THE ROYAL ENGINEERS JOURNAL.

Vol. XI. No. 3. MARCH, 1910.

CONTENTS.

CONTENTS.

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

3.—Yunnan Pack Saddle.

The Saddle before Trestle is fitted to it.

4. Yunnan Pack Saddle.

Fitting Loaded Trestle on to Saddle.

MILITARY INTEREST IN YUNNAN

The Posi Bridge from the South-West.

The East Gate of the Posi Bridge.

CONTRIVANCES OF MILITARY INTEREST IN YUNNAN.

THE following notes are communicated as being likely to prove of military interest. They comprise details of an old bridge at Posi, of a Yunnanese water wheel, and finally of a Yunnan bullock cart and pack saddle. The pack saddle, as described, is common in China, being also met with in Shantung and Chihli and most probably in many other of the Provinces.

1.—THE BRIDGE AT POSI.

Principle of Construction.—The bridge is a combined cantilever and suspension bridge, built in the following manner :—

Two cantilevers, similar to the military cantilever bridge, are built out from either bank with logs, which are, moreover, strengthened by joining them together with wooden trenails. On the inner ends of these logs, instead of heaping large boulders, the foundations of the towers are built. These towers support the eight chains, four on each side, which in their turn support the centre portion of the bridge. The general idea can be seen from the accompanying rough sketch (*Fig.* 1).

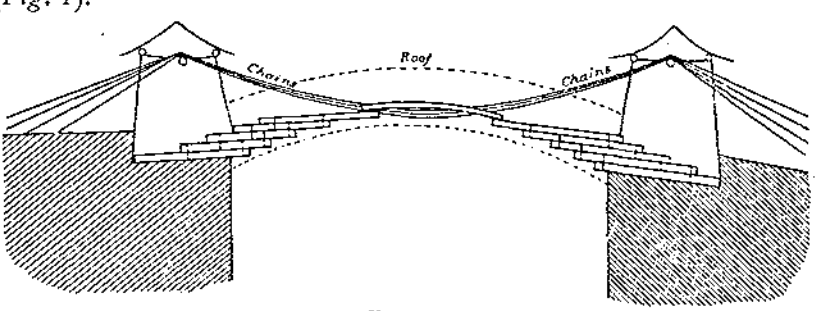


FIG. 1.

It seems that a bridge of this type should give a very considerable span, for two reasons :—

(1). The weight on the inner ends of the cantilevers is very considerably more than that of the ordinary field type of cantilever bridge.

(2). The load on the bridge is compensating, *i.e.* the greater the load on the centre of the bridge, the greater the downward thrust on the towers due to the chains and therefore on the inner ends of the cantilevers.

Finally the span of the Posi Bridge is about 300′, and there is a considerable mule caravan traffic across it.

2.—THE YUNNANESE WATER WHEEL.

These wheels are used for driving the rice mills and are of two distinct types :—

(1). A small diameter wheel with deep paddles for driving the husking mill. This revolves at a fairly high speed.

(2). A large diameter wheel for driving the hulling mill. This gives rather more power but revolves more slowly.

The principle on which these two ancient mechanical contrivances are based is the same in both cases, and is nothing more or less than the principle of the modern water turbine. The wheel pit is under the floor of the mill, and the wheel revolves on a vertical spindle with the paddles touching the water in the pit.

The paddles round the circumference are about 8″ to 1′ wide, and from 1′ to 14″ deep. They are made in two parts. The upper part is almost vertical, whereas the lower part is set at an angle of about 45° (*Fig.* 2).

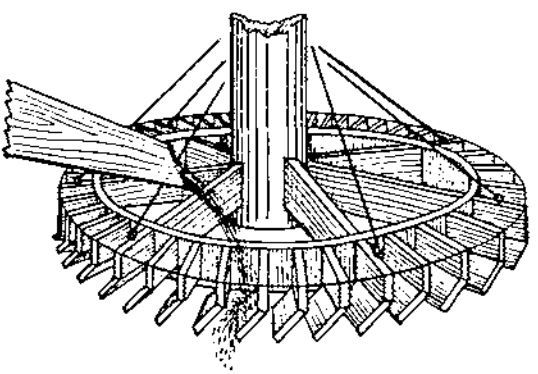


FIG. 2.

The mill is driven by a fall of water from a wooden chute the width of the paddles, and set about 3′ above the wheel. Speeds can be altered to a small extent by lowering or raising the end of the chute which alters the angle of incidence of the stream of water.

The damming arrangements are very simple. The mill is placed above the flood level of the river.

Water is led from a point higher up the river in a wooden trough (A) to a sort of reservoir (B) (*Fig.* 3) in which it is maintained at a height of 3′ to 4′ above the wheel, by means of weirs.

Three sluice gates serve the following purposes :—No. 1 leads to the mill-wheel chute, No. 2 serves to empty the wheel pit (*c*), when necessary, and No. 3 empties the reservoir if required.

This idea might serve in a standing camp near a suitable river for driving chaff cutters, etc., as it is much easier to put up and control than the old European water wheel, and uses less water.

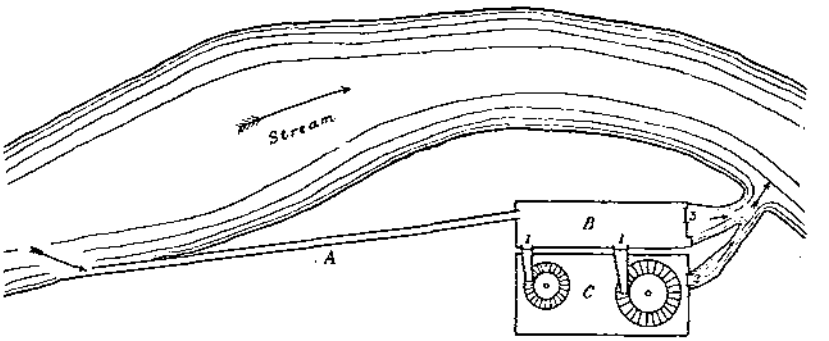


FIG. 3.

3.—VARIOUS MEANS OF TRANSPORT.

(*a*). *The Yunnan Bullock Cart.*—The wheels and axle are solid, and revolve together. The bearings of the axle are two wooden forks.

The cart can be lifted off the wheels and replaced in the event of an accident. The harness consists of the yoke, the yoke line under the neck, and a light breeching. Load about 500 lbs.

(*b*). *The Yunnan Pack Saddles.*—The saddle is of wood and is padded inside. It is retained on the mule's back by means of a breast strap and breeching. The crupper is of wood, threaded on a piece of gut or raw hide. A series of wooden discs or rollers on the crupper, prevent chafing on the animal's back. A triangular pad of cloth, fastened to the breeching on each side, goes over the root of the tail and under the crupper, presumably to prevent chafing. There are no girths (see *Photo* 3). Into the saddle fits a sort of wooden trestle as shown in *Fig.* 4.

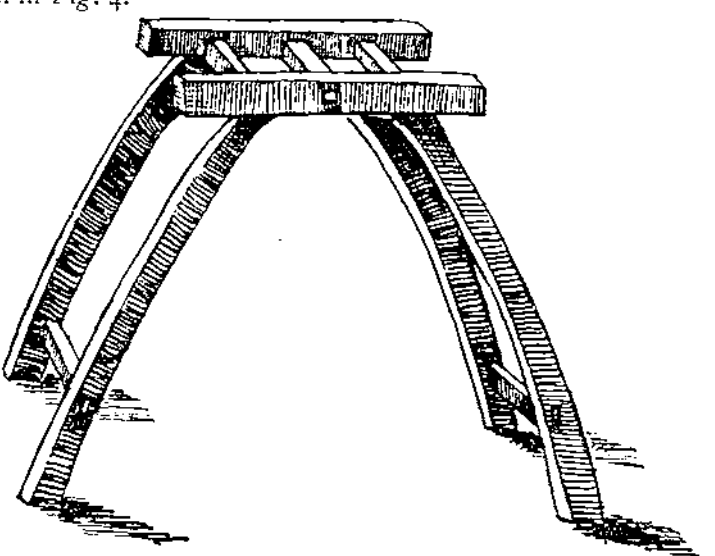


FIG. 4.

The trestle is placed on the ground and the packs lashed to it with raw-hide thongs. The Chinese grooms, in this case muleteers, make some very clever tightening hitches. Two men, one on each side, then lift the trestle and pack off the ground holding it by the feet of the trestle, and fit it into its place on the saddle, while a third holds the animal's head (see *Photo* 4). As soon as the animal is released he takes his place in the caravan of his own accord.

These mules and ponies carry from 140 lbs. to 180 lbs. for long journeys. The latter load is however, unusually heavy for the ordinary animal.

GENERAL PRINCIPLES OF ORGANIZATION AND EQUIPMENT, ROYAL ENGINEERS.

(*Continued*).

29TH COMPANY (WORKS COMPANY).

The peace station of this unit, which forms part of the Expeditionary Force, is Chatham.

Its establishment is based on the provision of :—

*(*a*). An advanced works depôt at each of two advanced bases.

(*b*). A headquarters including a small base depôt.

(*c*). A works depôt and workshop at railhead.

Such transport as may be required will be furnished under the orders of the Inspector-General of Communications.

Officers and civilian labour will be added as required.

The establishment of this company consists of :—

	Peace.	War.
Officers	2	7
Sergeants and Staff-Sergeants	4	18
Buglers	2	2
Rank and File	54	140

The machinery necessary for the installation of a workshop, together with other stores for the depôts, is maintained by this company in peace.

FORTRESS COMPANIES.

These may be divided under two headings—the Fortress Company Proper, and the Electric Light Companies which are the direct descendants of the old submarine mining companies. Both, though, are officially designated Fortress Companies.

The former are organized specially for work connected with the construction, attack, and defence of fortresses.

In time of peace these companies are employed in executing War Department civil work, in the construction and repair of buildings, barracks, works, and so forth.

The average strength of a fortress company in peace varies from 3·86 officers and 76·4 men at home† to 4 officers and 96·6 men abroad.

* "War Establishments, 1909-10."

† From "Regimental Establishments, 1909-10."

There is practically no established equipment detailed for peace or war. It is supposed that special demands for tools, etc., would be made according to the work on which the company was to be employed.

The electric light units are organized to assist in the defence of military ports at home and abroad, commercial ports at home and coaling stations abroad. The requirements of each station, based on its scheme of defence, have been definitely determined.

The details of *personnel* for each station can be found in "Regimental Establishments." Details of trades are given in Corps Memos. At home, on the outbreak of hostilities, the establishments are brought up to war strength by the addition of Territorials, Special Reserves, etc. Abroad there is but one establishment of *personnel* and stores, viz., that for war requirements.

There are two schools of electric lighting, viz., at Portsmouth and Plymouth. It is not considered necessary to detail what instruction is carried out at each school, but it may be mentioned that R.E. recruits for electric lighting proceed from the R.E. Depôt, Chatham, after training in drill and fieldworks, to these two schools. Each of the electric light companies is affiliated for purposes of supply of men, etc., to one or other of the two schools.

SURVEY COMPANIES.

There are three Survey Companies, with their headquarters at Southampton, York, and Dublin, respectively. The number of Royal Engineers at present employed on the Ordnance Survey of the United Kingdom is 21 officers and 326 W.O., N.C. officers and men. The establishment of the three survey companies is 8 officers and 342 W.O., N.C.O.'s and men. The majority of the employés on the Ordnance Survey are civilians, who work under the R.E. officers and with the men.

