. In the construction of approaches and attack positions, the company commander will take into consideration the direction of the enemy's fire, the configuration of the ground, nature of the soil, etc., and decide the direction of the sap, its type, and the point from which it breaks out, so that it may reach the objective point quickly and safely.

298. The company commander will usually divide the company into three detachments; these will relieve each other in succession every six or eight hours, and the work will thus proceed continuously day and night.

299. The company commander is solely responsible for the rapid progress of the work. He must, therefore, besides giving constant attention to the situation, and carrying out suitable measures according to circumstances, invariably make use of all local ground objects, and also of works evacuated by the enemy, and craters made by high explosive shells, etc., when these exist; he must strive whole-heartedly for a rapid advance, and there must on no account be any check, even for a moment, for the sake of arrangements to enlarge the trenches in rear, or for firing, etc.

300. A detachment commander will organize several squads, in accordance with the number of approaches for which the company is responsible; each squad is divided into two parties, which relieve

one another. He should also form special squads for enlarging the trenches, and for preparing for fire, and shelter.

When breaking out saps from one or both flanks of the head of an approach, for the purpose of constructing an attack position, the required number of squads will be formed accordingly.

301. The commander of a detachment, should he notice a good opportunity for taking suitable measures to expedite the progress of the work, must immediately seize it without hesitation; he is also responsible for maintaining the correct direction and width of the saps.

302. A squad commander will make every effort to advance the excavating work; he should constantly inspect the direction and width of the sap, and take care that these are always correctly maintained.

303. Even though the enemy should make a sortie while work is in progress, the men should calmly continue working; on these occasions the troops in the nearest attack positions will cover the working parties with their fire.

304. When the head of the approach has reached a point in its advance where it is insufficiently covered from the attack position, the company commander should prepare near here, on one or both flanks of the approach, special trenches for fire; or he should utilize bends in the approach for this purpose.

305. The new detachment should reach the area of work before the hour for relief, and make all preparations for work; the old detachment should wait till all preparations are complete, and then hand over and withdraw to the rear. During this time there must not be even a momentary break in the work. The commander of the old detachment should enter on his working plan the work executed, and in his sap diary the dispositions of the enemy and any other important points, and notify them to the commander of the new detachment.

306. When the defender constructs saps, the above rules should be generally followed. The sap should usually break out from some point in the fire trenches outside the fort, or from some local ground object there.

Mining.

307. During training in mining, the construction of a system of mines, the destruction of the enemy's mines, the occupation of craters, approaching the enemy underground, and also the ways to hinder these operations, must be mastered. It is also very important that officers and N.C.O.'s should be proficient in the reconnaissance of the enemy's dispositions.

308. An offensive system of mines will usually be formed by branch galleries, at an average interval of from 10 to 15 metres,

in order to expedite the work. Moreover, in order specially to increase the effect of the explosion towards the enemy's direction, or to protect the mines from being surrounded by the enemy, there are times when bore-holes will be used.

In the case of a defensive system of mines, in order to facilitate boring operations, and in order to afford good ventilation, the main gallery will usually be constructed beforehand. When in the vicinity of the enemy, in order to prepare the charge chambers in the desired positions, bore-holes or branch galleries will be pushed out from the main gallery.

Shafts will be sunk in order to facilitate the construction of galleries, or for the purpose of preparing a charge chamber at the bottom of the shaft.

309. In the construction of an offensive system of mines, the company commander will take into consideration the position of the defensive mines, the configuration of the ground, and the nature of the soil, and will determine the type of each mine, the intervals between them, the position of the entrances, their direction and slope, and the positions for charge chambers, so that the objective may be quickly reached and destroyed; he will also prepare a plan of the system.

310. The company commander will usually divide the company into three detachments, which will relieve each other in succession every six or eight hours. He will show to each detachment commander his prearranged task, by means of the plan of the system, and he will carry on the work continuously day and night. He will also detail special squads as required for the care and supply of tools and stores, and for taking measurements.

311. The company commander, in order to push forward each mine equally, must, in particular, keep control of the mining work, and ensure that the advance is simultaneous and rapid. He should also keep a constant watch upon the enemy's dispositions, and alter the type, direction, and slope of the mines, as may be necessary.

312. A detachment commander will organize a certain number of squads, according to the number of mines allotted to the company; he will divide each squad into two parties, which relieve one another.

313. A detachment commander will settle important details, based on the company commander's instructions; he is specially responsible for the correct maintenance of the direction and slope of each mine, and for the uniform and rapid progress of the system. He should, also, from time to time, observe the enemy's dispositions, and immediately report the result to the company commander.

314. The squad commanders will check very carefully the direction and slope of the mines, and the correct fitting of the frames

and sheeting; they will also observe the enemy's dispositions in accordance with the directions of their detachment commander.

315. As regards the reconnaissance of the enemy's dispositions, the position, type and extent of the hostile works may be judged from a consideration of the configuration of the ground, and the nature of the soil, in the vicinity, and from the degree and kind of sound; but it is specially important not to be deceived by the enemy's false works.

316. When the hour arrives for the relief of a detachment, the detachment commanders will act as described in paragraph 305; the commander of the old detachment will also fill in on the plan of the work, the work done by him, and enter on the mine diary the enemy's dispositions, and other important points; he will notify these to the commander of the new detachment.

317. When the time for the explosion arrives, a charge chamber will be prepared at the head of each mine, and the charge tamped and ignited.

When the situation demands haste, there are occasions when the charge will be merely placed at the head of the mine, and roughly tamped, or not tamped at all, and exploded immediately.

318. The company commander will give orders at a suitable moment to the detachment commanders, for loading, and igniting the charge in the charge chamber.

319. When a detachment commander sees that there is a good opportunity for loading and igniting the charge in the charge chamber, he will immediately report the fact to the company commander; as, however, the opportunities for exploding the charge are only fleeting, he will take action on his own responsibility when the occasion admits of no delay.

320. When it is intended to occupy craters, the company commander will, before the explosion, allot detachments to each crater to carry out the work in connection with their occupation; and he should indicate important points with regard to the preparation for fire from the edge of the craters, and the opening up of communications in rear.

The *personnel* of detachments detailed for work in connection with the occupation of craters will be kept to the minimum strength requisite.

321. A detachment commander will organize a certain number of squads, according to the type of work indicated by the company commander. Immediately after the explosion, he will himself dash into the crater with a few men, examine the traces of the defender's galleries which have been blown up, and see whether there is any danger; having done this he will call up in succession into the crater the other squads and the party for occupation, who then carry on with their prearranged work.

322. Having occupied a crater, the company commander, in order to connect with neighbouring craters, and drive a new mine, will, if necessary, tell off the company again, and immediately start work.

323. A detachment commander will form a certain number of squads, according to the kind of work; he will take special care that the position of the mouth of the mine is concealed from the enemy, and execute the work rapidly.

324. In the construction of a defensive system of mines, the above instructions will be generally followed.

The defender, judging beforehand the direction of the enemy's advance, will prepare as large a number of bore-holes, or branch galleries as possible, and await the enemy's coming; if necessary the direction of the enemy's advance should be reconnoitred, fresh bore-holes made, or short branch galleries driven; charge chambers should then be prepared at suitable moments, and the charge exploded. The charges for this purpose should be limited to the minimum necessary for the destruction of the enemy's mines.

SECTION 3.—BATTALION TRAINING.

325. The object of battalion training is to use the three companies as a single body, and render them capable of carrying out any large and important work in the division.

326. The battalion commander usually makes use of orders, as opposed to words of command, to control the battalion.

327. The battalion commander will point out the objective to each company, allot to them the duty for which they are each responsible, and see that the work is carried out uniformly.

When the work of each company is interdependent on that of the others, the battalion commander must see that the companies work in co-operation.

328. The battalion commander will, if necessary, arrange for the interchange of the technical tools and stores from regimental transport, according to the nature of the work for which each company is responsible.

329. When it is necessary for the battalion to requisition local material, the battalion commander will usually organize one party, drawn from each company, and make it responsible for the collection, arrangement, and distribution of this material.

330. As regards the command of a battalion, the principles in Part II., in so much as they refer to officers commanding engineers, should be followed, and also the instructions for company commanders included under Company Training, in addition to what is laid down in this section.

SIEGES AND THE DEFENCE OF FORTIFIED PLACES BY THE BRITISH AND INDIAN ARMIES IN THE XIXth CENTURY.

(*Continued*).

By COLONEL SIR EDWARD T. THACKERAY, V.C., K.C.B. (LATE R.E.).

THE SIEGE OF SEBASTOPOL (*continued*).

The Siege from the Middle of February, 1855, to the Second Week of April.

Colonel von Todleben saw that to defend the Mamelon the new French "approaches" on his left front must be arrested, and that then he might prevent them from acquiring ground whence their batteries would be able to drive off all Russian ships from the eastern part of the Roadstead.

Having taped down beforehand the lines of a newly-planned Redoubt, he moved out on the night of the 21st February with seven battalions commanded by General Khroustchoff, crossed the channel of the Careenage Ravine, ascended to the heights of Mount Inkerman, and under shelter of darkness laid hands on the chosen site.

The men were kept in a state of readiness to lay down their tools, and to take instant part as combatants whenever the need might occur; but they toiled undisturbed the first night, and when morning broke, it was seen that the cover already obtained by dint of pickaxe and spade, and gabions rapidly filled, was even then solid enough to be good against musketry fire. This work was called the Selinghinsk Redoubt after the name of the regiment that constructed it.

The French did not molest the new work until the early morning of the 24th. They then undertook to assault it with a force of three battalions, supported by two in reserve, and entrusted the command of the troops to General Mayran. The attacking part of the force consisting of one battalion column of Zouaves at each flank, and one of Marines in the centre was under the immediate orders of General Mouet.

When the moon had gone, General Mouet's three battalions

moved forward, and made good their advance with great spirit, driving in both the line of skirmishers, and the line of company columns which formed the front of the Volhynia Regiment, and apparently forcing back also two out of its three massed battalions. The ships in the Roadstead, and even the Karabel batteries soon began to intervene, but the advance of the French was not checked. The battalion of Zouaves on the right of the assailing force was commanded by Colonel Cler, a daring and brilliant officer much liked by our people. At the head of his Zouaves he turned the flank of the Russians, and pushing forwards so vigorously that before long carried the fighting to ground on the left of the growing redoubt.

To meet the stress of battle brought thither, the unengaged column of the Volhynia Regiment was moved laterally by Khroustchoff from his right to the ground on his left where the Russians were most hotly pressed. Before long the four Volhynia battalions, with some men of the Selinghinsk Regiment intermixed, gathered irregularly in advance of the new redoubt, presenting to their assailants a broad, concave front. General Mouet now received several wounds, and finding himself compelled to give up the command he handed it over to Cler, who was called away from the right in order to receive his new charge.

Cler, however, soon returned to his Zouave battalion, taking with him all the troops that he found on his road, and going in person up to the work knocked over the gabions revetting a part of its counterscarp, crossed its ditch, overthrowing the Russians there gathered, and mounted the parapet. But then he learnt that notwithstanding the darkness, the redoubt and its precincts were swarming with troops, and those of the French who had till then remained alive on the parapet were forced back into the ditch, and were there surrounded by Russians coming from all directions. To the fire of musketry there was added the fire from ships in the Roadstead, and even from the Faubourg Defences. But Colonel Cler stood his ground in the fosse hoping that reinforcements might come. But now General Mayran, becoming convinced that his foremost troops were in danger, caused the retreat to be sounded.