The country is divided into divisions for survey purposes, and to each division is attached a proportion of men of the Corps. All maps are printed and published at Southampton and Dublin. Endeavours are made that the R.E. employed on survey work shall become efficient in all branches of the several processes, so that on service they may be able to put their hands to any of them as may be required, or that detachments may be made up to undertake the survey of any new country where operations may be going on.

On a general mobilization being ordered, the Survey Companies provide certain survey *personnel* for lithographic sections and for field and railway companies. Survey sections may be required with, but do not normally form part of, the Expeditionary Force. These sections if required would be provided from the Survey Companies. The equipment for a survey section for war is given in the Mobiliza-

tion Store Table for the Section (Army Form G 1098-40). Two survey companies also mobilize as fortress companies with a peace strength as specially arranged. The remainder of the survey companies are retained on Ordnance Survey duties for any special work that the War Office may require.

Colonial Survey Section.

A Colonial Survey Section, with an establishment of two officers and four other ranks, was formed in 1902. The men are provided by the survey companies.

In addition, a number of N.C.O.'s and men of the survey companies are lent to the Colonial Office for employment on Colonial surveys.

The officers and men of the survey companies are paid by the Board of Agriculture and Fisheries, except during military training, or on mobilization.

DEPÔT BATTALION.

The Depôt Battalion, permanently stationed at Chatham, is organized in three companies, lettered G, L, and M, and the 29th (Works) Company is attached to it for purposes of discipline.

G Company includes all men on command at various institutions and employments who are not posted to service companies, or on the Supernumerary List. It is also the receiving company for casuals from abroad, on furlough, awaiting discharge, etc., etc. On mobilization, G Company is a receiving company for Reservists joining at Chatham.

L Company includes the Band and S.M.E. Staff.

M Company takes all N.C. officers and men coming to Chatham for courses at the S.M.E. It is also on mobilization a receiving company for Reservists joining at Chatham.

TRAINING BATTALION, R.E.

The battalion, consisting of six companies, lettered A to F, is stationed at Chatham, and exists for the following purposes, namely :—

(i.). The training of all Sapper recruits of the Corps, except those for field troops, in

(*a*). Military duties.

(*b*). Fieldworks.

(ii.). Training of all junior officers of the Corps on first joining in military duties.

Organization of Recruit Parties.—The company forms the training unit in the battalion. Each company receives recruits for a period not exceeding a month, or until a recruit party of about 64, and in some cases 80, has been formed. Each party is trained separately; the full course, lasting about 28 weeks, is divided into the drill course,

which includes physical training, musketry course, and fieldworks course.

Military Training of Junior Officers.—The course of instruction is in duties, drill, and tactics; it is given in two periods. The first period lasts for 83 days, commencing as each batch of junior officers joins at the S.M.E. The second period lasts 21 days, and includes the examination in subjects (a_1) and (a_2) for promotion.

Officers of the Royal Reserve Engineers also go through a course of military training on joining the S.M.E.

TRAINING DEPÔT FOR FIELD UNITS.

The Training Depôt is stationed at Aldershot, and is under the orders of the Officer Commanding the Royal Engineers Troops and Companies. Its duties are the training of the drivers, mounted sappers of field troops, and trumpeters of the Corps.

Its peace establishment, which includes the mounted cadres of two Bridging Trains, is:—

Officers	4
Warrant Officers, Non-Commissioned Officers and Men ...	262
Horses, Riding	40
„ Draught	36

ROYAL ENGINEERS IN INDIA.

The officers of the Corps serving in India belong to the Regimental Establishment, but their duties are entirely distinct from those serving at home or in the Colonies. Under the present pension rules, a higher rate of pension can be gained under certain conditions after 20 years' service in India. There are only very few European R.E. rank and file in India. The officers are employed in various Staff appointments, on the Military Works Services, in the Public Works Department, on the Survey of India, on railway work and other civil employments, in all of which they have civil labour under them. They may be also attached to the native Sappers and Miners, of which there are three corps. There are also two Indian Railway Companies, with headquarters at Sialkote, and three Submarine Mining Companies, with additional sections at Calcutta and Aden, and headquarters at Simla. The companies of the Sappers and Miners correspond to, and have the same functions as, the field companies at home, but their organization and equipment are different, and are specially designed to meet the requirements of the country.

MOBILIZATION IN THE 16th CENTURY.

EVEN the minutest detail of mobilization is so carefully worked out and tested in the present day, that a glimpse at the rough-and-ready methods of the 16th century is sure to prove of interest to the soldier. The manuscript, from which the following extracts are taken, has long been in the family of Mr. J. Coventry of Fordingbridge and apparently refers to the preparations made in Hampshire in 1553 to crush the rebellion under Sir Thomas Wyatt, and also to a later scheme for protecting the coast against an expected invasion in 1563.

As the manuscript refers to events which took place some 20 years only before the Armada, special interest attaches to it, as the mobilization of the men of the Southern Counties to meet the dreaded invasion was most probably carried out on exactly the same lines.

The abbreviations and spelling are unchanged from the original, but the detailed lists of the leaders, and the number of men to be provided by each hundred are omitted for want of space.

Finally, crude as the methods may appear to the soldier of the 20th century, they apparently served their purpose in the 16th. Mobilization in those days was a much easier task, as not only were most Englishmen well able to handle the simple weapons of the period, but the patriotism of the masses and their inborn sense of discipline, enabled their leaders to order whatever seemed best, with the certainty of their orders being carried out with unquestioning obedience.

MANUSCRIPTS ON THE DEFENCE OF THE ISLE OF WIGHT AND PORTSMOUTH.

(1).

(Letter from Lord Poulet to Lord Seint John).

After harty commendacions my lorde forgettyng to wryt thereof to you wyllyth me to wryte to you that the lord of Pembrok as levetenaunt generall dothe folow the rebels wher so euer they goe and my lorde with all hys power if they com in to Hampshire wyll com also with hys bande. my lorde hath wryte to you at length hys mynde and hath wylled me also to wryte you my mynde & therfor my poure advyce is this.

Furst to call all the gentylmen of the devysions adyoning the Sey costes & cause them to putt themself with the pouer of ther Quarters

to deffend Portesmouth with the Fortes Hampton & the fortes ther aboutes & wher harnesys be knowen as at Tycheffeld & such other places to geve order for suertye of hyt that hyt may serve if nede be. And by cause the Eretykes of the shire begynnith to Flocke to geders specyaly in the towne of Hampton, about Romesey & dyuers other places of the Shire you had nede to wryte to M^r^ Pacy for Hampton & to others that you know trusty to loke to ther doinges and yf they be gyne togader to call to you ther leaders & geve order for ther safftye for the tyme.

In the towne of Hampton by M^r^ Pacys Report ben knyt now togeder the Mayre with iiij mo heddes of the towne, yong M^r^ Lyster Seint John & dyvers other whiche now besely mete togeder very necessary to be considered. About Romsey is Foster Flemynges offycers, Gyfford, Baynbryg Harrys and Whytthedd & Dyuers other that now consultyth moche togeder.

Kepe sure you entre into the Ille of Portesmuth for that he wyll desire yf he may.

And Remembre well what I seiyd you of the prevy messangers that come to Hampton iij tymes in on month only to the Mayre & Bokyngham for Fere of treasons wherof Renegai can make you prevy.

I wryte to the Shryff & the Rest of the Shire to putt them selfes with all ther powers in Redynes of warde with all spede for defens of the Countre yf they com this way wherof you shal vnderstande shortly and so till furder knowlege so fare ye well.

Wryten this* Day of Febuary

yo vncle

GEORGE POULET.

I sende you herwith my letter wherof I wryte the lyke to al the devysions of the Shire except the devisions vnderwryten to whom I pray you to wryte lyke letters & putt therto my namandf wryte yo^r^self yo^r^ lyke letters to them that they ben in Redynes to attende with you at Portesmuth & thus ye shall put that quarter in Redynes as I wyll do with the Shreffes help the Rest.

My letters to John Whyt for his devision
To the Mayre for the towne of Southampton
to the Ile of Wight.

Thes iij letters I pray you sende with spede from me besides your owne letters.

To the right honorable the
Lorde Seint John with spede.
Hast.
Hast.

* Blank in MS.

† Apparently for "name and," in haste the two words being run together.

(2).

(*Letter from R. Wyngfeld to Lord Seint John*).

Right honorabull and my verie good Lorde my humble deutie considered pleasith y^r^ lordshipe to be aduertised that I haue sene the Estate of the towne of Portisemouth the castelles bulle workes walles and dyches of the same w^th^ all the peces shotte powder and all other artilerie and abelimentes For the warres wiche I fynde in good order savinge the Fortes wiche is in sore decaye, And the peopyll well ordered and in good quietnes. And for soo moche as S^r^ Richard Cotten is at Callyce and Rauffe Cotten his brother *brother* (*sic*, twice) Remayning at London M^r^ Wayte being not abull to travell there is none in that devision lefte but M^r^ Whyte and M^r^ Pound. Whereffore it is Requisite the premisses considered there maye be moo appoynted to theym as Sir John Broyne Thomas Vuedall and William Vuedall of Wykeham who is left oute of the same devision. And if the hundreth of Tycheffeld be appoynted to Haysylworth as your Instruccions is then there muste be ane other hundreth placed in the same to Portesmouth. And this present daye I doe intend to goo into the Isle of Wight, and at my Retorne I shall serteffie your Lordship of the Estate of all the same w^th^ the Rest in my charge by yo^r^ Lordship's instruccions by a perffite book wiche for lake of tyme I cane not now doo. Thus our Lord send your Lordship large (?) help.

At viij of the clokk this messenger aryved here w^th^ lettres directed unto yo^r^ Lordship, sainge he was willed to delyuer theim to Jhon Chuddeston, they commyng fyrst to my handes seinge the were yo^r^ Lordships, I dyd forthwith cause one assone as the tyde wold serue to come to yo^r^ Lordship with theim, in w^ch^ lettres I praye god send yo^r^ Lordship newis such as you wold desyre. From Portysmouthe the vij^e^ of februarj 1553.

Yo Lordships to command
R. WYNGFELD.

To the right honorable
and my singular good
Lorde, my Lord Seint Jhon.
On
Hast
Hast.

(3).

(*Letter from the Marquis of Winchester to Lord Seint John*).

For annser to yo^r^ lettre w^ch^ I receyved this tursday I lyke well that you Find all thinges well at Portismough & that quarter & that now you mynde to goo to the Ile of Wight to se all thinges ther w^ch^ I prey you do. First by yo^r^ seruaunt & then yo^r^ self at Portysmough to performe this that I writt to you in this lettre.

You shall vndrestand that this day x at clok in the fore none Wyat & his company departed from Londou towardes Kingston or to

Rochester the certenty wherof doth not appere. And therefore my Lordes willeth me to se well to Portismough & to the Ile of Wight Willing you to warne Winkfeld & all that quarter to make theym Redy lest he shuld draw to you warde.

And cause Portbredge to be furnisshed & euery castells. And wher nede shall requyr plant ordynance and truche that you may if you lerne he come towardes you.

I perceyve the bruhouses & bakehouses be well apt, wherof I am gladd.

And for yo^r^ helpe cause all the Commissioners to be warned to attend w^th^ all the poure they can make to defend Portismough & the Ile of Wight.