Thereupon, Colonel Cler passed back over the counterscarp, led the men acting with him against the host of Russians who were barring his path, clove a way through their ranks with the bayonet or the musket-stock used as a club, and rejoined the rest of the force which General Mouet had led. The French force thus reunited made good its retreat without being pursued.

General Mayran did not bring into action the troops which formed his reserve. The fight lasted an hour.

In killed, wounded, and missing the French lost some 270, and the Russians rather more than 400.*

The French did not renew their attack. Convincing themselves that, if captured, the Selinghinsk Redoubt might be swept by so potent a fire of artillery as would make it untenable, they resolved, however unwillingly, that they must needs stand by whilst the enemy, losing no time, completed and armed his new work. And this bold encroachment effected under their eyes was only the beginning of the counter-approaches, with which the Czar's great engineer was minded to try their patience.

Seizing ground that lay towards the left front of the newly-formed work, on the night of the 28th February he began to construct yet another one of a similar kind which was called the Volhynia Redoubt; and he lost no time in rendering it stronger every day.

Although the Allies by this time saw the object at which he was aiming, viz., to attempt the fortification of the Mamelon, they still resolved to abstain from storming the newly-reared works which now formidably obstructed their siege, contenting themselves with promising that so soon as the enemy should try to plant any field-work on the coveted Mamelon, they would carry it at once by assault.

Meanwhile their counsels induced them to await the actual happening of the apprehended contingency, and not undertake to avert it. The question whether the Allies should submit to these aggressions was one of course meriting their joint consideration, and accordingly, a council assembled. It included General Canrobert, Lord Raglan, General Bosquet, General Niel, General Birot, Sir John Burgoyne, Sir George Brown, and General Harry Jones. It lasted several hours without coming to any definite resolve. On the following day the council again met and discussed the general progress of the siege. The difficulties of the attack were a good deal dwelt upon, and were acknowledged to be increasing rather than diminishing.

The importance of endeavouring to take what with normal besiegers has commonly been called the first step, that is to invest the place, or in other words to cut off communication between Sebastopol and the Russian field army was much dwelt upon, whilst General Canrobert declared his opinion to be that, if from any cause Omar Pasha should be unable to act upon the rear or flank of the enemy from Eupatoria, he should be requested to come to the Chersonese with two-thirds of his army. Lord Raglan stated his reasons for not sharing the opinion thus formed by General

* *Todleben*, Vol. II., p. 30.

Canrobert. The French and English engineers did not come to any agreement, and the adjourned conference sat again on the 6th March.

Then the French making no proposal, Burgoyne submitted a memorandum recommending an attack on the Selinghinsk and Volhynia Redoubts with a view to driving the enemy effectively from that part of the ground.

General Canrobert and the French officers attending him did not consider the reasoning by which Sir John Burgoyne supported his opinion to be well founded; and they at once declared their determination not again to attempt to drive the enemy from his new works. Whilst the Allies were thus vainly deliberating, their adversary was acting with ceaseless vigour.

The Volhynia work was completed in the course of ten days; and the armament which the two new redoubts had received on the 10th of March comprised 22 pieces of cannon.*

To have a strong hold on the Mamelon was the object of besieged and besiegers alike, but it had not up to this time been the chosen scene of their efforts. Lightly held by an outpost of Russian infantry, it had neither been touched by the pickaxe nor assaulted by troops, nor even approached by "approaches"; but by the morning of the 10th March that state of affairs was fast drawing to an end.

Looking towards the north-west on the morning of the 11th March the Allies saw that during the night, their great adversary had been fastening on the Mamelon, and that there, with the rudiments of a work plainly meant to defend it, he had already saddled the Ridge. On the following night, the 11th March, the French opened their first parallel, against the new work, not yet one day old; thus almost repeating the all-involving mistake of the previous autumn, that of "besieging" an embryo.

To enter on a course of "approaches" was to give the enemy time. The Allies before long brought a powerful artillery fire on the growing lunette, but as the French were as yet not minded to undertake an assault they had to bear the torment of seeing or otherwise knowing that every day and night their unwearied adversary was completing his work. He finished it on the 21st March, and by that time had not only armed it with ten 24-pounder guns, but covered it by the fire of twelve other pieces, planted for that purpose in battery on chosen sites less in advance.

The reason which had prevented Canrobert on the 10th March from consenting to seize the then unfortified Mamelon proved

* *Todleben*, Vol. I., pp. 34, 35.

sufficiently strong to deter him from assaulting the embryo work which had newly grown over its surface.

To our people the notion of suffering the enemy to construct a defensive work on the one path which could lead our Allies to the Malakoff, seemed almost the same as abandoning the main design of the siege; and to deprecate such acquiescence, our chief engineer drew up a memorandum "on the expediency of occupying the Mamelon" which Lord Raglan imparted to Canrobert*; but all this insistence proved vain; and the Mamelon, growing daily in strength, continued to remain unassaulted.

Meanwhile Lord Raglan succeeded to a certain extent in allaying the apprehensions of the French commander who thought it possible that when the Allies should open their fire upon Sebastopol, the enemy would attempt a general attack, making a sortie with 20,000 men on the extreme left of the French, and at the same time the right of our position with 40,000 men, and the ground in front of Balaclava with an equal force by a simultaneous movement.

"In those times of trial," said one who best knew Lord Raglan, "he would calmly withhold his assent to all gloomy apprehensions, and throw upon those who conversed with him the spell of his own undaunted nature. Men went to him anxious and perturbed. They came away firm." †

"I think," said Lord Raglan, "our friends are a little uneasy, and are anxious for the arrival of some of the Turkish Army from Eupatoria; but they continue to have full confidence in their English Allies."

On the night of the 22nd March the enemy undertook an adventure with a much greater number of troops than are commonly charged with the task of making a sortie in darkness. He effected four sorties against his English besieger, thus extending the front of his great night attack, but still threw the main weight of his onslaught on that chosen part of the ground where our French Allies were engaged in sapping their way towards the Mamelon. The night was dark, and a strong wind intercepted the sound of troops marching, when at about 10 o'clock nine battalions of infantry, commanded by General Khrouleff, moved out from the flanks of the Kamtchatka Lunette along the Victoria Ridge; and another battalion assisting, it was with a strength of no less than 5,500 men that the Russians soon came into action.‡

The French "guards of the trenches," that night were under General d'Autremarre and comprised four battalions.

* Despatch "Secret" to Secretary of State, March 17th, 1855.

† Speech of General Airey to the Board of General Officers.

‡ Khrouleff was the General repulsed by the Turks when assailing Eupatoria.

Though not without some hard fighting, General Khrouleff's battalions recovered the lodgments which their adversary had been suffered to occupy, advanced to the head of the sap, and invaded the foremost "approaches," whence, after encountering a brave and stubborn resistance, they at last drove in the French working parties. After leaving in the "approaches" thus seized, a large number of sailors who wrought all the havoc they could, Khrouleff's force moved on in pursuit.

Here, however, by this time were gathered the three French battalions which d'Autremarre had within reach; and his force now opposed to the Russians a resistance so strong that those of them who made bold to adventure beyond the parallel met their deaths, whilst those who remained on its verge soon found themselves engaged in a hot and obstinate fight.

To the enormous preponderance of numbers already enjoyed by the Russians there now came a new and unexpected advantage, for a little body of troops had by this time moved up along the edge of the Woronzoff Ridge; and then it came to pass that the French whilst engaged against the host in their front suddenly found themselves stricken by a fire from across the ravine, and from ground so far south that it took their troops in reverse. Under this serious trial the French showed great firmness; and on the other hand the enemy failed to obtain any encouragement from the sight or sound of the fire newly befriending him.

His masses still remained hanging back on the verge of the parallel and apparently with the loss of their headway they lost all their clearness of purpose. There were glimmers of light in the sky which enabled the French to see that their assailants were gathered into bewildered groups, and in need of sure guidance.

The onset had spent its force, and the counter-sway followed. Whether simply, as von Todleben says, obeying their General's repeated signals, or yielding as Niel asserts to the prowess of d'Autremarre's force, the assailants at all points fell back. They were pressed for a while in retreat, but soon found shelter beneath the guns of the fortress.

The field officer that night on duty in the English trenches of "Gordon's Attack" was Colonel Kelly; and of the 1,200 men under him, one-half at first guarded the third or foremost parallel, which may be said to have crossed the whole breadth of the Woronzoff Ridge, from the Dockyard Ravine on his right to the Woronzoff road on his left.

With 300 of his men Colonel Kelly had furnished the working parties employed that night under the guidance of Colonel Tylden, R.E., and the remaining 300 he kept higher up in reserve. Colonel Kelly had the advantage of having at his side Major Gordon (the

directing engineer of the Gordon's or "Right Attack" siege works) who thoroughly well knew the ground.

Directed by Ensign Zavalchine, the attack planned against our right flank was opening with some shots from his skirmishers, when under the orders of Boudischeff, and designed to take effect on our front, a much heavier onslaught began.

Greatly favoured by the darkness, and also by the roar of the wind overpowering the sound of their march, a body of Russian troops, supposed to be about 800 strong, moved out from the lines of Sebastopol, and ascended the Woronzoff Ridge. It was opposed by a small detachment of the 97th Regiment comprising about 80 or 90 men commanded by Capt. Hedley Vicars. During the fighting Gordon who was with Colonel Kelly received a wound from a musket shot which struck his right arm and disabled him; but Colonel Kelly running forward overtook Capt. Vicars, and was presently moving down alongside him against the enemy's column. It is supposed that baffled by the darkness, the Russians failed to divine the scantiness of the small force that assailed them with a strength of only about one to ten, for when the advance of our soldiery was becoming or had already become a charge the Russians fired a last volley; and then, still hanging together after the manner of Russians in flight, began to retreat at the double, its rear files turning however and firing back shots as they ran. By one of these shots Capt. Hedley Vicars, who was moving eagerly forward at the side of Colonel Kelly, was killed. Colonel Kelly at last stopped the pursuit, and brought back the 97th detachment to its former post at the trench. From this time, about midnight, until one other hour had passed all was quiet on the Woronzoff Ridge. But again at 1 o'clock in the morning the tumult of more fighting began to make itself heard; and the seat of conflict this time was a part of the Ridge further west.

During the *mêlée* that ensued, Colonel Kelly saw a group of seven or eight soldiers whom he took in the darkness to be men of his own regiment—the 34th. So going close up to them he directed these men to fall in with the other men. He was met by an uproar of outlandish cries, and found that he had been accosting the enemy. Whilst attempting to defend himself with his revolver, the trigger of which was held fast by the safety-catch, he was felled by blows laid upon him with the butt ends of muskets, and was bayoneted in the right shoulder, in the left hand, and in the right leg and was only saved from being killed by a brave young Russian officer who interposed, and in shielding him became the recipient of some of the fiercely-aimed blows, and caused the wounded Colonel, as a prisoner of war, to be brought safely into the fortress.

The conflict drew to a head on the site of a new mortar battery occupying the trench during its centre. The enemy advanced on this battery from the west, the English from the east, and within it the two forces met, each moving with bayonets fixed alongside the parapet, and of course therefore facing the traverse. At the first traverse the Russians made a protracted stand. Colonel Tylden came up in person, and his own idea apparently was to execute a charge straight forward from east to west along the foot of the parapet; but our people instead, with a rush, drove their way round the end of the traverse, overthrew at the point of the bayonet all they then found before them, and pursuing, approached the next traverse where the enemy made his last stand. Colonel Tylden by one charge more overcame the resistance they offered, drove all the Russians out of the battery, and pursued them some way along the course of the trench, but the fugitives before very long were all over the parapet and making off towards the Redan.