And geve order to theym appointed to the Ile to be redy to defend the same & to enter [? Quarter] at the Castell of the Hurst purposely for that purpose.

And be not yo^r^ self out of Portismough til you be certen what he wyll do. And for yo^r^ certen knolege therupon I cause one to folow hym to se wher he will become that you may be certen to stand the more surely apon yo^r^ gard, & to voyde troble & charge but where nede ys.

And yf the hundredes named to you be not sufficient wherof I do not a lytill marvel for that I have all years (?) found them sufficient, yet my mynd is you take as many mo hundredes to you as you shall think mete. And bring not to many to you for any fere but for nede when you shall se tyme. And so take all the Sheire for that purpose.

iiij or vj men in the castill of Hasillworth is I now to wacthe the same & to geve warnyng for the hundred to helpe if nede be & all the rest may tende Portismough.

And my bruder Sir George Poulett will apon the reding of this lettre geve order to all the rest of the Shere to be redy if the case shall so requyr.

And order must be taken that you may kno certenly his Jorney & purpose to make his Jorney towardes you or somme oder way in whom ys no suerty for that he is a verry desperatt man.

And like as I make serche to kno his Jorney so must yo^r^ vncle & you apply to kno what Jorney he taketh that you may the mor surly defend yo^r^ selfis and the cuntrey.

And taking a copy of this lettre send the same, my lettre unto the Ile of Wight wherby they wilbe the more diligent to defend the quenez highnes & theym selfis. Wretin this Shrof tursday in hast by yo^r^ fader.

WINCHESTER.

And if any charge fall apon your quarter as I trust in God yt sall no. Then must euery hundred be named to send mete & drinke for ther men for xij days as yt hath byn done afore this tyme.

And his comyng towardes you must be by Fernham (?) & so to Aulton or else ouer Kingston bridge & so to Besingstoke & to you & that I think he cannot do for Kingston bridge is broken.

And if you perceyve of his comyng take hede towardes you take hede for he will make gret hast.

And the ordynance you have to mount you may cause yt to be done as you se cause or else Spare.

My Lord of Winchester will se the devyne service ther said the lett therof is in the governours of the towne.

To my son the lord
Seint John.
WINCHESTER.

Here follow lists of the "ablemen" to be provided by the various towns and villages. Only one of these is given, but all are on the same model.

Thornegate	Edward Harries Brian Fantleroy Robert Caitterton Humfrey Barqueley	ablemen cc.
Buttilsgate	James Ritche Bartilmew Dove William Hall Jo. Bacon	ablemen cc.
Sombourne	Ric. Gifford Hen. Walley Jo. Douse Robert Pister	ablemen clx.
Forthingbride Ringewood	Edwerd Abarrowe S^r^ W^m^ (?) Kellewey Phillip Okeden	ablemen ciiij^xx^
City of Winton & the Soke	xxx Maior of citie of Winton xxij Bailif of the Soke	ablemen lij.
Barton Stacy	Thomas Salmon Tho. Chandlour	ablemen lxxij.
Micheldevour	Ed. Clerke Robert Stansbie	ablemen lxxviij.
Redbridge	Robert Baymant Jo. Jeynynges W^m^ Hoker	ablemen lxiij.

Sum—M^l^.V.

The whole are detailed as follows :—

Apointed for the Coast betwene Boremouth & Hampton	Summa	iiii^{c}xlviij
"Southt" ... ... ablemen ...	...	iii^{c}iiii^{xx}
Apointed for Portesmouthe	Summa	M^{l}cxxii
Portesmouth ... ... ablemen ...	...	Cxlviij
Yle of Wight ... ... ablemen ...	...	M^{l}D
Apointed for the bodie of the shire ...	Summa	M^{l}ij^{c}iiii^{xx}iii

(4).

An order as well for the Armour of all Captaynes as shalbe appointed to serve the Quenes M^{tie} at this tyme as allso for all Souldiours that shalbe appointed for the like service.

Furst if it be possible to make any nomber of demi Launces (as I suppose there wilbe butt few) then the Captayne of theym and Souldiours also must be well armed at all pointes accordingly, that is to saye his Colo^{r} his Curettes his Vambraces, his pollrons, his heddpece, his gauntlettes and his Cusshes, and the Capitayne to have his graunde garde & his graves more then the Souldiour & his horsse to be of xvij handfull height or ther about and the same to be trymmed wth a sele Saddell and a Shaffron. And the Souldiours to have horses of like height wth Bolster Saddells of blacke lether or Buffe, and euery man to have his demi Launce staffe.

There belongith allso to this kinde of service a Guydon of the Captaynes colours and a Trompett.

Item a Captayne of light Horsemen must be armed with a Jacke or Brygandyne covered wth vellvett or satten, and for his hedd a Sculle or Murryan for his Armes a pair of Sleves of Mayle and euery Souldiour to have Jackes covered wth fustian & Skullis with Scotishe cappes & for his Armes sleves of Mayle & euery man a light horsemans staff & their horses to be of small xv handfull height or there aboutes.

A Captayne of footemen must be armed wth a fair Coslett for his body a pair of Vambraces for his Armes & a morian for his head, with Swerd & dagger. & either a poll axe or els a glave to be caried after him by his page.

Item Harquebuttes must be armed in a shirte of Mayle for his body & a morian or huffekyn for his head and to have his pece of an elle longe at the lest or more, & to have his powder & matche wth all thinges accordingly.

Item all Archers must be armed in Brygondynes wth sleves of Mayle for their Armes & Skulles or morians for their heades & euery man to have his Bowe & his Sheaffe of Arrowes & for lacke of Brygondynes the said archers must have Alman revettes for their bodies wth splentes for their Armes.

Item pyke men must be well armed in fair Coslettes white or blacke for all their bodie from the Mydde there vppewarde and vpon their heades Morians or huffekyns & euery man to have his pyke.

Item Bill men must be armed w^th^ Alman revettes splintes & Sallettes & euery man to have his Bill.

This ends the correspondence dealing with the preparations in 1553. It is followed by a list of "Lordes & nobylle men taken by the Kinges Ma^tie^" at St. Quentin in 1557, and this list, in its turn, is followed by further lists of "ablemen" in connection with the second mobilization of 1563.

The l. lordes & nobylle men taken by the Kinges Ma^tie^ the ix of August 1557 at S^t^ Quyntyns.

In primis the heigh Constabull of Fraunce and his second sonne.
Item the Duke of Montpensere.
Item the Duke of Longvyle.
Item the prince of Mantua.
Item the prince of Rocha de Vynyard.
Item the Vicounte Cothon.
Item the great Chamberlayne of Fraunce.
Item the Vicounte of Toben.
Item the Ringrave Capitayne generall of xij^M^ heigh duchemen.
Item Laroche de bew a son in law to the high Constabull.
Item prisoners taken to the nomber of vj^M^, whereof dyuers great men ouer and aboue thes beffore Rehersed.
Item taken xxxij^tie^ peces of great ordenaunces.
Item taken vj^c^ wagons w^th^ vitalles and municion.
The Capitayne of the towne of S^t^ Quyntyns did offer the Towne to the Kinges Ma^tie^ soo that he wold graunte theym there lyves with bagge and baggage.

(Indorsed) :—An order for armour and wepons and the names of the nobyll men taken at Seynt Qwyntyns.

The papers which follow are in connection with the preparations made in 1563. In 1560 Elizabeth had sent help to Condé, leader of the French Protestants, in their war with the Duke of Guise, and she was compelled in 1563, by the reduction of the garrison after the peace of Amboise, to surrender Havre, which, with Dieppe, had been the price of her support. As the letters are written in the same year, it seems fair to assume that the measures taken were directed against an expected invasion by the French.

The first document contains a detailed list of the "ablemen" available. Unfortunately it is too long to give in detail, but the final disposition of the forces is as follows :—

MV..."For the Relif of the Isle of Weight."
M'ccxxii..."For the Releif of Portismouthe."
Cxv..."Towne of Portismoth."
xxxiii..."The guyldable within the Isle."
Ccc..."The crew or garison there at the quenes ma^tie charges."
M DCLXX..."Totalis for Portismouth."
M D..."The Cap^ne & the gentlemen within the Isle—The Isle of Wyght."
Ccccexlviij..."Summa—For the Bodie of the Shire."
Ccciiii^xx.. "The Towne of Suthampton."

"Summa Totalis"—.vji^M'cciiii^xxvj.

Next follows "A booke of the names of suche as ar thoght most metest to be captaines or Leders of all the able men in every hundred within the Countie of South' as well to the releffe of the Isle of Wight and Portesmouth as also for the defence of the Boddie of the Sheere and the see Coste" which again goes through the detail of "Ablemen" provided by each "Hundred." Unfortunately this also is too long for publication, but the following letter from Lord St. John, containing a list of the boats available for transport purposes, is given in full :—

A° Elizabeth. vj^to.

Havinge receved the councelles lettres of great importaunce requiringe presente execucions as consultations with the captaines of
1563. Portismoth and Isle of Wight, this shalbe to requier you not onlie to cause your accustomed beacons to be errectid and watchid substanciallie butt also to send suche numbers of men to call short and Hurst as heretofore hathe ben assigned vnto them in all acacions of drede of forren enemyes. And for that the quenes ma^ty hathe no lesse care to defend thisles of Weight and Portismoth than she hathe ben heretofore, her ma^tie pleasure is the botes shulbe put in a redines for transportacions in to the said Isle as nede shall requier, and the same presentelie must be don vppon sight hereof. And for that I doubt whether the number of the said boates be increased or diminished, you shall receave a note herein closed of the last certificat of them w^ch I praye you make perfyt the number of boates with the names of thoners and his retinewe and what number euery bote maie transport at one time. And I praye you note your passage botes and charge them to geve attendaunce and not to depart for aine seruice other then the quenes and tak order with your country to be in a redines for service and to repaire to deffend thenimyes and saffegard of the quenes fortis as occasion shalbe geven, for which matre victualles muste be put in aredines. And for thes causes I wisshe yourselves would repaire at suche place and time as shalbe geven forder in knouledge vnto you, when I shall here from the Captaines of Weight

and Portismoth, who be speciallie writen vnto as we be. Thus muche I geve you knowlege of presentlie to be put in execucion whereof I requier you not to faile, and for the ledinge of suche number as you shall make tak the same knightes and gentlemen which hath ben heretofore ascribed vnto you. And for the beter transportacions of your men and strenght of the quenes castell of Hurst tak likewise the same gentlemen, and what you shall do in the premisses I praye you to aduertise with speede that the wantes maie be supplied. Wryten in hast this xxvj of January,

Your frend,
JOHN S^T. JOHN.

Of Heath.

Owner.	William Waie a bote iiij^o tunnes	Botes appointed to leape to transport men into thisle of Wight upon larum or fier contening xx^ti tunnes after x men to their tunn CC.
Owner.	Jefferey Ward a bote iiij^or tunnes Richard Ward mariner with him	
Owner.	John Holford a bote iiij tunnes John Holfurd his sonne mariner with him	
Owner.	John Hilles a bote iiij tunnes Thomas Skipp & Ric: West mariners *in the same*	
Owner.	Robert Gervys a bote iiij tunnes Edmint Wall mariner with him	

Botes of Leape.

Owner.	Hugh Mone a bote v tunnis.	iiij^or botes conteininge xvj tunnes.
Owner.	Thomas Goodier a bot iij tunnes Richard Alrige mariner with him	
	Thomas Cowper & Jerom Ingram a bote iiij tunnes and they two to serve the same	
Owner.	Thomas Hailes a bote iiij^or tunnes John Mone a mariner with him	

Botes of Gurnarde.

Owner.	Richard Cole a bote viij tunnes	ij botes conteininge xv tunnes.
Owner.	John Aly a bote of vij tunnes	

Summa Totalis of botis—xj conteininge lj tunnes which will convey over CCCCC men at a sodden.

Christchurch botes ...	vij	botes ... xxxv.	v^cl x.
Kinhaven botes ...	iij	tunnes ... cxl.	
Hurst botes	ij	burden after the rate of iiij^xx men to the tunne.	
Lymington botes ...	iij		
Yermoth botes ...	ij		
Frenshwater botes ...	iij		
Leape botes	ij		
Farley botes	iij		
Heathe botes ...	vij		
Gurnarde botes ...	iij		

I commend me hartelie vnto yow and have sent yow the names of suche hundreds as are appointted & charged for the Releffe of the Isle of Wight that is to saye Thornegate Buttelsgate Somebourne, Fordingbridge, Ringwood, Redbrydge, the Citie & Sooke of Winton, Bartonstacy and Mycheldevour of which Hundredes I praie yow make choise of the best & ablest men, and cawse them vppon euery alarum to be brought to the Sea Coste to be transported into the Isle of Wight w^th^ thear armour and weapons mete for this service and victuelles w^th^ victuallours to followe them and for Captens. I praie yow make choise of the best not onely of habilite but also of knowledge and experience to bringe the nomber that is appointted for the Wight to the place of service or to the places of transportinge and so ouer. Fare ye well at Letley this last of Januarie 1563.

Your loving frend,

JOHN S^T^ JOHN.

Postscript. I find in the last orders that my Lord tresaurour tok for the Shire that Andevour infra et extra is not charged to thisle of Weight but to the body of the Shire And therfore it must stand and be charged for the body of the Shire.

The Councelles lettres to my Lorde Seint John.

After our verie hartie commendacions to your Lordeshippe like as vppon suche aduertisement as we formerlie receivede we wrote yesterdaie vnto yow of the preparacion of the french and therefore required you that the beacons on the see costes might be wached and the countrie neare the see costes put in a redines to meet with all sudden attemptes that might be offered, so havinge now forder intelligence of french shipps made to the sees and numbers of soldiers comme downe vnto pikerdy neere bullen and Callice Albeit that they make shewe to attempte sumwhat about Dover or the costes of Kente and Sussex, yet it is to be fearied that ther interprice is tende towardes Portismoth and thisle of Weight, and therefore the quenes ma^ties^ plesure & comanndement ys, even as her highnes hathe geven order for the deffence of thother partes, and reenforced her navy in the narrowe sees that your lordeshippe do forth with call vnto you the Shreif of that countie of Sutht: and other discreet gentlemen borderinge towardes the see and to repaire with speede nere vnto Portismowth and vppon conference together with the Captaines of Portismowth and thisle of Weight to devise all the best meanes you can possible to meet with the frenche doinges if they shall vppon the sudden which is most to be fearid attempt anie thinge that waie. And for this purpose to cause the Shire to be put into aredines vnder the leading of your Lordeshippe and other the beste and most skilfull gentelmen of that countie that will take care of this service to repaire

with all speede vppon the fieringe of the beacons and other admonicions of the french attemptes to the see costes. And if neede shall so requier to be put ouer into thisle of wight for the Doinge whereof vppon the sodden boates are to be set in a redines before hande for ther transportacion, so as no slacknes or impediment be found at the time that seruice shalbe requisyte in this behalf. and for the better executinge thereof in time we requier your Lordshippe to be vearie earnist with the Captaines of Portismothe and the Weight, to whom we have also presentlie wryten, and to all other Captaines of fortes and bulwarkes on the see costes to stand so vppon ther garde to have ther ordinaunce mountid and their numbers and all other thinges vnder ther charge in such good redines as thenymy maie well perceive ther practises discried and sufficient force redie to meete with anie thinge they dare attempt. Whereof the quenes ma^tie for the trust that she reposyth in your Lordshippe nothing dovbtith but you will have that dewe care which the importaunce of the case requireth having ever regarde to meet withall ther sodden attemptes, for otherwise her ma^te nothing mistrustith but to make them within few daies repente ther enterprises. And thus we bid your Lordeshippe Right hertelie farewell from Windsore the XXV^th of Januarie 1563.

Your Lordeshippes assured loving frindes,

ARRUNDELL.
PEMBROKE.
EDW. CLINTON.
WILLIAM HAIWARDE.
FRANNCES KNOLLES.
WILLIAM CYCILL.
EDWARDE ROGERS.

After my right hartie commendacions vnto you. You shall vnderstand the Capitaines of Portismouth & Weight are commanded to lygh in theire gard with such numbers as they have. And I have receyved like commandement from the L. treasurer to cause the Shyre to lye in a redynes for this service for the better ayde of bothe the said capitaines vpon any sodeine attempte. And likewise for the body of the shere, and of your diligence here in I doubt me nothinge yet never the les for that this service is of so grete importaunce and the certeinetie of men & Armor is not knowen. Therefore this shalbe to praye you & euery of you to send me a certificat what your numbers of men be in euerie hundred & also of your Armor that the wante maie be supplied. And certificat therof made vnto my said Lord as his pleasure is. Farther signifieng you my Lordes pleasure is noe parte of thorders he hath taken for this service shalbe altered. And therefore like as I have geven you knoledge out of what hundredes the M. men for Ayde of Portismouth shall rise. And so likewise for the Ayde of thisle of Weight, & so the body of

the Shere with the places of theire repaire vpon occacion of service. So have I thought hit mete to send you the names, as he hath heretofore appointed for the Leding of euery numbre to thende you maie the better folow the same. And because this service is committed vnto him he requireth to vnderstand how the numbers and armor will rise which must growe by your certificat which you promised to have done before this, And that as yet I here not of trusting you will consider hit is nedefull to him that is charged with this service to vnderstand the power. Otherwise his service can not be to the princes expectacion w^ch^ I committe to your wisedoms.

I have receyved from the Capitaines of Portismouth & Weight such orders as is taken by them in theire charges aswell for the fortes & botes as for the Isles. And for the wester partes of the shere I have receyved theire bokes for order of the botes and for theire sortes of Armour. But I here not anything what order is taken for Caelshotte & the botes of Leape &c which M^r^ Pattget as apperith by his hand hath taken vppon him to se furnysshed, but what is done I here not, w^ch^ I wishe maie be vnderstanded. So I committe you to God. From Letley this x^th^ of February 1563.

Yo^r^ loving friend

JOHN S^r^ JOHN.

Postscript. I praye you make certeyne yo^r^ postes & certifie them as you maie have knoledge of my Lordes pleasure as the same shall growe.

To my loving friendes S^r^ William Kayleway knight, Richard Gifford, John Foster esquyours & to the reste of the Justices of Peace assigned for the relyef of thisle of Weight in hast.

The Manuscript ends with the foregoing copy of the Privy Council's letter to Lord Seint John and with his own letter to the Justices of the Peace of the Isle of Wight.

As there is no mention in history of any invasion in 1563, the expected attack evidently did not take place; but after events show what would have been its fate had France tried to anticipate the Invincible Armada of 20 years later.

DIRIGIBLE AIRSHIPS.

By Baron Roenne.

It is to be hoped that enterprise and technical skill may eventually lead to such perfection in airship construction, that this new means of locomotion may not only prove to be of great value in solemn national crises, but equally useful for peaceful traffic and communication.

Germany at present possesses the best aerial fleet, and is able in case of war to take in service 19 dirigible airships. This number will be increased until it reaches to at least 30 in the near future.

In view of the vast importance already attained by aerial navigation as a means of defence, and for the observation of a hostile force, to say nothing of its latent possibilities as an aggressive factor in naval warfare, it may not be out of place to describe, for the benefit of readers, the chief existing types of dirigible airships.

Those airships which are constructed after the designs of Major von Parseval are the typical examples of frameless motor balloons protected only by the overpressure of the gas contained in the bag. The gasbags must, therefore, be large enough to allow of the equalization of the gas when the cover is contracted by loss in the lower air strata, otherwise the bag would lose its rigid form and become unsteerable. In such cases the motor must be stopped, and the airship is as entirely at the mercy of the wind as an ordinary balloon. "Parseval III." has proved this fact, as in August, 1909, at Frankfurt, a gust of wind drove it upon a lightning conductor, which tore the bag and caused it to fall to earth. Another disadvantage of the frameless balloons is that the propeller must be attached to the car, thus operating, not at the centre of resistance, but far beneath it. But these airships possess at least one advantage for military purposes: they are very portable.

Siemens-Schuckert, in Berlin, have built a balloon on the Krell system, the largest non-rigid balloon hitherto constructed. Its capacity is about 424,000 cubic feet, length about 393′, and diameter 42′. The keel of the car is about as long as the whole balloon. Four motors of 110-H.P. each are built in the keel, at such distances apart as to equally divide the weight. These motors drive four propellers, which are attached, two at each side of the car, to steel tubes, in a manner similar to the French system Juillot.

The Rheinish-Westphalian Motor Airship Company is at present building a vessel in Elberfeld on the same lines as the Parseval type; regulation of altitude, in this case also, is obtained by shifting the centre of gravity. The construction of the car and the bag is very much like the Clément-Bayard.

The airship "Ville de Paris" is built according to the design of Colonel Renard, who constructed the first French airship suitable for military purposes. Colonel Renard was the first to apply balloonets—to ensure stability—at the rear of the cylindrical part of the airship, and to fix the propeller on to the front of the car. The body of the balloon is of a conic shape, gradually tapering toward the rear, where there is an attachment carrying, at each side and at the top and bottom, two cylindrical balloonets for the purpose referred to above. The balloon itself is 201′ long and 34′ in diameter.

The motor balloon of Clément-Bayard is constructed on the same principle as the "Ville de Paris." The envelope has no frame, neither have the drop-shaped balloonets at the rear. The elevating planes and rudders are attached to the "nacelle" by a framework of steel tubes tautened by steel wires. This airship, however, does not possess two elevating planes like the "Ville de Paris," but has a similar rudder, composed of two parallel planes, attached over the rear of the car—or nacelle.

The system De la Vaulx airship, used as an advertising medium for *Le Petit Journal*, has a capacity of only 26,500 cubic feet. As the utmost carrying power of coal gas is roughly 16 ozs. to 27 cubic feet, the total weight must not be more than about 984 lbs. The envelope is made of light varnished material, and it is impossible to use hydrogen therefore to produce greater lifting capacity. The car is built of wood, and carries an 18-H.P. 4-cylinder automobile motor. The motor makes about 1,300 revolutions per minute, driving a two-bladed propeller at the proportional rate of 1 to $3\frac{1}{2}$. The De la Vaulx can carry at the utmost two persons, with fuel, oil, and ballast sufficient for a two hours' flight.

The Baldwin system airship, which has been acquired by the United States Government for the Signal Corps, also resembles the "Ville de Paris" in construction. Here the car is likewise a long piece of framework, but instead of one propeller in front the Baldwin has two! Hence this balloon has not proved itself of sufficient stability during trial flights, as it pitched rather severely. It is 58′ long, has a major diameter of 16′, and a minor diameter of 14′.