The two English detachments engaged in this part of the field lost three officers and several men.*

Whilst this combat was raging, yet one other sortie began, and was directed against our Left Attack. A column commanded by Béruleff, about 500 in number, moved out against the foremost trench at the base of Green Hill which was afterwards called the 4th Parallel.

Favoured greatly as had been other columns by the darkness and the roaring of the wind, this column surprised and drove in the detachments of the 20th Regiment which had lined the parapets of the advanced trench. A great number of the assailants entered the two new and incomplete batteries No. VII. and the advanced No. VIII. which had been established in the 3rd Parallel, there surprising the working parties, which under Capt. Montagu, R.E., were engaged in thickening the parapets. Lieut. Carlton, of the 21st Fusiliers, collected his own little force, about 50 in number, adding to it some men of the 57th whom he found within reach, and then at once opened fire on the hesitating conquerors of the advanced trench who were then brought to bay.

Lord Raglan highly commended the gallantry with which officers and men, called from their toil with pickaxe and spade, had met the successive emergencies, and not confused by the darkness or putting all their trust in cartridges, proved able to drive off the masses one after another by simply the use of the bayonet.

* Capt. the Hon. Cavendish Browne, of the 7th Fusiliers, and Lieut. Jordan, of the 34th, were killed, and Lieut. McHenry, of the 34th, wounded.

Our Allies, all this time, both above and below the earth's surface had been pressing their siege operations against the town of Sebastopol, whilst the British with scantier numbers, and besides on more difficult ground, had been slowly pushing forward their batteries against the Redan and its neighbours. Lord Raglan did not wish to oppose the conjoined wishes of the French and Turkish commanders; and at this time Omar Pasha was brought to the Chersonese with from 15,000 to 18,000 men supported by 30 guns. Towards the end of February the Russians sank six more of their ships in order to more effectually close the Roadstead.

In the command of the Russian forces, Prince Mentschikoff was succeeded by Prince Michael Gortchakoff; and General Osten-Sacken was placed at the head of the Sebastopol garrison.

On the 17th March, the Russians lost their valiant Admiral Istomine, a cannon ball killing him whilst standing by the Kamtchatka Lunette.

Pursuant to the early decision of Lord Palmerston's new administration General Harry Jones on reaching the Crimea was at once put in orders as the commander of our engineers, and Sir John Burgoyne being apprised of the instructions recalling him ceased of course to hold power officially at the seat of war. But Lord Raglan believing at that particular time that the continued aid of Burgoyne would be of great value to the public service, requested the General to remain for a while at headquarters. This Burgoyne did, and it was only in the third week of March that he left the Crimea. Lord Raglan addressed to Burgoyne a letter expressive of the grateful appreciation with which he regarded his services.

The April Bombardment.

The Allies had now in the month of April decided upon a bombardment of Sebastopol on an immense scale, and had expended great efforts, undertaking to deliver their fire with 501 guns which (with the exception of 31) were of great calibre; and for the service of all this artillery they had collected a vast amount of ammunition. Of the 501 pieces only 123 were English, the rest being French; but in aggregate weight of metal, the difference was less; computed in that way the proportion of the French siege power to that of the English was only as sixteen to thirteen.*

Of the 998 guns which by this time they had established in battery, the Russians could bring into action against the now threatened attack, as many as 466, with an aggregate weight of metal which

* "The weight of projectiles thrown by the French pieces of ordnance in one salvo was 15,957 lbs.; by the English, 13,333 lbs.; combined salvo, 29,290 lbs."—*Todleben*, Vol. II., p. 164.

compared with their adversaries, was as twenty-three to twenty-nine. On the whole, it seemed plain beforehand that in this artillery conflict the balance of advantage was strongly against the besieged.

On Monday, the 9th of April, the morning opened with heavy mist, storm, and rain, so that each object was thickly obscured, but nevertheless, soon after daylight, the cannonade was commenced.

In almost every bastion some 20 or 25 minutes were suffered to pass before the Russian batteries opened. At the end of that time the garrison began to answer, but were firing with a rigid economy of ammunition; and this very unequal interchange of artillery missiles had not gone on for many hours, when the richly-supplied besiegers were seen to be having the mastery. All day, the besiegers went on with their great cannonade, which, even when darkness fell, did not relapse, the defences being plied at night with a powerful vertical fire.

From the 10th, to the close of the 18th April, the Allies continued to work their guns with destructive effect. But the enemy laboured indomitably, always at night-time, though still more or less under fire, and never failed before morning dawned, to repair the broken defences and restore the artillery power.

With some little help from our people, the French siege guns broke down the most precious defences of what was called the "Town Front," and again in the opposite quarter, silenced the two "White Redoubts" on Mount Inkerman, whilst our British artillery mastered the interposed batteries of the Kamtchatka Lunette which had blocked all approach to the Malakoff.

The official narrative tells us that on the eve of this April bombardment General Dacres preferred a request, one not however conceded, that in order to complete his arrangements, the opening of the fire might be postponed for 48 hours.* What caused General Dacres to ask for delay was the backwardness of certain preparations in the Left Attack.

Before evening on the 11th April, the ground had become much more firm than it was on the days preceding; and when our left siege-train commander directed Capt. Oldershaw, of the Royal Artillery, to take down the guns meant for the arming of the advanced No. VII. he was answered by a cheerful "All right, sir," that had the ring of decisiveness.

With the aid of 300 infantrymen, Capt. Oldershaw opened a road through the parapet of the 2nd Parallel, brought his guns through

* *Journal of the Royal Engineers*, Vol. II., p. 145.

the passway, and before morning, lodged them all safely in the advanced No. VII.

The advanced No. VII. of our Left Attack was the battery destined to be fought on the 13th April by Capt. Oldershaw, and on the 14th by Capt. Henry. It was one of two batteries in the 2nd Parallel of our Left Attack, and was not only in close proximity to the enemy's frowning defences, but was so low down as to be commanded from most of the ramparts. The little advanced No. VII. was placed so forlornly as to be openly inviting a fire of almost indefinite power. The distance of No. VII. from the Crow's Nest (the nearest of the enemy's guns) was only about 700 yards.

On the evening of the 12th, Capt. Oldfield (the officer commanding the artillery of the Left Attack) ordered Capt. Oldershaw to work the No. VII. Advanced Battery on the next day.

Long before sunrise so as to be under cover of darkness Capt. Oldershaw moved down into the work, having with him one subaltern, one surgeon, and 65 gunners. There four guns stood planted in battery, and a fifth one was near them, but lying in its travelling carriage. It was with the four guns already established in battery that Oldershaw undertook to fight.

Capt. Oldershaw now found himself engaged against five batteries, and undergoing the concentrated fire of their twenty heavy guns. For a while the chief's losses in men went on faster than the disabling of his guns ; and there soon came a time when, with three pieces still undisabled, he could barely find sufficient unstricken men to work them. Still, all who could, toiled heart and soul, and one of these was Oldershaw's subaltern, Lieut. W. R. Simpson, a zealous and valiant officer. At this period of the fight, Capt. Oldershaw sent off a messenger to the 1st Parallel to ask for reinforcements.

With all the power left them our gunners still answered the storm of the enemy's fire, but their guns of course after a while had been wrought by incessant discharges to a state of intense, scorching heat, and could only be fired at intervals.

A hollow shot entered the embrasure through which Oldershaw was laying his gun, and achieved what is perhaps unique in the annals of gunnery conflicts ; for killing two, wounding the rest, and yet sparing the Captain himself, it laid the whole of the gun detachment at its feet. The gun was disabled. It had twice before been struck by a shot without becoming unserviceable. So of the four guns with which Oldershaw had begun the conflict, only one now remained intact. With that one gun, however, the Captain still continued to fight.

Capt. Oldershaw had maintained the unequal combat for five hours, when at length a superior officer came down into the battery

and directed him to retire. The detachment at first comprised 65 gunners. Of these 18 men at the close of the fight had been sent away by Oldershaw with orders to bear off wounded men. Of the remaining 47, the enormous proportion of 44 were either killed or wounded, so that the remnant of the original body with which Oldershaw at last marched out of the battery mustered only three.

On the day of the fight the Brigadier-General Commanding (afterwards Sir Richard Dacres) rode accompanied by his staff to the tent of Capt. Oldershaw, and there thanked him personally for his exploit of that morning saying, "You fought your battery nobly, and are an honour to your regiment."

The advanced No. VII. was restored and prepared for new fights with so great despatch as to be again in working order on the next day, the 14th April, and its sister work, No. VIII., having at last been armed, the fight of the previous day was renewed.

On that day the advanced No. VII. was commanded by Capt. Henry, of the Royal Artillery, having under him Lieut. Conolly and 35 men. Capt. Henry engaged the barrack batteries, and they answered him with a power that soon proved him to be hugely overmatched; whilst he was also assailed front and flank by the Garden Batteries, besides being placed under the strong enfilading fire of the left face of the Flagstaff Bastion. Out of his small force Capt. Henry lost two men killed and five wounded. From each of his 32-pounders he fired about 100 rounds, but one of his guns was after a while disabled. Kept under a powerful fire for nearly eight hours, the battery and its embrasures suffered havoc.

With their siege guns in this bombardment of ten days the Allies are believed to have fired some 130,000 shots, and to have been answered by the Russians with about 88,000.

Though inflicting on the Russians huge losses, the artillery conflict cost the French and the English together no more than a few hundred men. Of this loss in killed and wounded a large proportion, as usual, was borne by our sailors. They were masters of the art of bantering the enemy by making humorous signs to him, sometimes a seaman standing up on the top of the parapet teasing by gestures the Russian officer when seen to be bending his field-glasses on one of the batteries, or by the favourite prank of extinguishing his own mirthful head beneath an inverted bucket. To say whether this great bombardment did or did not open paths for assault, it is right to hear the voice of authority. Commanding on this subject more weight than any other man, General von Todleben answers the question. He wrote that the "French might have advanced to the assault of the Flagstaff Bastion with an absolute certainty of success, and this so much the more since they found themselves

at a distance from it of only some hundred paces." After stating that the Allies had planned assaults and failed to execute them he goes on to say :—" It is thus that the Allies failed to profit by the important advantage they had gained ; yet they had it completely in their power to take the Flagstaff Bastion, and that would have carried with it the fall of Sebastopol."

The Siege from the 9th April to the Middle of May.

On the 11th of April the French, and indeed the Allies, sustained a painful loss. Whilst making his way along one of our unfinished trenches, General Bizot was struck by a shot, and the wound some days later proved mortal. Commanding the French engineers he had pursued his huge task with a zeal that never relaxed. General Bizot died on the 15th April, and Lord Raglan together with those of his Staff who could be spared from their imperative duties, showed the feeling with which they regarded the brave engineer by following his remains to the grave.

General Bizot had scarce breathed his last, when the French carried into effect a design he had long entertained, and had long been seeking to execute. At the close of that series of mining operations which he had devised for the purpose, they at length on the evening of the 15th brought about some convulsing explosions, which opened up from below a line of volcano-like craters, at a distance of less than 100 yards from the counterscarp of the Flagstaff Bastion, and thus formed in front of the work a long deep cavity, interrupted, it is true in one place, but forming elsewhere what might almost be called a ravine.