The British Army airship shows considerable improvements in construction, the antiquated form, viz., a cylindrical balloon with rounded ends, having been abandoned. The stability balloonets have been converted into gas-inflated fins, a decided improvement upon the stability balloonets of the "Ville de Paris," Clément-Bayard, and "Ville de Bordeaux," though the car is similar to that of the

first-named French airship. The elevating plane and rudder are both attached behind, the former to the car and the latter to a floating beam over the car, whilst the axis of the rudder is fixed slightly in front of the middle, thus practically obviating all resistance in front of and behind the plane, and rendering the steering a much easier operation. The propeller is made of steel tubing with aluminium blades, and is fixed above the car. The balloon itself is about 98′ long and 23′ in diameter.

The semi-rigid airships of the French Army are the Juillot and Lebaudy systems :--The French engineer Juillot built the first semi-rigid airship in Lebaudy Brothers' workshops, which created, in 1905, a great sensation in France. In both speed and steerability this vessel was far superior to all existing types; it neither pitched, wavered, nor rolled. The second and larger airship ordered by the French Government was delivered in November, 1906, and in its turn again surpassed the first for speed. The vessel was named the "Patrie," and was lost in a storm in December, 1907. It is supposed to have been driven into the Atlantic, for a propeller from the ill-fated "Patrie" was found on the coast of Ireland.

The construction of the semi-rigid airships is as follows :—A framework of steel and aluminium tubes strengthens the balloon itself, and serves to affix the wires supporting the car. Thus it will be seen that the wires running slantwise from the ends of the balloon to the car can exert no contracting influence upon the envelope : the framework obviates such possibility. The frame is lengthened towards the rear into a cross-shaped stability plane, to which the rudder is attached. At the rear of the balloon itself there are attached several wing-shaped planes, made of double layers of material and stretched upon light frames of cane. These canes meet inside the balloon and are connected there ; thus the planes support each other, and are, in addition, stretched with steel wire. The beam is of a cross-sectional T shape ; the upper surface is entirely covered with material, and of the vertical section only the rear half is thus covered; here the valve for the balloonet is fixed. In front of the frame an elevating plane is attached on either side, and each is regulated from the car by wires. The car, which is suspended to the beam by steel wires, is finished off underneath with a pyramidal pedestal, upon which the airship rests on *terra firma*, and can be turned in any desired direction. At the same time, the pedestal prevents the propellers from touching the ground in landing. The balloon has a diameter of 33½′, a length of 197′, a cubic capacity of 113,700′. The balloonet has a cubic capacity of 14,133′. The balloon has a lifting capacity of 2,625 lbs., and a velocity of 42′ per second.

The French Government acquired a new airship, "Republique," to replace the "Patrie." Almost of similar construction to its predecessor, the "Republique," after making 81 satisfactory ascents,

burst in mid-air in September of 1909. This balloon had a diameter of $35\frac{1}{2}'$, a length of $217'$, and a cubic capacity of $128{,}965'$. The balloonet contained 30,390 cubic feet. The whole vessel weighed 5,580 lbs., and had a lifting power of 2,844 lbs. Three further vessels were then built by Lebaudy Brothers after the Juillot system.

The airship "La Liberté" has a diameter of $35\frac{1}{2}'$, a length of $233'$, and a cubic capacity of $148{,}300'$.

The "Malécot" also belongs to the type of semi-rigid balloons. It is heavier than air and is dynamically raised. For this purpose the frame is fitted with wide kite planes, which can be trained slantingly against the travelling direction by means of a sliding weight—fixed beneath the car. The planes cover an area of 1,290 square feet. Stability planes are here dispensed with, being unnecessary to this type. The balloon is $112'$ long, $24'$ in diameter, and has a cubic capacity of $35{,}330'$.

GERMAN MILITARY AIRSHIPS.

Both the first and the second new military balloons of the Airship Corps are built according to the design of Major Gross. The new one is somewhat similar to the French military balloon (Juillot), in that it is also semi-rigid. It differs, however, in that the propellers operate nearer the centre of resistance, rendering the pedestal unnecessary under the car. The balloon is $217'$ long, $36'$ in diameter, capacity, 169,600 cubic feet. The stability planes are fitted like fins at each side, almost at the rear of the envelope. At the front of the beam is a double elevating plane, akin to the box-kite, and the other apparatus attached is covered with waterproof material. The car, of steel tubing, is attached close to the balloon with tubes and steel wires, and carries two Körting motors with water coolers, of 70-H.P. each. Under favourable circumstances, this airship could make a flight of 13 hours.

COUNT ZEPPELIN'S RIGID AIRSHIPS.

There were several things to be desired in the Zeppelin I., which made its first ascent on July 2nd, 1900. Chief of these was that a movable weight, suspended from wires, proved insufficient to effect the necessary stability in straight sailing. Zeppelin II. was wrecked in a storm near Kisslegg, in Allgäu. The third Zeppelin was completed in 1907, and worked considerably better than the others, attaining to a speed of $49'$ per second.

Zeppelin IV. was burnt in August, 1908, near Echterdingen. The cause of the disaster was undoubtedly due to the ignition of detonating gas by atmospheric electricity. This gas, leaking from the outer envelope, was ignited by sparks emanating from the metal skeleton and being attracted by the trees. Profiting by the

experience gained from Zeppelin IV., the airship Zeppelin III. was enlarged from 413′ to 446′, retaining its original diameter of 42′, but extending the cubic capacity to 530,000′, which space is divided into 17 separate compartments, or balloons. The inner skeleton is composed of 16 longitudinal sections, tapering together and meeting at either end. These are surrounded and bound together by 16 hoops, each of which is held together by spokes like a bicycle wheel. The square spaces between the long and cross sections are fortified by wires stretched diagonally across. The 17 balloons are kept from contact with the outer envelope by ramie-laces; the object being to allow of expansion when the airship is subjected to sun rays, which warm the gas and enlarge the balloon. Loss of gas is thus prevented. At the same time, a sudden cooling cannot occur if the vessel is passing through clouds. In order still further to strengthen the framework, a long skeleton gangway is attached underneath the balloon, to which the cars are fixed, at a distance of 82′ from either end. The cars are only 6½′ from the bottom of the balloon. In each of the cars is a small Daimler motor of 115-H.P., driving two propellers, consequently the airship is driven by four propellers. The propellers are attached to the sides of the balloon itself by means of brackets. Recently, however, another motor and two more propellers have been added to the centre of the vessel, so that Count Zeppelin was enabled to attain a speed of about 56 miles per hour. Two rudders at the rear guide the vessel, each composed of three parallel planes of 43 square feet, and attached between two stability planes. These last named are about 42′ long, with a superficial area of 332 square feet. To prevent rolling and wavering, another and similar plane is fixed on top of the balloon. The rudders are worked from the forward car. The elevating planes consist of four movable kites, two attached at each side near front and rear. They can be worked separately or together. Each plane is made up of four parallel planes of 121 square feet. At full speed they generate a pressure of 1,312 lbs., and are capable of raising the vessel dynamically a height of 1,640′. Sufficient benzine, oil, and ballast can be carried for a 40 hours' flight.

Rigid airships can only be constructed on a very large scale, as the skeleton alone requires from 25 to 33 per cent. of the total lifting power. Thus the smallest possible model of the Zeppelin would require a cubic capacity of at least 247,330′. Such a vessel, however, is much safer in the air than one of the limp or semi-rigid system, but dangerous when standing on the ground; although there is less necessity for frequent descents in order to replenish the gas, it must, nevertheless, descend in case of storm, and is still liable to destruction if it does not land near its garage. Still more dangerous would be a descent upon the sea, as the waves and wind would speedily destroy the whole vessel.

Baron de Marçay has supplied the French engineer Kluytmann with the necessary means to carry out a novel and interesting method of airship construction. The idea is to place the propeller in the exact centre of resistance. To carry this out, Klutymann has divided the balloon in the middle, separated the two halves by a circular steel frame, and here inserted the propeller, the blades of which protrude from the sides, top, and bottom of the envelope when in motion. The little model constructed on this principle proved that the position of the screw, at any rate, was not without its useful point. Beyond the frame fixed in the middle, the balloon was of the non-rigid type.

Another example of the non-rigid airship was that of the American engineer Morel. It was about 328′ long and 33′ in diameter. Morel's idea was to inaugurate an express airship service between New York and San Francisco, but disaster overtook him. The vessel was too weak in build; at its first ascent, in 1908, with 20 passengers, it reached a height of 491′, burst, and crashed to earth, killing 13, among whom was the engineer himself.

Of the many airships now in course of construction, I will only describe the more important of the rigid types. Zeppelin is building two airships, one to carry 40, and the other 400 persons. The latter will resemble Herr Wetzel's very closely, excepting in the construction of the skeleton and the disposition of the motors and propellers.

Professor Schuette in Danzig is building a rigid airship, now approaching completion, of 426′ long, containing a wooden skeleton, and, like the Zeppelin, divided into 17 compartments.

The engineer Prill, of Hamburg, is engaged upon an airship the skeleton of which is formed of steel. Brand also intends to adopt this method. Prill has also adopted the idea of the vacuum airship, which the Jesuit de Sana described in his works so long ago as 1680. Prill proposes to use hard rubber for the envelope. He calculates for a balloon of 556′ in length, 59′ in diameter, and 0·8 vacuum, to possess a lifting capacity of 72,187 lbs. With such an enormous bag he intends the wall thickness to be only 0·1575″, which would give the balloon a weight of 52,000 lbs., leaving a balance of 19,687 lbs. carried.

Herr Rettig in Berlin is building a rigid airship, like Schuette, of wood. But instead of constructing a wooden skeleton to go inside the envelope, he proposes to make the envelope itself of wood. Thin boards are tightly fitted together and rendered airtight. Herr Rettig hopes to attain a greater degree of density by this means than with waterproof material.

Herr Albert Wetzel has completed arrangements in Stuttgart for the construction of a gigantic airship. The vessel is to have a length of 984′ and 65½′ in diameter. The envelope is to be composed of a

magnalium alloy. Corrugated sheets of this material, 0·0167″ thick, are to be welded together on the Schoop system. The form of the envelope is to be cylindrical, and strengthened inside with 151 tubular hoops tautened with wires like bicycle wheels. In the two ends of the envelope oil and benzine tanks are to be fitted; in order to tilt the front of the vessel upwards or downwards, the liquid is to be driven from one end to the other by pneumatic pressure. Quite a novel departure is the idea of fixing the eight motors on the front end of the cover, beneath and on top. A car of about 500′ in length will be suspended 30′ below, and provided with only one rudder!

The opinion prevails that Germany, with her Zeppelins, is far in advance of other countries. This is true, but only so long as no other and more practical vessel is built, for the carrying power and the safety of these are insufficient for any serious purposes of peace or war.

Although no inventor has as yet succeeded, it is, nevertheless, possible even to-day to construct a dirigible airship which shall satisfactorily fulfil all the demands made upon it. But in order to do this it will be necessary to recognize the most correct solutions with the aid of modern appliances, and not, as has hitherto been generally the case, to obstruct *great advantages with perhaps greater disadvantages.*

All airships up to now have been *compelled* to land during a storm. The law, however, does not demand this; but it does demand a rigid airship which, in any case of danger, shall sail into that domain to which it belongs, namely, the air. This condition is, unfortunately, not fulfilled by the existing rigid airships.

That airship is the best which in any circumstances runs the least risk of danger, which need not land involuntarily, and which can at any time ascend into the air.

One would imagine, from all that has been spoken and written, that very many years of experience were still necessary in order to produce something worthy in this art, and that considerable progress is, for the time being, impossible. This is wrong! It is only a question of appreciating and correctly utilizing the means at our disposal. British industry can supply everything desirable for aerial navigation, and that to a remarkable degree of perfection,—be it for the construction of flying machines or of airships, or possibly in a more limited measure for aeroplanes.

All methods of human transport,—railways, ships, or automobiles, point to the necessity of the traffic working without any co-operation on the part of the passengers. In other words, the attention of passengers must not be distracted by the means of locomotion, thus creating a feeling of perfect safety and comfort. They should enjoy the beauties of nature in the passing landscape, or consider peacefully the plans to be carried out on arrival at their destination.

Social conditions demand rapid transit, with a minimum of expense and loss of time. These considerations absolutely preclude the possibility of solving the problem by any imitation of the flight of birds. Let the exertions of progressive nations be ever so great in the domain of aerodynamics, they will never achieve anything for more than sporting purposes with aeroplanes. I will not touch upon the scientific aspect of the question. Flying machines have this in common with motor cycles: they claim a certain amount of skill and presence of mind from the operator, thus limiting the area of practical utility. The project of flying to Africa and back in a day, which is the dream of the German aviator Wanderfalkeh, will no doubt be abandoned, as was also the hopeless attempt to attain a speed of 150 miles per hour on the experimental electric railway between Mariendorf and Zosen. Seagulls are frequently blown into the water: what chance, then, would the best aeroplane stand, a machine not by any means so qualified for flight as a bird, and possessing, furthermore, no instinct of equilibrium.

All these considerations indicate that the way to the above-mentioned goal lies through the airship, and not the aeroplane.

THE FYERS FAMILY.

(Continued.)

LIEUT.-GENERAL SIR WILLIAM AUGUSTUS FYERS, K.C.B., COLONEL OF THE DURHAM LIGHT INFANTRY.

(Continued.)

The 2nd Battalion of the Rifle Brigade returned from the Crimea six months after Capt. and Brevet Lieut.-Colonel W. A. Fyers had gone home on leave, and was at first sent to Aldershot, where he rejoined it. After the battalion had been reviewed in London by the Queen, it was moved to Dublin in the summer of 1856, and a year later was hurriedly ordered to India to assist in putting down the Mutiny. In the meantime Lieut.-Colonel Fyers had been promoted on 16th June, 1857, to be a Regimental Major. The battalion was divided into three bodies; the second of these, under Fyers, embarked at Kingstown on the 4th August, 1857, in the *United Kingdom*, transport, but did not reach Calcutta until the 7th November. Leaving Calcutta with the detachment by rail for Ranigang on the following day, Fyers went on in advance from that place, reached Benares on the morning of the 16th, left again the same evening, and got to Allahabad on the 18th November. There, amid all the hurry, bustle, and excitement that surrounded him, he began a letter home, telling how he had already snatched a few minutes at Benares to write to his brother Henry in the Artillery, in order that they should get news of him. This letter from Allahabad was continued even on the forced march to Cawnpore. The following extracts are taken :—

Extracts from a letter from Bt. Lieut.-Colonel W. A. Fyers, Rifle Brigade, begun at Allahabad, and dated 12.30 *p.m., 18th November,* 1857.

"I have arrived here about one hour, and having breakfasted at the Dak Bungalow, find some paper and a little quiet to write to you. I left Benares (without seeing anything of it) on the evening of the day of my arrival . . . having a detachment of about 200 (88th), as well as my few Riflemen (11), with me. The whole of the battalion is behind, with the exception of 20 men, along with myself and Colonel Woodford; the rest of his detachment and mine are on the road following up. This arises from the different modes of conveyance, there being three—horse dak, bearer dak, and wagons with bullocks. They travel fastest in the order above, and consequently we, having gone in the first, are ahead of all the rest. Whether we wait here until all come up or go on to Cawnpore at once I do not yet know, but I rather think the latter.

"I believe there is still some sharp work before our army, as the Mutineers, who are chiefly men of Oude, are, it seems, resolved to fight

it out with us in defence of that territory. As far as I can see, our annexation of that country appears to have been the match that fired the magazine. Lucknow, the chief city, is at this moment being bombarded, and we shortly expect to hear of its fall. There are other forts, and strong ones too, I believe, in their hands, which must be taken. I fully expect to have some sharp work, and though, by the goodness of God, I have hitherto wonderfully escaped from injury, yet the chances are great against my coming out scathless. . . ."

Before continuing the extracts I find that, according to Cope's account, Fyers waited at Allahabad for the detachments to come up; both Woodford's and Fyers's divisions left that place by rail on the 23rd, and reached the terminus at Lohanga the same day. Here they again divided, Woodford's detachment proceeding by bullock carts, and Fyers's by route march. Fyers marched from Lohanga at midnight of the 23rd—24th, in charge of commissariat stores carried on donkeys; he halted after about 16 miles. Another march of the same length brought them to Fatehpur on the 25th, the stores in their charge being a great impediment to their progress. Leaving Fatehpur the same night, they marched some 17 miles, and just as the men were pitching their tents about 8 a.m. on the 26th a messenger on a camel arrived from General Windham at Cawnpore. The messenger had already met Woodford's detachment and hurried it forward, and now came up to Fyers with a pencil note from the General, urging him to make all speed, as troops were wanted.

At the halting place, which is not named, where Fyers received Windham's message, and while his men were resting, Fyers continued his letter home:—

"*26th November.*

"I had it not in my power to finish this in time for the last mail. Ever since leaving Calcutta we have had to go through great fatigues, and since I wrote the above, having stopped at Allahabad for I think three days, we have had abundance of work. . . . Since leaving Allahabad we have been making long marches at night, tiresome because so slow. Last night I started with my detachment of 233 men, and did not reach this place until 8 in the morning.

"While pitching a few tents, an express messenger came with a note, directed to Colonel Woodford and myself, from General Windham at Cawnpore, pressing on us to make all speed, as a large and fine force, the Gwalior contingent, was close to him with a large park of artillery, 36 guns, and a siege train; he has about 2,000 men. The messenger met Colonel Woodford last night not far from Cawnpore, and he would reach it shortly after. He went ahead of me with a bullock dak, while I have had to march with a large convoy of commissariat things, etc., etc. We did 17 miles last night, and I intend to push on to-night with elephants (10) and camels only; the distance I have to complete before 8 to-morrow is 32 miles.

"I have set the elephants apart for the sick and fatigued men only.

I reckon for 12 hours, allowing two hours for a halt for food and rest. The men are very much knocked up with having so little sleep, and very many are suffering greatly from their feet; however, I am sure they will make the effort, and will succeed in reaching the place so as to be in time for anything that is going on. General Windham said in his note he expected a row to-day (this day) or to-morrow, the 27th.

"To-day we have heard a great deal of firing (cannon) in either that direction or Lucknow; it is difficult to judge which. Artillery, our 3rd Battalion, and then our headquarter wing, are now on the road following our steps; they will shortly be up. Lucknow is, I fancy, already in our hands, or very nearly so. We literally hear nothing of the operations going on. You would be pleased to hear of their success there, and of the junction with General Havelock; the despatch was shown to *me* at Allahabad. I fear the losses are great, for the ruffians are very desperate.

"There is a chance of my being obstructed in reaching Cawnpore, but I will feel my way at daybreak with caution. I fancy it is the object of the Gwalior force to invest the entrenched camp of Cawnpore. I fear we are badly off for guns. Your old friend Jock Anderson is on his way with his men of a troop of Horse Artillery; he gets his guns and horses at Allahabad. A battery is about three marches on this side of Allahabad. They have had very great difficulty in getting horses. General Dupuis and his Adjutant-General, old Adye, passed through Allahabad while we were there. . . . At Allahabad I fortunately lighted on a strong Cabooly pony, quite a weight carrier (300 rupees), and as I have had to march, this is very fortunate. . . .

"Though I have gone through so much fatigue lately, I am quite well, and hope, with God's blessing, to remain so. I am very glad Windham is in command; there must necessarily be a bond of interest between us. I wrote him a hurried note on my knee in acknowledgment of his, saying that I would do all in my power to press on. The post camel that brought his message took back mine. As you may suppose, I am now very much taken up with my present work, and have but little time for the pen. I have taken upon myself to part with all the incumbra of my line of march, carts and what not. I have a rope ladder made this evening to accelerate the climbing the elephants by the cripples. Our servants go on elephants for the first half of the march, and then make their way on foot. It would have amused you to see us at work making this. The men have, I hope, put in some sleep; I cannot say I have, for my thoughts have been too busy. I may yet however get a snatch. . . ."

Leaving the commissariat stores he had been escorting in charge of the local police at the halting place, and carrying with him only what was necessary, Fyers started with his detachment for his 32-mile march. He allowed his men frequent short halts on the way, but many of them were so fatigued that when a halt was sounded they fell asleep almost as soon as they lay down on the ground.

In the early morning of the 27th Fyers gave them an hour's rest and a ration of rum. At daybreak he halted for a breakfast of tea

and biscuits. Then, weary, hot, and footsore, the men marched on. At length the near sound of booming guns and rattling musketry fell on their ears from the direction of Cawnpore. These sounds seemed to put fresh life into them, and, inspired with the hope of being in time for the fight, they pushed on and were able to join in the fray, arriving about 2 p.m.

When it is remembered that the men were wearing European cloth clothing and shakos, this march may well have been considered a splendid performance.

General Windham's camp lay outside the town of Cawnpore on the S.W., and not far from the Great Trunk Road from Allahabad. The fort and entrenchments were on the N.E. of the town, covering the bridge across the Ganges. The enemy were enveloping Windham's camp from the S.W. to the N.E.

General Sir John Adye, in his *Recollections of a Military Life*, says :—

"November 27th proved to be a very eventful day. Our small field force, as I have explained, was camped outside the city, not far from the point where the Great Trunk Road crossed that from Cawnpore to Calpee. General Windham naturally hoped that the successful blow he had delivered on the previous day would, at all events, so far tend to discourage the mutineers as to delay their movements and give time for the return of the Commander-in-Chief. The position however was critical. . . .

"About 10 a.m. a cannonade suddenly commenced away on the right, followed shortly afterwards by a similar demonstration in front. The mutineers were evidently determined to make a simultaneous attack on both points, and although for the time they held back their infantry, their artillery fire was very severe and continuous. . . . Not only was the fire incessant, but there were indications that our left as well as our right was threatened—in fact, the enemy were in great strength (in a semi-circle) all round us. The battle continued for several hours without signs of abatement. Our ammunition was running short, and the bullock drivers began to desert.

"Under these circumstances General Windham directed his troops to fall back a short distance, until they found a temporary shelter under cover of some mounds and remains of old brick kilns just outside the city. It seemed now that the position might be held. Still anxious about the right flank, late in the afternoon he sent an aide-de-camp to obtain information, and shortly afterwards directed me to ride through the streets and ascertain the state of affairs. Whilst threading the narrow lanes I suddenly met the aide-de-camp coming back in haste, who informed me that the mutineers were in possession of the lower parts of the town, and had just fired a volley at him. At this moment Windham himself joined us. Whilst deliberating on the critical position, two companies of the Rifle Brigade also appeared on the scene, as if they had dropped from the clouds. They had been marching all day up the Trunk Road, hearing firing in various directions, but unable to find anyone to give them

information. Windham said a few words to them, and, placing himself at their head, away they went cheering, and soon cleared the streets of the enemy."