This artificial opening of the ground close to and in front of the Flagstaff Bastion became for the French a beginning of their 4th Parallel, and, though not until after hard struggles, they were ultimately able to establish themselves in the hollow, taking care of course to connect it with their 3rd Parallel, full 100 yards less in advance, by covered lines of way.

Passing yet further west to the front of the Central Bastion, Colonel von Todleben at this time began to construct new works on the zone then dividing his lines from the French, by establishing lengthened chains of rifle-pits which he had taught the Allies to distinguish as "lodgments"; and, as previously on Mount Inkerman, and the Victoria Ridge, General Canrobert appeared to be reluctant to make any resolute stand against the encroachments.

General Pelissier at this time only commanded a corps ; but these as it chanced were the troops challenged and defied by this last growth of new Russian works thrown out in advance of Sebastopol ; and although he was only a subordinate owing obedience to the

Commander-in-Chief, was by nature so constituted as to be in hot rage at the notion of quietly enduring the enemy's audacious encroachments. He seems to have got his way over Canrobert, and was either empowered or suffered to make war against the "lodgments."

Pelissier determined to attack them on the night of the 10th April, but the Russians, on the same evening withdrew their troops from the lodgments, and prepared to ply the new occupants who might soon be there with a powerful fire of artillery from the Central Bastion.

Between 9 and 10 o'clock in the evening the French advanced in some strength, and planted themselves in the then empty lodgments, but were presently assailed by a powerful artillery fire. Under this ordeal the French held their ground firmly during several hours, but not without suffering losses. Then at 2 o'clock in the morning the enemy made a powerful sortie, retook at once two of the lodgments, and did not give himself rest until he had recovered them all. In like manner, on the nights of the 11th and the 12th there was a taking and retaking of these pits; but on the night of the 13th Pelissier caused them to be attacked in some force and destroyed.

In order to cover a somewhat weak part of his defences by a species of "counter-guard," Colonel von Todleben had established in front of his Schwartz Redoubt another strong chain of lodgments which were to make a beginning of the work designed.

These lodgments Pelissier seized on the night of the 12th April; but after dark on the 23rd, the strife was renewed. From that last night until the close of the month, the Russians not only remained masters of the lodgments, but deliberately converted them into a new work of counter-approach in the form of a redoubt, and so thrown forward as to be 141 yards in advance of the Russian line of defence and within 116 yards of the French siege works.*

This new work the Sousdal Counterguard was furnished already with nine 6-pounder mortars which, with the fire of the riflemen, were used to annoy the French workmen who toiled in their most advanced trenches.

General Canrobert grudged the loss that would have to be suffered in wresting this Sousdal Counterguard from the enemy, but Pelissier brought his Chief to consent that the attack should be made, and orders were given accordingly.

* Todleben does not deny that the extreme proximity to the enemy's siege works was a defect, but says its position was dictated by the lay of the ground. The new work was executed by troops of the Sousdal Regiment, and thence acquired its name.

On the night of the 1st May, a strong body of French infantry, commanded by General Metterouge, advanced against the work in three columns.

Either in or about the work, the enemy at this time was present with no less than four battalions; but the Russians devoting their care to the task of repairing the havoc done in the daytime by French artillery, were said to have been off their guard, and to have been taken in part by surprise.

Without firing a shot, the assailants made good their advance to the edge of the work, and the centre column at once broke over the parapet intent on the use of the bayonet. Some fighting ensued but did not last long. The centre column prevailing soon drove out the Russians, pursued them some way in their flight, and was master of the counter-approach including its nine little mortars.

With admirable valour and skill the French engineers, under Colonel Guerin, hastened to clench the victory. Reversing the parapets of the captured work, they connected to the use of the French what so lately had sheltered the Russians, and achieved under fire the perilous and difficult task of forming by flying sap the gabionaded approach, full 350 yards long, that would link to their system of trenches the newly effected conquest. The conduct of the French troops, that night, was as Lord Raglan said " very brilliant."

It was not without making sacrifices that the French achieved this conquest of the lodgments. In killed and wounded they lost about 600 officers and men ; the Russians 425.*

On the following day the French strengthened themselves yet further in the conquered work, and afterwards at about 3 o'clock they promptly repulsed a sortie which the Russians attempted against it.

On the night of the 13th, they repulsed a new sortie attempted against the work, as also one made further west.

On the night of the 20th April the enemy had determined to make a sortie to prevent the British from seizing the lodgments confronting the left advanced sap of Gordon's Attack ; but our people anticipated him by 24 hours ; and it was at 9 o'clock on the evening of the 19th April that, commanding in person a detachment of his splendid 77th Regiment, Colonel Egerton assaulted the lodgments These he promptly carried, but suffered some loss, and Capt. Lemprière of his regiment was killed.

In one of the captured lodgments, our engineers resolved to

* " The French losses at the Battle of the Alma were not, it seems, quite so great as those they sustained in this combat."—*Niel*, p. 241.

establish a lodgment of their own, and to connect it with the head of their sap. This, though only of course incompletely, they found means to do in three or four hours. They determined that they would not retain the other lodgment; but some men, eight or ten, were left there on watch for the time.

At about 1 o'clock the Russians advanced with a whole battalion of their famous Vladimir Regiment reinforced by some hundreds of men volunteering from its other battalions. The assailants drove in our covering sentries, and the eight or ten soldiers left watching in the otherwise unoccupied lodgment. Then advancing against the lodgment which our people had resolved to hold fast, the Russian force moved in its strength; but the British coming up in good time soon drove back the Vladimir troops, thus defeating the enemy's efforts to reconquer what he had lost. Thenceforth accordingly the lodgment thus taken and held remained connected definitely with the siege works of "Gordon's Attack."

But this brilliant achievement cost our people some lives. Whilst forming his troops for the second of the two encounters Colonel Egerton was unfortunately killed. Lord Raglan reported the conduct of the troops to have been admirable. In killed and wounded, all reckoned, the losses were sixty-eight.

The real advantages achieved by these petty enterprises was of a general, not special, kind. They kept the besiegers on the alert, and made it their duty to go on unceasingly with the always harassing task committed to the "guards of the trenches."

Towards the end of the month of April the task of laying down a submarine telegraph cable connecting the Chersonese was brought to completion, and on the 2nd May the arrangements for communication were completed. Thenceforth a few hours sufficed for the passage of messages from either Paris or London to the camps before Sebastopol. There was also laid down a cable which connected the Chersonese with Eupatoria.

Lord Raglan towards the close of this period was happily strengthened in numbers by reinforcements of troops which were placed under his orders.

On the 8th May General de la Marmora, with a part of the 15,000 Sardinian troops despatched to the seat of war, and followed by the rest of the force, was already landing at Balaclava, and placing himself, as agreed, at the British Commander's disposal.

Dr. Russell in his history of the siege says:—"It was impossible to deny to the Russian engineers great credit for the coolness with which they set about repairing damages under fire, but words could not do more than justice to the exertions of our own men, and to the Engineer officers and sappers engaged in this most perilous duty. When an embrasure was struck and injured it was the duty of the

sappers to get up into the vacant place and repair the damage, removing the gabions, etc., under fire, and without the least cover from shot, shell, or riflemen. Our Engineer officers had frequently to set the example to their men in exposing themselves when not called upon to do so."

On May 28th a meeting was held in Pelissier's hut, at which the Generals of the French were present, three of whom were Engineers. On the part of the British, General Jones, R.E., and Colonel Adye, R.A., took part in the proceedings. At the meeting General Pelissier announced his intention of promptly assaulting the Mamelon and the redoubts in front of the Inkerman attack, known as the "Ouvrages Blancs," and requesting that the British should at the same time establish themselves in the Quarries in front of the right attack.

General Jones promised to lodge a force in the Quarries and clear the ground in front at the same time that the French crowned the Mamelon. A good deal of discussion took place for the next few days, at the end of which it was decided that fire should be opened from all the batteries for two days, and that on the evening of the second day the forward movement should take place on all three points simultaneously by signal.

By this time the following additions had been made in the British attacks:—On the left No. 10 Battery for seven guns in the centre of the 2nd Parallel; No. 11 for eight guns on the extreme left of the same parallel, beyond No. 9 with a communication from it under shelter of the crest of the ravine; No. 12 for four mortars to the right of No. 9, and No. 13 for four mortars in the 3rd Parallel between Nos. 7 and 8. In the right attack three new batteries had been thrown up, No. 13, or the Sandbag Battery, for four guns in the 2nd Parallel, to the immediate right of No. 12; No. 14 for five guns, in the same parallel, to the left of No. 9, and No. 15 for three mortars in a small quarry to the left of No. 12.

During the interval since the April bombardment the 9th Company, Royal Sappers & Miners, had also been added to the strength of the British Forces. On the other hand the following losses had been sustained:—Capts. King, Crofton, Lieuts. Baynes and Carter, killed; Capt. Owen, wounded, and Capt. Porter and Lieut. Pratt, invalided.

It may here be mentioned that during the month of May a very successful expedition was made to Kertch and Yenikale where the Russians had accumulated vast masses of stores of every description. These were all destroyed, and after a few days spent in carrying devastation in every direction, the force returned to the duties of the siege.

On June 6th all the batteries opened at 3 p.m., and before sunset

had done good service, the enemy's works being greatly knocked about. During the night the mortars were kept firing upon all the quarters where the enemy were likely to be engaged in restorations, and on the 7th the artillery fire recommenced at daybreak. At 6 p.m. that evening the signal was given and three simultaneous attacks delivered. One French column was directed against the "Ouvrages Blancs," a second against the Mamelon, and a British column against the Quarries. All three were perfectly successful. The Russians were driven out, and the first steps taken to connect these works with the besiegers' advanced trenches.

As regards the British attack, the troops were commanded by Capt. Shirley, of the 88th, acting as a General Officer. He was assisted by Lieut.-Colonel Tylden, R.E., who guided him as to the points of attack, and the distribution of the troops in the assault. The Royal Engineer officers employed in this brilliant operation, under Lieut.-Colonel Tylden, were Capt. Browne,* and Lieut. Elphinstone † in charge of the working parties, and Lieut. Lowry as guide to the attacking column. Capt. Wolseley ‡ and Lieut. Anderson also served with the working parties.

Lieut.-Colonel Tylden made the following report on the operations:—"The enemy's 'ambuscade' known as the Quarries, and the adjoining trenches in front of the left of the right attack, were stormed and carried yesterday evening about 7 p.m. by a party of 400 men from the Light and Second Divisions. A good lodgment has been formed on our right of the Quarries, and the communication from the left advanced sap made good. Our troops are at present in occupation of the Quarry lodgment, covering their left, extending from thence to the right along the reverse of the enemy's trench to his salient rifle pit at the centre. The whole of these works have been appropriated for our own use. The enemy's resistance was energetic and determined, evinced, not only in the defence of his Quarries, but in the repeated efforts he made during the night, to retake his trenches by turning their right, as well as by direct attacks. A reserve of 600 men formed the immediate support of the assaulting party, and a working party of 800 men was detailed for the forming of the lodgment.

"Communications, etc., were divided into four different parties, each for a special part of the work. Three of these parties I brought forward in readiness to commence work directly the enemy's trenches were taken, but such was the resistance of the enemy and his numbers, that the assaulting party and their reserve were

* Afterwards General Sir J. F. M. Browne, K.C.B., Colonel Commandant, R.E.

† Afterwards Lieut.-General Sir Howard Elphinstone, V.C., K.C.B.

‡ Afterwards Field Marshal Viscount Wolseley, G.C.B., G.C.M.G.

insufficient to hold the captured trenches, and I quite concurred in the necessity of those portions of the working party who were armed being appropriated for this purpose. The last 250 men I kept in reserve in the right ravine communication, and as soon as the advance had been reinforced and regularly posted, I brought this party forward, and with them made the lodgment and communication. The former was effected under the immediate direction of Lieut. Elphinstone, R.E., and when the darkness of the night and critical circumstances under which the lodgment had to be made are considered, I think that this officer deserves the highest praise for the creditable manner in which he executed this service. Capt. Browne, R.E., who was the officer of Engineers in charge of the general superintendence of the work, and of the arrangement of the working parties executed these services to my perfect satisfaction. Capt. Browne speaks in high terms of the conduct of Capt. Wolseley, 90th Regiment, Assistant Engineer, who was employed in forming the communication to the lodgment."

"We have unhappily to regret the loss of Lieut. Lowry, R.E., an officer whose gallantry and untiring zeal, added to the experience he possessed from many months' service in the siege, adds another instance to recent losses in the Corps which we cannot replace, nor sustain without the deepest concern. Lieut. Lowry was the officer who conducted the storming party, which service he performed in the most gallant and conspicuous manner."

To these reports must be added General Jones's remarks on Lieut.-Colonel Tylden, which are as follows :—

"Lieut.-Colonel Tylden, of the Royal Engineers, distinguished himself particularly on this occasion, as well as on every other from the commencement of the siege, always at hand to aid in the repulse of the enemy whenever our works have been attacked."

After repeating Lieut.-Colonel Tylden's encomium on Capt. Browne and Lieut. Elphinstone, etc., he continues :—

"The Sappers & Miners were conspicuous, and by their gallantry and zeal obtained for themselves strong marks of approbation from His Lordship, the Field Marshal Commanding."

The next few days were spent in rendering secure the new acquisitions, and in constructing within them advanced batteries to play upon the line in their rear. Meanwhile fire was kept up more or less vigorously from most of the existing batteries. After a conference between the Artillery and Engineer chiefs of the two armies, which was held in General Jones's hut on June 10th, at which six French and two English Generals were present, plans were submitted for an assault on all points. The Generals-in-Chief, however, decided upon limiting the attack to the Mamelon and the Redan without advancing on the line in front of the French left.

The Attacks on the Mamelon and the Redan.

On June 16th General Jones issued his orders as to the duties of the Royal Engineers on the occasion. The Redan was to be assaulted at three points—the right, centre, and left. The columns were numbered one, two, and three. Each was to be headed by an Engineer officer, with 10 Sappers provided with tools for removing obstacles, behind them a covering party of 100 men, then some men with bags of wool, and after them the ladder party. The main column was to consist of 400 men, to be followed by a reserve of 800 men, and lastly a working party of 400 men. The three columns were to be identical in strength and organization, and captains of Engineers were to accompany the officers commanding.

The following Engineers took part in the operation :—

Lieut.-Colonel J. W. Gordon, attached to Lieut.-General Sir G. Brown, who commanded the entire force.

No. 1 Column.—Major Bent, Lieuts. Murray, Graham, and C. G. Gordon.*

No. 2 Column.—Lieut.-Colonel Tylden, Capt. de Moleyns, Lieuts. James and Donnelly, and Major Campbell, Assistant Engineer.

No. 3 Column.—Capt. Jesse, Lieuts. Fisher, Graves, and Somerville.

There was also a fourth column which was to move towards the Woronzoff Ravine, and enter the works of the place beyond No. 3 Column.

The assaults failed in every direction, no column, either French or English, succeeding in establishing themselves within the enemy's works. There were two causes for these failures. First the attack was made before the fire of the garrison had been sufficiently crushed. Secondly, the French columns on the extreme right, which was intended to penetrate the line to their right of the Malakoff, started before the signal was given. The Russians were therefore fully prepared for the other columns when they left their trenches. The result was, as has been said, complete failure, coupled with severe losses, especially in officers.

Two Engineer descriptions of the British attacks were given, one by Lieut. Graham, who was with No. 1 Column, the other by Lieut. Fisher, who was with No. 3 Column. Graham's report was as follows :—

" In obedience to brigade orders of this day's date " (the 19th June) " I have the honour to inform you that at half-past three o'clock yesterday morning, I was in charge of the ladder party

* Afterwards Major-General Charles Gordon, C.B., the hero of Khartoum.

accompanying the storming party, ordered to attack the right flank of the Redan, Brig.-General Sir J. Campbell commanding. On the signal for the attack being given Lieut. Murray, R.E., advanced in rear of the skirmishers towards the left, followed by the ladder party. The skirmishers did not advance beyond the rear spur of the hill, the fire from the Redan, Flanks, and Creek Batteries being too heavy. Lieut. Murray was here severely wounded, and obliged to retire. Lieut.-Colonel Tylden here came forward, and I had just obtained his sanction to advance on the salient instead of on the flank when he too was struck down by grape shot. The skirmishers now advanced towards the salient, followed by the sappers, and the party carrying the woolsacks and ladders, whom I halted in front of the advanced trench, in order that the skirmishers might cover us before we advanced. Finding, however, that the skirmishers could not advance under the formidable fire of grape and musketry from the Redan, I ordered the escalading party to retire into the advanced trench, which they did. After about 10 minutes the officer in command of the storming party, Lord West, told me that he was again about to lead out the skirmishers, and requested that I would take out the ladders. This I accordingly did, and the ladders were again brought to the front. Here, I beg to be allowed to remark on the remarkable steadiness and gallantry of the officers and men of the Naval Brigade, who formed part of the ladder party, and who suffered most severely on this occasion. As it was again found impracticable for the skirmishers to advance, the ladder party again retired, bringing in most of their ladders, though not without severe loss. After this no further attempt was made until the order was received for the supports to retire. I beg to call your attention to the steady conduct of the party of sappers, under Sergt. Coppin, 4th Company, Royal Sappers & Miners, especially to Private F. Perrie."

Lieut. Fisher reported as follows :—

" On a signal being given from the 8-gun battery, No. 9, I observed the skirmishers moved to the front in open order, and almost simultaneously the assaulting column advanced from the right of our position. I immediately led the Sappers to the front, followed by the remainder of the column in due order under Lieut. Graves, R.E. I proceeded at a steady pace to allow time for the ladder party to cross the two old Russian trenches which were in our line of advance. We were exposed to a heavy fire of grape and musketry as we advanced.

" On arriving at the abattis I looked back to see how the ladder party were coming on. I could not see a single ladder, the men having abandoned them or (as I believe was very general) been shot down in advancing. I observed the whole party to be very

much reduced. I endeavoured to rally the men, but being unable to get together a sufficient force to attempt an assault in the face of such fire as we were exposed to, I ordered the men to get under cover as fast as possible among the irregularities of ground and shell holes which existed close to the abattis, in the expectation of the supports which I hoped would advance to our relief. Here they were shot down by the Russian soldiers, who stood on the parapet of the Redan to fire, as well as by the grape which continued to sweep through our force. After waiting some time for the supports to come, in vain, I felt with such a handful of men any attempt to assault would be madness. Accordingly I endeavoured to find an officer senior to myself to recommend him to retire. Failing in this I took upon myself to order a retreat into our trenches, which was effected, but I fear our loss was very great. The abattis, though not very thick was almost entirely uninjured by our fire. It stood from 5 to 6 ft. high above the ground. There were small gaps and weak places where men could push through. I did not attempt to pull it away with the grapnels as I considered the fire too heavy to justify me in exposing men so prominently at so short a distance from the work, our fire being insufficient to keep the Russian soldiers off the parapet from which they were firing on us. I am of opinion that under a less severe fire it would be easy to break it up by means of axes and the iron grapnels. I am not aware that any of our men passed the abattis. I regret to state that Capt. Jesse, R.E., was shot through the head while speaking to me. Lieut. Graves is missing. He is supposed to have been killed under the abattis." (Then comes a list of N.C.O.'s and privates of R.S. & M. killed and wounded). "I must not conclude without bringing under your notice the very gallant conduct of Sergt. Fandry, R.S. & M., whose steadiness in the advance and exertions in cheering on the men were most praiseworthy."

The Engineer casualties in this unfortunate business were Capt. Jesse, Lieuts. Murray and Graves, killed; Lieut.-Colonel Tylden, died of wounds; Major-General Jones and Capt. Bourchier, wounded. The only success gained on the occasion was at the left attack where the cemetery at the head of the Dockyard Creek was captured, and a communication made from it to the advanced trenches. This was effected by the promptitude and zeal of Lieut. Donnelly, R.E.

On June 28th the army had to deplore the death of the Commander-in-Chief, Lord Raglan. He had been for some time in feeble health; but there is no doubt that the recent disaster was the cause of his sudden collapse. He was succeeded by Lieut.-General Simpson, who for some months had acted as Chief of the Staff.

It was now determined to add greatly to our weight of metal,

and no efforts were spared to establish fresh batteries, and to bring up the ammunition that so large an armament would require.

On August 16th the position on the Tchernaya, which was held by the French and Sardinian troops was attacked in force by the Russians. After a heavy battle the enemy were driven back with great loss.

On the following day the batteries opened a certain amount of fire, intended to prevent the garrison from annoying the advanced trenches, which were being steadily pushed nearer and nearer to them, especially in front of the Malakoff; and this fire was maintained with more or less intensity until the beginning of September.

By this time the following additions had been made to the British attacks:—On the Left six new batteries had been constructed. In the Right Attack also, six new batteries were formed. Two new parallels, the 4th and the 5th, with their communications, had been established, and a trench was pushed out in front of the 5th Parallel, towards the salient of the Redan, reaching to within 190 yards of it.

The losses in the Royal Engineers had been very heavy. Lieut.-Colonel Tylden, Capts. Jesse and Dawson, Lieuts. Murray, Graves, and Lowry had all been killed. Major Montagu and Lieut. James had been taken prisoners but the former returned to duty having been exchanged early in August. Many other officers of the Corps had been invalided, of whom Capt. Belson and Lieut. Somerville had died at Scutari.

On September 3rd the chief Artillery and Engineer officers of the two armies were once more summoned to assemble. They gave in their joint opinion "that the siege works have arrived at such a point that the assault ought to be given to the place after a short delay." They observed that the French left attack on the town had been stationary for a long time, no further advance being practicable. The British advance on the Redan could also not be carried further. At the Malakoff the French artillery had obtained a marked superiority, and in consequence the approaches were within 25 metres of the *enceinte*. Although it might be possible to push farther forward, and blow in the counterscarp, they thought the delay to enable this to be done would be prejudicial. The French extreme right attack in front of the Careening Bay (or little Redan) was also within 25 metres of the place, and could approach no nearer owing to the rocky soil. Under these circumstances "the moment to give the assault has arrived." It was decided that the principal attack should be on the Malakoff and little Redan.

"If we succeed in seizing and lodging ourselves securely in these works, the fall of the Karabelnaia suburb becomes inevitable."

It being decided that these were to be the main attacks, it was considered necessary to distract the garrison by subsidiary assaults.

"For this purpose, as soon as the success of the Malakoff front shall appear certain, the English at a concerted signal should give the assault to the Redan, and the French would at the same time advance on the enceinte of the town."

This project was approved, and on September 5th the bombardment became general, every gun that could be brought into play having opened on that morning. The British batteries consisted of 202 guns and mortars, and the French of 627. The calibre of the British guns was, however, in many cases superior to that of their allies. By these figures it will be seen that the weight of bombardment was of a most stupendous character, far exceeding what had ever before been brought into play on a similar occasion.