Fyers, whose letter from Cawnpore I shall presently quote, says he arrived there about 2 p.m. on the 27th. General Sir John Adye says he met the two companies late in the afternoon. Some time may have been occupied between the time of arrival and the meeting with Sir John Adye. It must have been soon after Fyers and his men had cleared the streets that orders were given to withdraw the whole force from the front and concentrate at the entrenchments on the Ganges, in order to hold that position and prevent the bridge of boats being destroyed. Fyers must indeed have been thankful to get there and to be able to refresh his men with an issue of grog, biscuits, and tea. The retirement through the town to the fort or entrenchment had been conducted without haste and in good order. As soon as the men had partaken of this slight refreshment, they went on outpost duty at an outwork of the entrenchment.

"On the 28th," says Cope, "the Riflemen were ordered, about six in the morning, to come into an outwork of the entrenchment, where, having been supplied with some biscuit and tea, they were ordered out to resist the enemy, who were expected to make another attack. The Rifle Companies, with part of the 82nd Regiment, and Capt. Greene's battery of Artillery, were posted on the left of the canal, looking from the entrenchments. In moving to this position they were exposed to a heavy fire of musketry and grape. The action itself began about noon, and after hard fighting these troops repulsed the enemy. . . . In the course of the fight Colonel Woodford, Lieuts. Playne and Nicholl, with three Riflemen, were in a dip in the ground, in front of the enemy's guns, and were making good practice in picking off the Gunners, when Woodford, who was in the act of taking a shot with a rifle at a Sepoy, was shot through the head, and uttering an exclamation, expired. . . . The Riflemen took two long 18-pr. guns, and the men, having tackled-to with ropes, drew them into the entrenchment, a distance of more than 3 miles. On their arrival they were greeted with a round of cheers for the guns, and another for the Rifles, and, amidst great excitement, civilians and soldiers pressed forward to offer congratulations and refreshments to the gallant captors.

" . . . During the night of the 28th the enemy took entire possession of the town, and on the 29th began a heavy fire against the entrenchment, hitting the bridge of boats over the Ganges several times, damaging the hospital, and destroying stores. The Riflemen, who had during the night and morning occupied the principal outwork of the entrenchment, were ordered out by Sir Colin Campbell (who had arrived at Cawnpore at sunset on the 28th) to take some guns which were doing much damage. Accordingly at

3 p.m. two companies of the 2nd Battalion and Atherley's Company of the 3rd, under Lieut.-Colonel Fyers, who had succeeded to the command on Woodford's death, made a sortie. Running out over some very uneven ground, they attacked some Sepoys who were in the Residency, and were for some time exposed to a very severe fire. However, after a while, they drove the enemy out of these buildings, and as they were escaping by the back of the compound, some Riflemen of Atherley's Company crept round stealthily under the wall and succeeded in catching the retreating rebels on their swords as they leapt over it. They thus slew a large number. However, as they did not receive reinforcements, they were unable to take the guns, and returned to the entrenchment.

"The Riflemen, or some of them at least, had not had their clothes off since they left Allahabad (on the 23rd); had been scantily fed, often being for 24 hours with only one meal, and sometimes that only of biscuit and tea or rum; exposed to heat by day, and great cold by night, and suffering from sore feet; yet they kept their spirits up, and did their work on these four hard-fought days in a manner to elicit General Windham's marked approval repeatedly expressed to them."

A somewhat different account of the engagement on the 28th is given by Colour-Sergt. William Cox, of the 2nd Battalion of the Rifle Brigade, in an interesting statement he wrote out and signed. He tells us that the 2nd Battalion marched out at early dawn, tolerably well supplied with water and ball cartridge, a large number of steel pins being also served out to spike any guns that might be captured. Advancing in skirmishing order (about 6 paces) under a heavy fire of round shot, while bringing up the rear of his company, he was joined by Lieut.-Colonel Fyers, who, sword and revolver in hands, brought up the rear guard. From the cover of some irregular mud walls a level plain stretched before them, and at a distance of 500 or 600 yards they saw three 18-pr. muzzle-loading guns, which kept up an incessant fire, being well served by the Sepoy gunners.

The 2nd Battalion of the Rifle Brigade was the first regiment sent out armed with the short Enfield rifle, sighted for 1,100 yards, and the Riflemen soon "played havoc among the Sepoy gunners," who as soon as they came forward to load were "knocked over like nine-pins." The guns were then retired, and "Lieut.-Colonel Woodford, seeing that they were harnessing their elephants to one of the three guns, gave the order to 'fix swords' and 'charge.' This charge was led by Lieut.-Colonels Charles Woodford and William Augustus Fyers, and while leading thus, the former was unfortunately killed.

"The enemy got one of the guns away safely, while the other two fell into our hands, and one of these was spiked by the pioneer of my own company (by name Sandy Robinson). We found the Sepoy gunners lying in heaps round the captured guns, with their uniforms

smouldering on their dead bodies, having been intentionally set on fire by their comrades, doubtless in accordance with the rules of their caste. We noticed that scores of our bullets were imbedded in the woodwork of the swivel sighting-boards on the breech of each gun, showing that the gunners must have had a hot time of it, and that they must have stuck to their posts most manfully, and worthy of a better cause."

A difficulty then arose. How were they to get the guns into the fort over a mile away? Evidently they had no ropes with them, as stated by Cope. The colour-sergeant says they soon solved the question, for "we took the loose slings off our rifles and made drag-ropes of them, all hands joining in the work with hearty good-will, and frequently having to use the handspikes attached to the limbers to extricate the wheels from the numerous ruts into which they continually fell."

As they were nearing the fort a detachment of the Naval Brigade came out to bring in the guns, but, says Colour-Sergt. Cox, "Lieut.-Colonel Fyers courteously declined their assistance, telling the officer in charge of the sailors that as we had captured the guns and brought them in safety thus far, we were quite qualified to take them into the fort without any extraneous assistance. This we did amidst the deafening cheers of the crowds within the fort, military, naval, and civilian."

There would appear to have been some dispute as to the capture of the guns when the histories of the Mutiny came to be written. Sir John Adye says: "Away on the left in the open plain, near the ruins of the 'Old Dragoon Lines,' the Rifles, with part of the 82nd and a battery, after a hard-contested fight, drove back the mutineers in a brilliant manner and captured two 18-pr. guns." At any rate Colour-Sergt. Cox is not in any doubt. He adds emphatically:— "This I do know, and will maintain with my latest breath, that the four companies of the 2nd Battalion Rifle Brigade, *unaided*, captured the two 18-prs. alluded to, and brought them safely into the fort, where a few days afterwards they were able to retort upon their late possessors. . . ."

In a letter from Lieut.-Colonel Fyers himself, written at Cawnpore on 30th November, he refers to the events of the last few days:—

"CAWNPORE, 30*th November*, 1857.

"I arrived here at about 2 p.m. on the 27th, after a forced march of 50 miles, and as soon as we got into cantonments was met by a Staff officer, begging me to proceed immediately to the scene of action. From 12 o'clock we had heard the guns going hotly, but were not prepared to find things in the state they were. General Windham had made a great mistake, as you will have seen by the accounts from here. He had retired from his ground that morning under the impression that the enemy were making an advance on the fort of Cawnpore, which of course was to him a matter of great concern and importance. His

information came from bad sources. The consequences of his retiring were the loss of his camp equipage and almost everything belonging to the troops. To be sure the numerical superiority of the enemy, as well as their great strength in artillery, may be regarded as some excuse for this false step, but I think a bolder course would have been the better of the two. I have heard a good deal of talk about the misconduct of some of our troops, and I fear there is too much ground for it. You may imagine how the strength of my detachment has been taxed since their arrival. At first there appeared to be quite a panic in the minds of all, and we were dragged here and there by orders and counter-orders. The day's work finished by our getting no food and having to man one of the outworks of the fort. This was not all, for I had to set a proportion of the men to work on the unfinished parapets, get up sandbags, and all that sort of work. Having had a little sleep, I was summoned to the General's Quarters to a Council of Commanding Officers of Corps, and remained there some hours. . . . It was determined to beat up the enemy the next morning, and the plan was explained on the map. On the next day we accordingly started to our different points, and in good course of time came in contact with the enemy's troops, the result to us on the left being that we forced them to retire with considerable loss. The right did not succeed so well, and met with considerable loss. Our loss in officers was, considering, a good deal, and as poor Colonel Woodford fell, certainly hit us hard. We had however the satisfaction of capturing two 32-prs., and brought them in. These guns were taken chiefly, I am happy to say, by three companies under my orders. I have the satisfaction of believing that they (the companies) worked well in spite of the fact that I could get *no fresh ammunition.* How this arose I can't say. I tried every means in vain. I had seized some excellent points which gave me cross fires, and the Enfield rifle, under the good management of the captains of companies, did a great deal of execution, and especially damaged the before-mentioned guns, that is, their powers of locomotion and of being dangerous, which they had proved themselves to be by the showers of grape they sent among us. We must have done much mischief also among their cavalry. We however walked off with the guns triumphantly, some others interfering with our movements by keeping up a brisk fire. I found a couple of companies of the 34th, I think, doing little or no good, so I walked them off to a brick kiln and some cottages, and showed them how to use their rifles on the guns who were annoying our people. When they had got out of the range of these guns, I saw a mounted officer of the regiment these companies belonged to, and gave them up to him and joined the R.B.'s, having the honour of conducting them into the fort with their prize guns as commanding officer. You may imagine the day's work gave me considerable satisfaction, damped though by poor Woodford's death. . . ."

From December 1st to the 5th Fyers and his Riflemen continued to occupy the outwork of the entrenchment, the enemy keeping up an intermittent gun fire on them. In the meantime Sir Colin Campbell was busy sending off all the wounded and the women and children

he had rescued from Lucknow to Allahabad. When these were well on their way, and had got beyond danger, he was free to act with a strong hand against the rebels. The Riflemen joined Sir Colin's camp at the "Old Dragoon Lines" on the afternoon of the 5th. By this time the 3rd Battalion had arrived there from Allahabad, under Colonel Horsford, and the two battalions were brigaded under Brigadier Walpole.

Although the enemy was in full possession of Cawnpore, their main position and camp was outside the city, and on the west of the Great Trunk Road. At 10 o'clock on the morning of the 6th Windham, who was in command of the entrenchment, opened fire from all his guns and mortars on the city and on the enemy's left. This continued for two hours, and the rebels in the city were destroyed in great numbers. More and more rebel troops were brought in to repel the expected assault, and their right was left unsupported. Then the bombardment ceased, for Sir Colin's way was clear. Greathed's brigade closed on the line of the canal and kept the enemy's centre occupied, while Walpole's brigade crossed the canal; the Riflemen deployed, and fixing swords, advanced and soon extended and cleared the ground between the canal and the city, and prevented any column of the enemy debouching from the streets to the assistance of their right. Then they moved towards their left to connect with the force which had crossed the canal by another bridge. Soon they saw the rebels flying towards their camp, hotly pursued by our troops. So, continuing to advance in skirmishing order, the two battalions swept the ground between the town and the Great Trunk Road, passing the brick kilns, and through suburbs and trees, till they came in view of the enemy's camp, which they at once occupied, while other troops were pushed on in pursuit.