On September 6th the orders were issued for the British assault on the Redan. The assault was ordered for 12 noon on September 8th. Punctually at that hour the French columns rushed from their trenches, and the Malakoff was in their possession in a few moments. As soon as the tricolour was hoisted on the parapet as a token of capture, the signal was given for the British advance on the Redan. The story of this attempt and failure is best told in the words of the two principal Engineer actors, Capt. Montagu, attached to the General leading the column, and Lieut. Ranken, who had charge of the ladder party. The report of the former ran thus:—

"Upon the signal being shown that the French were in possession of the Malakoff Tower, the order was given for the troops to get ready. Such, however, was the excitement of the moment, that 100 men or more mistook the order, and went over the parapet before it was possible to stop them, and it was found necessary to let them all go, although by doing so the ladder party under Lieut. Ranken had not sufficient time to get all the ladders on the move and placed before the assaulting party arrived, they having less difficulty in passing the abattis, the passing of which, however, did not prove any serious obstacle. The first parties formed and moved off very well, but after that the showers of grape and rifle balls, etc., upon the succeeding parties sent from the flank of the Redan and Garden Batteries caused the men to run to the head of the single sap, from whence, after a short halt to take breath, they made another rush towards the salient angle, but by this means they were no longer in regular formation. All the men crowded on the salient angle so as to be out of the way of the flanking fire. To prevent this first check, I obtained permission from the General to allow the men pressing up from the left of the 5th Parallel to go up the single sap and start from the head of it. After about two hours' heavy firing the men all returned to the 5th Parallel, and no further attempt was made during the afternoon. General

Wyndham, who was in charge of the assaulting column, informed me that he had been inside the Redan with some 60 or 80 men who got behind a traverse and could not be induced to go further. . . I have great pleasure in informing you that Lieut. Ranken performed his very dangerous service to my great satisfaction, placing the ladders very judiciously, and he afterwards succeeded in making the descent and ascent such that the troops experienced no difficulty in getting up without ladders, and he has expressed himself perfectly satisfied with the conduct of the sappers under his charge. I regret to say that Capt. Sedley, R.E., who was in charge of the working party to form the lodgments, was wounded, also Lieut. Elphinstone, R.E., who was on duty in the trenches; and of the sappers two were killed, and eleven wounded."

General Jones, who was at the time too ill to move, insisted on being present. He was carried down into the trenches in a litter, and remained with General Simpson throughout the attack.

In addition to the casualties among the Royal Engineers, Major Chapman, 20th Regiment, Assistant Engineer, was mortally wounded and died on September 20th.

This was the last operation of the siege. The French had made good their grip on the Mamelon in spite of the most furious attempts of the Russians to secure that vital point.

There is no doubt that the British storm of the Redan, unsuccessful as it was, enabled their Allies to secure themselves within their prize. For two most critical hours the enemy were compelled to divide their forces, and to devote a large portion of them to the retention of the Redan. During those two hours the French were able to block up all the rear openings by which access was obtained to the Malakoff from the interior, and at the same time create a communication with the trenches. A flying sap was established to the crest of the counterscarp, and a bridge of planks thrown over the ditch. The troops were therefore poured into the work rapidly and without confusion or exposure. Unquestionably this operation was much aided by the distraction caused by the other attacks, although they all failed. Most fortunately, the one point that was secured was the key of the position. The Russians were well aware of that fact, and shortly after darkness set in they began that masterly retreat to the north side which reflects so much credit on those who planned it, and also on those who so steadily and quietly carried it out. Before midnight the first of the explosions took place, by which the magnificent forts erected at such cost to protect the harbour, were being destroyed by their own constructors, and a constant stream of men was observed to be passing across the bridge that led from the south to the north side of the town.

At the end of two days the British entered the place and occupied

the Karabelnaia suburb, the French being posted in the town. A mixed commission was formed, composed of officers of both armies, to take an inventory of all ordnance and military stores that were found in the fortress, in order that an equitable division might be made between the two armies. Twelve British members sat on this commission.

The number of Engineer officers who from first to last took part in the Crimean War was sixty-nine. Of these thirteen were killed, six died of disease or accident, thirteen were wounded, and twelve invalided. Of the nineteen Assistant Engineers, two were killed, and five wounded. Of non-commissioned officers and privates of Engineers who landed in the Crimea, fifty were killed, ninety-two wounded, and sixty died of disease.

The following are approximately the numbers of the principal engineering materials used at the siege :—Common gabions, 17,015 ; iron gabions, 2,307 (these were made of the strap iron by which the compressed hay trusses were bound) ; fascines, 2,780 ; sandbags, 336,345 ; bread bags, 7,413 ; hide bags, 40.

The main object of the Siege of Sebastopol having been the destruction of the Russian fleet and the magnificent docks that had been constructed for its maintenance, the place had no sooner fallen into the possession of the Allies than orders were given to prepare a project for the demolition of the docks.

The docks were demolished by means of a series of three lines of mines, one under the centre of the floor, and the other two behind the revetments of the side walls, continued so as to meet round the semi-circular end. For the three docks there were 134 such mines, and 22 additional ones for the half of the basin that fell to the British share. As soon as this operation had been carried out the destruction of what was known as the White Buildings, an extensive range of barracks, was undertaken. The officers employed in this work, under Lieut.-Colonel Lloyd, were Major Ranken, and Lieuts. C. G. Gordon and G. Graham.* The demolition of the buildings was satisfactorily effected with one sad casualty. Major Ranken himself undertook to fire the form of four charges in the gable of one of the buildings at 5 p.m. This was to be done by means of a 3-ft. length of fuze. Unfortunately some loose powder became ignited, and exploded the four mines before Major Ranken could escape. His body was not found until the next morning when it was extricated from the ruins in a very mangled and crushed condition. This was the last British life lost in the war, and the sadness of the accident was accentuated by the fact that he had led the storming party on September 8th with the most dashing gallantry, and had escaped unhurt.

* Afterwards Lieut.-General Sir Gerald Graham, V.C., G.C.B.

TRANSCRIPT.

ANTITYPHOID INOCULATION.

From the *Medical Record, U.S.A.*

FACTS as to the efficacy of antityphoid inoculation accumulate almost daily. Perhaps the most satisfactory statistics with regard to the value of the method are those afforded by the United States Army. As pointed out by Major Russell of the Medical Corps, U.S. Army, in 1911, it was made compulsory for all recruits in the army. The following figures showed the contrast between the state of affairs in the Spanish War and that in 1911. At Jacksonville, Fla., in the early campaign there occurred certainly 1,729 and probably 2,673 cases of typhoid fever with 248 deaths. The strength of the force was 10,579. At San Antonio when an American army was concentrated on the Mexican border in 1911, 13,000 men were encamped for about the same length of time as in the Spanish War and among these were only two cases of enteric fever and no deaths, although the disease was actually present in the civil population of San Antonio and the troops were allowed to enter the town freely. According to Major Russell, in the army as a whole a great drop has occurred in the incidence of typhoid fever since inoculation was made compulsory. Reports from France are as favourable as those from this country. For example, during an epidemic of typhoid fever in Avignon, the garrison of the town consisted of 2,053 men, of whom 1,366 were inoculated. Among the unvaccinated soldiers 155 cases of typhoid fever with 21 deaths occurred, while among the vaccinated there was not a single case. All the soldiers lived under exactly the same conditions. Again, in Eastern Morocco among 962 vaccinated soldiers there was no case of infection, whereas among the non-vaccinated the morbidity was 38·22 and the mortality 5·51 per 1,000.

In the British Army in India the results of the method have been conspicuously brilliant. There the typhoid rate fell in five years from over 15 to under 5 per 1,000, and the death rate from over 3 to 0·63 per 1,000. During the year 1910 among about 70,000 men there was a total of 306 cases of enteric fever; 151 of these occurred in the 10,000 who were unprotected and only 155 in the 60,000 who had been vaccinated. Only 11·2 per cent. of the inoculated died and 16·1 per cent. of the uninoculated. It must be borne in mind that members of the white race in India are peculiarly prone to typhoid fever and that up to recent years this has been one of the main causes of sickness and death.

Figures dealing with the efficacy of antityphoid inoculation in the Italian and Japanese Armies tend to show that the method has greatly decreased the death rate and morbidity rate from this cause. The Italian statistics are especially favourable, while the heads of the Japanese Army have found antityphoid inoculation of so great preventive value that it has been made compulsory.

At the present juncture, the question is insistently of moment. Immense masses of men are gathered together in Europe under conditions necessarily the reverse of sanitary. In spite of all precautions typhoid fever is certain to break out, in fact, has already broken out. Consequently, any method calculated to protect individuals from contracting the disease should be employed without hesitation. Even if the method had not been proved to be as efficacious as it certainly is it should be practiced. When an authority of the rank of Sir William Leishman declares that not only is antityphoid vaccination efficacious but the subsequent ill-effects are slight and fleeting, a view which is endorsed by the great majority of the British medical profession, and when Professor Chantemesse of Paris goes so far as to state active belief that typhoid fever will gradually disappear during the present century just as small-pox vanished in the nineteenth century and when Italian and Japanese authorities, who have tested the method, are practically unanimous in giving evidence as to its value, scepticism must, to a great extent, vanish.

REVIEW.

THE LIFE OF GENERAL SIR HARRY N. D. PRENDERGAST, R.E., V.C., G.C.B.

By COLONEL H. M. VIBART, late R.E. With 25 Illustrations, including a Photogravure of Sir Harry Prendergast. Price 15s. net.—(Eveleigh Nash, 36, King Street, London, W.C. 1914).

THIS Memoir of a very distinguished officer, who has recently passed away, is a welcome addition to the library of biographies of Royal Engineers, who have brought honour to the Corps to which they belonged, as it not only gives an admirable account of his life and services, but also contains much useful Corps history, especially as regards work in India, of which Sir Harry Prendergast had the good fortune to see a great deal both in peace and war.

Prendergast came of an ancient family of warriors, originally Flemish, one of whom, Maurice, went over to Ireland in the twelfth century, when that island was a happy hunting ground for men of military capacity, seeking to gain fortune by the sword. From him descended Sir Jeffrey, grandfather of the subject of this volume, the first of the family to serve in India, who was born in 1769, a year which produced several remarkable men, including Wellington and Napoleon. This Jeffrey had a distinguished career, commencing with a period of imprisonment in France during the great war, whence he succeeded in escaping to Switzerland. The account of his experiences as a prisoner of war will be read with special interest at the present time when a number of our country people are imprisoned in Germany. On returning to England he received a commission in the Madras Army and served for forty years in India, retiring in 1835, when he was promoted to the rank of major-general.

Sir Jeffrey's son, Thomas, was one of the East India Company's civil servants, and held a number of important appointments in the Madras Presidency during the thirty-two years of his Indian career. He had two sons, Hew and Harry, both of whom received commissions in the Madras Engineers, of whom the former joined as second lieutenant in 1850, and retired with the rank of major-general in 1887. Harry, the younger brother, joined at Addiscombe College in 1852, where he was specially distinguished in athletics. He was a member of the cricket eleven, a good fencer and boxer, and proficient with the oar; but his prowess in sports did not interfere with his studies, and, in 1854, he was given a commission as second lieutenant in the Madras Engineers. After passing through the usual course of instruction at Chatham in military engineering and survey, he embarked for India

in 1856, and, soon after his arrival, was posted to the Madras Sappers, a corps with which he did important service.

Prendergast's active military service commenced almost immediately, as war was declared with Persia in November, 1856, and B Company of the Madras Sappers, to which he belonged, formed part of the British Expeditionary Force under the command of General Sir James Outram. The campaign was of brief duration, as, after the British had advanced up the Shatt el Arab River, and captured the Fortress of Mohumera on the east bank, the Persians gave in and peace was concluded in March, 1857, when the troops returned to India. The Madras Sappers were highly praised by General Outram for the zeal and activity they had displayed in the advance and assault on Mohumera, and it is interesting to call to mind that the Engineers have again very recently distinguished themselves in the advance up the same Shatt el Arab against the Turks, whose territory is on the west bank of the river from Fao to a point between Mohumera and Busra.

But, although the Persian War was at an end, B Company did not return to Madras as the Indian Mutiny had broken out, and, on landing at Bombay, Major Boileau who commanded it, asked that the company might be allowed to join the column, which was about to be sent from Poona against the mutineers in Central India. His request was at once granted, and the company joined the Deccan field force in July at Aurungabad, where a column was formed under the command of Brig.-General C. Stuart, which reached Mhow in August, where a halt had to be made on account of the monsoon. Two months later, a force, to which Prendergast, although only a second lieutenant, acted as brigade-major, captured the fort at Dhar, and, soon afterwards, General Stuart marched with the Malwa field force to Mundisore where the rebels were completely defeated and Prendergast won the V.C. for saving the life of Lieut. G. Dew, of the 14th Light Dragoons. He was badly wounded and had to return to Mhow, but recovered in time to take part in the brilliant campaign conducted by Sir Hugh Rose (afterwards Lord Strathnairn) with the Central Indian field force in 1858, during which the strong fortress of Jhansi was captured.

Prendergast's account of the Siege of Jhansi, quoted at considerable length by Colonel Vibart, is very interesting and gives a good idea of the hard work that fell to the lot of the Engineers, work of which Prendergast had his full share, and he was again severely wounded. His services met with well-deserved recognition, as, in addition to getting the V.C., he was recommended for promotion to a brevet majority on reaching the rank of captain. The official notification of the recommendation for the V.C. was as follows :—

"For conspicuous bravery on 21st November, 1857, at Mundisore, in saving the life of Lieut. G. Dew, 14th Light Dragoons, at the risk of his own, by attempting to cut down a Velaitie who covered him (Lieut. Dew) with his piece from only a few paces to the rear. Lieut. Prendergast was wounded in this affair by the discharge of the piece, and would probably have been cut down had not the rebel been killed by Major Orr. He also distinguished himself by his gallantry in the actions at Ratghur and the Betwa when he was severely wounded."

Sir Hugh Rose, in forwarding the recommendation, wrote :—

"Lieut. Prendergast, Madras Engineers, was specially mentioned by Brig.-General (now Sir Charles) Stuart for the gallant act at Mundisore where he was severely wounded; secondly he was specially mentioned by me when acting voluntarily as my aide-de-camp in the action before besieging Ratghur on the Beema River for gallant conduct—his horse was killed on that occasion; thirdly at the action of the Betwa, he again voluntarily acted as my aide-de-camp, and distinguished himself by his bravery in the charge which I made with Capt. Need's troop of H.M.'s 14th Light Dragoons against the left of the so-called Peishwa's Army under Tantia Topee; he was severely wounded on this occasion."

This was a fine record for a second lieutenant, and was the auspicious commencement of a distinguished career.

The severe wounds received in the Mutiny Campaign necessitated two years' sick leave, and, much to his regret, Prendergast was not allowed to take part in the China Campaign of 1860, but he recovered sufficiently to return to duty in Madras by the end of that year, and held various appointments until 1867 when he had his next turn of active service, as Sir Robert Napier was appointed to the command of an expeditionary force to Abyssinia, in order to rescue certain persons, who had been imprisoned by King Theodore in the fortress of Magdala. Major Prendergast was sent in command of three companies of the Madras Sappers to make arrangements for the landing of the expedition at Zulla Bay, and for its transport to Senafé, the secondary base, in the highlands of Abyssinia.

It was to a large extent an Engineers' war; piers had to be constructed for landing the troops and stores, a railway laid to the foot of the mountains, and roads traced up the long and difficult passes, which rose, at their summit, to 7,000 ft. above sea level; it was satisfactory that Sir R. Napier was in command, as being an Engineer officer himself, he was thoroughly competent to direct the operations and to appreciate the work done by his brother officers, while his diplomatic skill in dealing with Kassai, Prince of Tigré, afterwards King John of Abyssinia, had no little effect in insuring the success of the campaign.

The *résumé* of the war given by Colonel Vibart is very interesting, but the map is not altogether satisfactory, as there are a number of important places mentioned in the text, which are omitted, and, on the other hand, places of less importance, not referred to in the text, are shown on the map. It would have been better if the latter had been prepared so as to read with the former.

The advance from Senafé was made in January, 1868, and, by April, the expeditionary force had arrived in the vicinity of Magdala. After a sharp fight with the Abyssinians, in which Prendergast had his part, Theodore retired into the fortress, and sent the prisoners to the British camp. Magdala was then attacked and captured, when the King committed suicide and the campaign was brought to a satisfactory

conclusion. For his good work in this war Prendergast was made brevet lieutenant-colonel after only 14 years' service in the Army. On his return to India he was selected for the command of the Madras Sappers, an appointment which he held for 12 years, during which he did much to improve the efficiency of the Corps, and was respected and loved by the officers and men who served under him. In 1875, he was promoted to the rank of colonel and was given the C.B.

The next military expedition out of India upon which Prendergast was employed was in 1878, when a force of about 7,000 men was sent from India to Cyprus during the Russo-Turkish War, and the Engineers, composed of two companies of Madras, and two of Bombay Sappers, were placed under his command. They disembarked first at Malta, and then went on to Cyprus, where they had plenty of work, but no fighting, and matters in Europe having settled down, the army returned to India. On rejoining at Madras, Prendergast was appointed Military Secretary, and, in 1880, became brigadier-general in command of the troops in Malabar and Cannanore, whence he was transferred in the following year to Bellary. But he did not hold the appointment long, as, in 1881, he was promoted to the rank of major-general after only 28 years' service. His advancement had been very rapid, indeed too rapid, as after events proved.

In 1883 Prendergast was selected for the command of the British Burma Division, and joined at Mandalay in April. At that time the country was tranquil, but there were signs that Thebaud, King of Burma, was likely to give trouble, as he was in correspondence with the French Government, and was developing a policy of hostility to the Government of India, which could not be allowed to go on unchecked. In October, 1885, the Indian Government sent him an ultimatum, to the effect that a British agent should be permanently stationed at Mandalay, and at the same time, a British force was organized under General Prendergast to back up the ultimatum. As the King sent a defiant reply to the letter, orders were sent to Prendergast to occupy Mandalay and dethrone the King; he was told that these objects were to be attained if possible by the display rather than by the use of force, so that the task was by no means an easy one, but it was admirably carried out.

General Prendergast left Rangoon on November 12th, with a force of about 9,000 men, British and Indian; and, by November 29th, the frontier fortresses on the Irrawaddy had been captured, the Burmese Army dispersed, and King Thebaud dethroned and sent as a prisoner to India. The manner in which the work had been done was well summed up in the following letter from Lord Dufferin, the Viceroy:—

"I cannot rest content without conveying to you in a more permanent form than a telegraphic message my high appreciation of the manner in which you have conducted the whole of the Burma business. It does you the greatest possible credit; and I am happy to say that your services have been fully appreciated both at home and in India itself. The Queen is delighted, so is the Secretary of State, and so is

the Government of India. One of the characteristics of success is that it excludes from public observation the fact that, in the hands of a bungler, the result might have been very different; and we have already received sufficient information in regard to the difficulties with which you have had to cope to convince ourselves that it is rather to your skill and good management, than to any exceptional easiness of the task you were commissioned to fulfil, that so satisfactory a conclusion of the affair is to be attributed. Had there been only a little mismanagement, any unnecessary delay or less promptitude of decision, the conquest of Burma would have probably cost us many valuable lives, and greatly aggravated our future difficulties. As it is, thanks to your skill, prudence and humanity, and your rapidity of execution, we have attained our ends with little loss to ourselves, or to Her Majesty's future subjects. This circumstance will enable us, of course, the more readily to shape our eventual policy. Again congratulating you upon the well-deserved honour conferred upon you by Her Majesty, as well as on the high place to which your recent achievements have raised you both in the eyes of the English and of the Indian public, believe me, my dear Sir Harry, yours sincerely, DUFFERIN."

After the successful occupation of Mandalay, Prendergast led an expedition up the Irrawaddy to Bhamo, an important strategical point on the river 250 miles further north, upon which a Chinese force was advancing from the east. This move he carried out on his own initiative, as the necessity for action was pressing, and there was not time to obtain authority from the Indian Government; but his rapid move received the complete approval of the Viceroy, as it prevented serious political complications with China.

For his services in this very successful campaign, Prendergast was made a K.C.B. Soon after its conclusion he felt the disadvantage of too rapid promotion, as he became lieutenant-general during the war, and, Burma being a major-general's command, was ordered back to India. This was regarded by his friends as a grievance, and there was some criticism of his action in Burma, due apparently to the action of a *Times* correspondent, who had been sent out of the country for indiscretion. One is inclined to think that Prendergast would have preferred that such matters had been left to rest, but they are dealt with at unnecessary length in the Memoir, which is rather to be regretted. No one in Sir Harry's high position can expect to go through life without incurring some criticism, and meeting with some difficulties, and the subject was well dealt with in a letter from Lord Dufferin in which he said :—

"The one fact which history will record, and the only fact which I am sure at this moment remains present in the minds of your countrymen, is that in the course of a fortnight you conquered a kingdom and overthrew a dynasty; and this in consequence of the vigour, the celerity, and the judicious character of your operations. . . . We said to you 'Go and take Thebaud and occupy Mandalay,' and you did both with scarcely the loss of a man."

After leaving Burma, Prendergast took furlough to England, and, on his return to India was appointed Officiating Resident at Travancore, and, in 1889, was made the Governor-General's Agent at Baroda. He was also Resident at Mysore and Chief Commissioner of Coorg from 1891 to 1892, when he finally returned to England after 36 years' service in India. In 1902 he was given the G.C.B., a well-earned honour, and, in 1908, he became Colonel Commandant of the Royal Engineers. But though he had retired from Government service he led a most useful life, and always worked for the welfare of the Corps to which he belonged. He is well described as "The Happy Warrior," on the title page of Colonel Vibart's volume, which we hope will be read by the young officers of the Corps who will learn from it much that will be helpful in their passage through life, and they will do good work for their country, if they follow the bright example of Sir Harry Prendergast.

CHAS. M. WATSON.

NOTICE OF MAGAZINE.

RIVISTA DI ARTIGLIERIA E GENIO.

October, 1914.

AERIAL COMBATS.

In one of the last numbers of the *Kriegstechnische Zeitschrift* there appears an interesting article on aerial combats, a subject which has been the object of many discussions and theories which are far from agreeing one with the other. The article in the German periodical is a *résumé* of a series of publications of the military writer, C. Dienstach, gathered from the *Scientific American*. The views of Dienstach refer essentially to the good results furnished by the German Military Press that were obtained from dirigibles armed with mitrailleuses, and the slight value that France is inclined to attribute to this armament in view of the always increasing capacity of ascension of the aeroplane.

It is an indisputable fact that in these later times aeroplanes, even with some passengers, have frequently reached a height to which it is not possible for a dirigible to follow without a considerable sacrifice of gas and ballast. The lessons which ardent aviators have brought to their country after traversing the Pyrenees and the Alps, in France, tend to consider fighting in the air exclusively from a point of view of gaining the greatest height, like a battle between artificial birds of prey. As there seems no doubt that the aeroplane can attain a greater height than the dirigible the French conclude that the final victory should remain with the first. The problem, however, is not so simple as it appears, and is deserving of a more careful examination. Altitude appears a decisive factor, since it is admitted that an aeroplane with its greater velocity can freely rise above the dirigible, and in a state of relative immovability can destroy the dirigible by simply throwing a bomb. The fallacy of this French deduction is at once revealed when contrasting the velocity of a falling bomb with that of a mitrailleuse projectile.

With regard to a dirigible armed with a mitrailleuse, the aeroplane cannot approach without great risk, to discharge its bomb, at less distance than 600 m. Besides, the aeroplane has to fly with the same velocity, and in the same direction, as the dirigible if it is to have a probability of striking. Now, it is clear that for an aeroplane, when dropping a bomb on a target on the ground, the same conditions have to be determined when the target is a dirigible in motion. In the first case it is necessary to consider its own velocity and the approximate distance of the ground, whilst in the second there are two velocities to be considered, and the relative distances of the two aerial machines, and this is not easy. The aeroplane has to take into account its greater

velocity in order to keep itself above the dirigible, and to take aim at a target in motion with a fair chance of striking the latter from a height of 600 m. Such is the theory, but other factors have to be considered, and especially the great precision of fire of the modern mitrailleuse that renders it dangerous to the aeroplane within a large area around the dirigible. Besides, the stability of the dirigible which can fire quietly and at ease, and the modern precision of the sights, are factors which have to be taken seriously into account. Contrasted with the fire from modern mitrailleuses, the throwing of a bomb from an aeroplane is like the mediæval custom of pouring pails of boiling pitch. A bomb takes 13 seconds to fall from a height of 600 m., which gives sufficient time to avoid the unwelcome visitor from the sky. In the clear atmosphere of the higher regions an observer on a dirigible can with a good field glass follow continuously the movements of an aeroplane 600 m. above him, and it is certain that the throwing of a bomb cannot pass unobserved, even in mist, with the strong searchlights with which the great dirigibles are now provided. A short electric signal to the pilot can effect a rapid deviation. Owing to the great speed and the efficiency of the rudders the dirigible may be found at a great distance at the moment at which the bomb arrives from above. Nor is it to be supposed that a dirigible will easily permit an aeroplane to attack it from above. It can manœuvre continuously without prejudice to the accuracy of fire from its armament. A projectile fired from a mitrailleuse pointed at a great elevation can traverse 730 m. in a second, notwithstanding the slight correction for the resistance of the air. The aeroplane would certainly not have the same facility of aiming for dropping its bomb. It is also impossible to determine by the eye if the vertical direction is effectually above the dirigible, nor can one calculate the trajectory of a bomb dropped under such conditions. Without a special field glass fixed vertically the most capable pilot would not be able to keep the aeroplane for any time vertically in a position above the dirigible. Besides, the aeroplane has to contend against the wind, which does not affect the dirigible to the same extent. There exists then great difficulties for an aeroplane wishing to throw a bomb on a dirigible from above, which render success problematical. Again, the fact that the small bombs of aeroplanes, of limited weight and of relative large surfaces, in traversing the strata of air of different densities are subject to deviations, which become increased with the distances. There seems then only to be one expedient, that is, to give an armoured protection to the car of the aeroplane, to enable it to approach nearer to the dirigible, but this entails the danger of being capsized by the eventual explosion of the latter. With the fire from mitrailleuses, which can cut through a tree, it is not possible to give armoured protection to the propellers, which must always remain vulnerable. On the other hand if the aeroplanes have armoured protection the dirigibles may be armed with small cannon in place of mitrailleuses. The attempt would perhaps be made to arm the aeroplanes with mitrailleuses; it would then be a question of a combat with firearms for both sides, which would put an end to the tactics of the falcon now badly applied. Doubtless, in the fight between two aerial machines, both armed with

mitrailleuses, the advantage would remain with the aeroplane because the dirigible with its superior mass could not compete in front of a fleet of small aeroplanes. But the greater capacity of the dirigible would admit of its having on board a gun which with its longer range would always be able to keep the aeroplane at a distance and to destroy it before coming under the range of fire of the aeroplane's mitrailleuse. There would be no material inconvenience to a dirigible provided with a small cannon, as a gun of this kind would be almost as easily manageable as a mitrailleuse. It cannot be denied that the considerations of the American writer have a certain value as opposed to the opinions of those who think that the dirigible must be a prey to the aeroplane. Pending the results of practical experience no one for the moment should arrogate to himself the right of a definite judgment on the question which should be considered calmly and without preconceived ideas.

Dienstach in another article treats briefly of the combat of aeroplanes with one another. The Turkish and Bulgarian aeroplanes at the lines of Chataljia were limited to exploration work, but the immense European War with Germany now in progress furnishes many examples of combats between aeroplanes. The author concludes that only the experience of the future will be able to furnish lessons. This is fully brought out by several cases which have occurred in which at the decisive moment brave aviators have not hesitated to sacrifice their lives and their machines for the good of their country.

November, 1914.

NOTICES.

Mortars of 30·5-c.m., Model 911.—From the *Jahrbücher für die deutsche Armee und Marine* we extract the following notices :—Trials made with a mortar of 30·5-c.m., Model 911, against a target constructed with reinforced concrete, 18 m. wide and 9 m. in depth. 151 shots were fired from a distance of 8,000 m., of which 90 struck the target. Of the latter, 21 were direct hits. A block of cement 1·50 m. thick was completely destroyed. An armoured turret, 15 c.m. thick, was entirely perforated.

Cyclist Companies.—From the pages of the *Internationale revue über die gesamten Armeen und Flotten* the following report is taken on the constitution of the Austrian-Hungarian cyclist companies :—In Austria-Hungary there are only four companies of cyclists, which are the fourth companies of the rifle battalions (11th, 20th, 24th, 29th). Each company is subdivided into four sections, of which the 1st, 2nd, and 4th are cyclists; the 3rd Section is for mitrailleuses. Each company also has a sanitary patrol. The cyclists are armed with repeating carbines, Model 96, of 8-m.m. calibre, carried on the back. In each section the knapsacks and the cloaks are carried on a motor-car. The Mitrailleuse Section consists of two mitrailleuses with relative detachments, and of 20 cyclists carrying ammunition. The mitrailleuses and their carriages are carried on ordinary flexible bicycles conveniently modified. All the bicycles are provided with a bag fastened behind the saddle. These bags contain the cartridges. The bicycles for the sanitary patrols are not flexible,

but are constructed in such a manner that they can easily be transformed into litters. These can be used as stretchers for carrying the wounded, or attached to bicycles ridden by cyclists. Each company is provided with signalling apparatus for visual signalling by day or night, telephonic material, sappers' tools, and explosives. Usually the sappers' tools and the explosives are carried in one of the motor-cars of the company. In case of need these tools and half the explosives can be carried by the cyclists of the 4th Section, which are equipped with bags fixed behind the saddle of the bicycle. The greatest care is given in the instruction of the company cyclists in exploration work and in musketry.

BULGARIA.

Consumption of Artillery Ammunition in the Balkan War.—At the commencement of the war against Turkey, Bulgaria arranged for about 1,000 rounds for each field gun. The consumption in the greater part of the regiments in the campaign varied between 450 and 500 rounds per gun; but in some others it amounted to over 800 rounds. Reinforcements were effected partly by acquisitions made during the war, and partly from Krupp projectiles captured from Turkey. During the whole of the war, including the campaign against Servia and Greece, the consumption for each gun amounted to about 1,076 rounds per gun. At the conclusion of peace the batteries had only 40 rounds for each gun. Following the experience gained Bulgaria has arranged for the future that, in peace time, 1,500 rounds shall be held ready for each field artillery gun.

FRANCE.

Telegraph Service for Cavalry Divisions.—The telegraph service for cavalry divisions, as referred to in the *Jahrbücher für die deutsche Armee und Marine* for August, gives the following regulations (War Service, 2nd December, 1913) :—The director of the service is a captain of engineers attached to the staff of the division, and has at his disposal a cavalry telegraphist detachment for the service of the cavalry light telegraph, and a telegraph section. This (composed of 1 sergeant, 1 corporal, 5 telegraphists, all mounted on bicycles) is commanded by a lieutenant on the Reserve. These telegraph sections for cavalry divisions are not formed at the moment of mobilization, being selected from various corps. The *personnel* in time of peace is united near to one of the regiments of the division, under the orders of a lieutenant who is responsible for the military and technical instruction. At the time of mobilization the telegraphist detachment becomes part of the general staff of the division. Such a detachment comprises 1 officer, 3 non-commissioned officers, 18 cavalrymen, 6 cyclists, 3 light wagons ; and is subdivided into three equal sections. Each detachment contains 6 transmitters and 6 Morse receivers, 6 visual apparata of 10-c.m. diameter, 9 telephonic stations, 9 intermediate stations, 9 k.m. of telegraph wire, and 18 k.m. of wire on 18 drums per telephone. Each section fixes 3 k.m. of telegraph line in an hour, and 6 k.m. of telephone line in the same time. For visual communication a searchlight is used ; if with petrol it projects the light 5 k.m. by day and 15 at night ; used

with acetylene 8 to 25 k.m. respectively during the day and during the night.

Transport of Cartridges for Companies.—The *Internationale Revue über die gesamten Armeen und Flotten* for September gives the following information :—The carriage for cartridges for a company has two wheels and is drawn by two horses ; the weight unloaded is 380 k.g., loaded 1,300 k.g. ; it contains two boxes with 12,928 cartridges each, total 25,856, besides 200 empty bags for cartridges. The ammunition in the boxes can be carried in the bags. In that case the load is less; or precisely 25,856.

Calculating 200 rifles per company there are disposable per man :— 88 cartridges carried by the man ; 129 cartridges carried on the company wagon ; total 217.

For the transport of the cartridges for the section-mitrailleuses they use improvisionally the old battalion carriages transformed for four horses, weighing, empty, 1,100 k. and 1,900 k.g. loaded. They contain behind 18,000 cartridges in belts and in front 1,500 in belts, and 2,400 in boxes. Each car thus carries 21,900 cartridges.

GERMANY.

The Greatest Cannon in the World.—We read in the pages of the *Mitteilungen über Gegenstände des Artillerie-und Geniewesens* that in the range for fire for Krupp's factory near Meppen trials have been made with the largest gun in the world. This gigantic cannon has a calibre of 38 c.m. and is 17 m. in length. The charge weighs about 2 quintalis. The cost of each round fired is about 10,000 marks. With this gun the range is said to attain to 24 k.m. (15 miles). The complete expenses for the gun, including the placing of it in position, are said to amount to about 400,000 marks. The periodical mentioned above does not give any other details of the gun.

E. T. THACKERAY.

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MANUAL OF TRAINING FOR JUNGLE AND RIVER WARFARE. Illustrated by Photographs and Sketches by the Author. By Major Gordon Casserly, Indian Army. Price 3s. 6d. T. Werner Laurie, Ltd., Clifford's Inn, Fleet Street, E.C.

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