Later in the day, leaving the charge of the captured camp to others, they took part in Mansfield's futile attempt to cut the rebels off from the Bithur Road by seizing their position at Sabadar's Tank. "In front of the tank," says Cope, "the enemy had some heavy guns; some distance on the right of the Riflemen was another gun, and two more a little to the left. These were well protected by earthworks or walls; a considerable body of rebels kept up a musketry fire from tops of trees and enclosures; and the Riflemen were exposed to showers of grape, canister, and round shot. They advanced extended about 300 yards on each side of the road, slightly in advance of some heavy guns, while the 93rd were kept in reserve. The fire of these guns soon began to tell on the enemy. This, and the approach of the long line of extended Riflemen, soon disheartened the enemy, who began to give way immediately on the Riflemen passing through the enclosures to the right and the broken ground to the left of the road. On reaching the entrance of the village, called the Soldiers' Burial Ground, the guns of Capt.

Middleton's battery were pushed through as rapidly as possible, the Riflemen running up to support them. They got very near the gun on their right and the two on their left, and were in hopes of capturing them, but they were so much delayed by having to climb over mud walls and pass through enclosures to get at them, that the rebels succeeded in removing them by the right and left, and took them among some houses which the Riflemen had orders not to pass."*

The Rifle Battalions pursued the enemy, now completely routed, until about 5 o'clock in the afternoon, when a halt was called at some unoccupied houses for the night. Here the 2nd Battalion got hold of some sheep, and had such a feast of mutton that they named the house "Mutton Bungalow." On the 8th they moved in to Cawnpore, and then joined Sir Colin Campbell's camp some 4 miles in advance. The headquarters of the battalion, under Colonel Percy Hill, all this time had been delayed, and did not reach Cawnpore until the 15th December.

Sir Colin Campbell now decided to sweep the Doab of rebels. Brigadier Walpole's brigade was directed to make a semi-circular sweep to the left through the Lower Doab on Manpuri, and finally to move on Fategarh, whither Sir Colin himself intended to march with the main body of the army.

On the 18th December, 1857, both battalions of the Rifle Brigade, forming part of Walpole's brigade, marched off on this expedition, in which there were many long marches and little fighting, the enemy generally flying on their approach. They joined Sir Colin at Fategarh on the 4th January, 1858. On the 13th they were sent to Aligarh to protect the passage of the Ramganga River, but soon returned to Fategarh, whence, on the 4th February, they made another sweeping march, reaching Cawnpore on the 11th. During this month Sir Colin Campbell was awaiting reinforcements and maturing his plans for the Siege of Lucknow.

The two battalions of the Rifle Brigade now formed a brigade, under Colonel Horsford, in the division commanded by Brigadier Walpole. Fyers marched with his battalion from Cawnpore on the 27th February for Banthira, where the whole army encamped, and on the 3rd March they started for the Alambagh. Walpole's division was to form part of Outram's force. It was at the Alambagh that Outram had taken up his position in November, 1857, when Sir Colin Campbell left him with the garrison of Lucknow, which he had

* Holmes, in his *History of the Indian Mutiny*, says that Mansfield "had before him the chance of forcing something like two-thirds of the entire army to surrender. When he reached the tank large masses of the enemy were already retreating. He opened fire upon them, but, in spite of the remonstrances of his officers, would not allow his infantry to advance. . . . He might have captured their guns if he had not shrunk from incurring the loss which an attack upon their position would have involved."

relieved, with directions to watch the city until Sir Colin should find himself able to lay siege to it. In spite of the small force at his disposal, Outram had gallantly held his ground and defeated numerous attacks of the rebels.

On the 6th March Outram crossed the Gumti River and encamped his whole force near the Faizabad road. "On the 9th March he made his attack; himself leading the left column across the Kokrail stream, he seized the Chakar Kothi, or Yellow House, the key of the enemy's position in that quarter, and, driving the rebels to the river, threw up batteries on its bank to keep down the enemy's fire and explode the works in rear of the Martinière. On the 10th March he strengthened his position, repelled the attack of the enemy, and kept up the fire of his batteries upon the Kaisar-bagh and main street. The Kaisar-bagh fell to Sir Colin Campbell on the morning of the 14th. On the 16th Outram, having re-crossed the Gumti, advanced through the Chattar Manzil and carried the Residency. On the morning of the 19th Outram attacked the Musa-bagh, held by 5,000 men and 13 guns, and carried it, capturing 12 guns. So ended the capture of Lucknow."*

And what part did the Riflemen take in the fighting of these 11 days? On the 9th they advanced in skirmishing order in front of the contiguous columns, and after fording the Kokrail stream, found themselves in front of a small village, strongly situated in broken ground, which was well wooded. Lieut.-Colonel Fyers took his company to attack the village, but the rebels retired. On coming to the Yellow Bungalow, the Riflemen went for it with a rush.

On the following day the Riflemen shifted their camp to the neighbourhood of the Yellow Bungalow and furnished the outlying picquets. On the 11th they took part in a reconnaissance in force to ascertain the possibility of crossing by a bridge to Lucknow. They led in skirmishing order among orchards, by buildings of various kinds, and through narrow streets. "They skirmished through these as well as they could, each captain acting in a measure independently and handling his company as he thought best. The streets were so intricate, and the continuity of the battalions so broken, that no other system was possible. The Riflemen worked their way through these obstructions, and reached the mosque on the Old Cantonment road, which commands the approach to the Iron bridge. . . . Leaving the mosque in charge of other troops, they proceeded to fight their way to the Iron and Stone bridges. . . . The camp of the rebel 15th Irregular Horse was surprised, and two guns and the standard of that regiment were captured by the Riflemen. . . . Eventually the Riflemen cleared the whole of the suburbs near the Old Cantonment road as far as the Iron bridge."† The casualties of the battalion

* See "Outram," *Dictionary of National Biography*.
† Cope's *History of the Rifle Brigade*.

to which Fyers belonged were considerable, and two officers succumbed to the wounds received on this day.

On the 19th March the 2nd Battalion was detailed to hold the Iron bridge and the 3rd Battalion the Stone bridge, while the force on the right bank of the river cleared the city of Lucknow of the remaining rebels. They took up their position at 7.30 in the morning, and remained there for 10 hours. But they were not actively engaged, as the rebels did not venture to try to cross the bridge in face of so strong a body of men.

After the capture of Lucknow the 2nd Battalion formed part of the movable column, under General Sir James Hope Grant, which did such good work in stamping out the embers of the rebellion in Oude and across the Gogra. The battalion had no rest. From April to the end of the year they were incessantly marching and frequently fighting, and it was not until July, 1859, that they occupied barracks. For 20 months they were in the field, often bivouacking in the open; they had marched about 1,750 miles in 160 marches, and the company officers, of whom Fyers was one, had accompanied their men on foot. It is said that they were the only infantry battalion that had kept the field the whole time, from their arrival in India in November, 1857, until the end of the Mutiny campaign in July, 1859.

In these constant marches, in such a trying climate, Lieut.-Colonel Fyers took his part until broken down in health he was forced to give in, and his name frequently appears in the Records; but I have not space for many such references, and a few must suffice.

On the 23rd April, 1858, he commanded 200 riflemen at the destruction of the fort of Jangarabad.

On the 10th May, in the pursuit of Beni Madho, when the thermometer marked 118° Fahr. in a tent, and men were struck down by the sun in great numbers, at the close of the day they came up with the enemy, but it was too late, on account of the light, for more than a smart skirmish. Colonel Fyers, with two companies, captured a gun. "It was getting dark, the 'retire' had sounded, and all had joined the main body except these two companies. The gun was heavy, the ground bad, and the men worn out by heat and fatigue. They made little way with their gun, and it became dark. Then some horsemen appeared on the left. . . . At last they came near, and Colonel Fyers challenged; the reply was not satisfactory, and he fired his revolver. The Riflemen at once poured a volley into them at 30 yards, which emptied half the saddles, and then fixed swords. But the horsemen fled. . . . The Riflemen, not without difficulty in the pitchy darkness, rejoined the battalion."

Worn out by the privations and fatigues of the campaign, Fyers at last succumbed, and had to return home in June, 1858. For his services in the suppression of the Indian Mutiny he was mentioned in

despatches was made a Companion of the Bath on the 17th June, 1858, and was given the war medal, with clasps for Cawnpore and Lucknow.

It would seem that Fyers must have been recommended for the Victoria Cross for his gallant conduct at The Alma, for writing from Lucknow on the 10th April, 1858, he says:—"Lord Panmure did me the service of scratching my name from the list, when it had *actually* passed the Committee, for the Victoria Cross."

On the 28th September, the same year, he married, at Kingswood,* Surrey, Mary Stuart Nepean, daughter of Rear-Admiral Evan Nepean, R.N., and of his wife, Mary Stuart, daughter of Rear-Admiral Henry Stuart, R.N. The bride was born in 1829. Her father was the second son of Lieut.-General Nicholas Nepean, by his marriage with Countess Johanna Francina von Host Wedekind, and nephew of Sir Evan Nepean, 1st Bart. (Secretary of the Admiralty, and afterwards Governor of Bombay, etc.).† Her mother's father was nephew and heir to General James Stuart, who was Colonel of the 72nd Highlanders. It was a pleasant coincidence that the Warrant for his C.B. reached Fyers on the morning of his wedding.

Fyers returned again to India in July, 1859, to do duty with his battalion. He remained in that country in command of the battalion for eight years, except for a short interval, until he returned home with it in the autumn of 1867. He was then quartered at Devonport. In the meantime, during his long service in India, he had been promoted Brevet Colonel on the 8th June, 1864, and granted a Distinguished Service Pension. On the 28th October, 1868, while at Devonport, he was promoted to be Regimental Lieut.-Colonel, and posted to the 3rd Battalion, still in India. Once more, and for the last time, he went to India to take up his command. He returned to England with the battalion, landing at Portsmouth on 1st January, 1871, and remained at that station until he went on half-pay as a Major-General in the following year. His commission as Major-General was antedated to 23rd August, 1869. He retired from the Service on the 1st July, 1881, with the honorary rank of Lieut.-General. He was created a Knight Commander of the Order of the Bath on the 25th May, 1889, and on the 15th June, 1894, was appointed

* The connection with Kingswood, Surrey, was as follows:—Admiral Stuart's beautiful second daughter, Elizabeth, married Thomas Alcock, formerly of the 1st Royal Dragoons, who, in 1828, travelled through Russia, Persia, and Turkey, including the Caucasus and the Crimea. He was M.P. for East Surrey for many years. Having no children of their own, they adopted their niece, Mary Stuart Nepean, who continued to live at their place, Kingswood Warren, near Epsom, until her marriage at the church in the grounds which her uncle had built.

† Sir Evan Nepean, 1st Bart., married Margaret, daughter of Capt. William Campbell Skinner, R.E., and granddaughter of Lieut.-General William Skinner, R.E., Chief Engineer of Great Britain.

Colonel of the Durham Light Infantry, in succession to General Sir J. Bisset, K.C.M.G., C.B., deceased.

After a long illness Lieut.-General Sir W. A. Fyers died at his residence in Onslow Gardens, South Kensington, on the 10th November, 1895, in his 81st year. He left a widow, two sons, and an only sister to mourn his loss. The funeral took place four days later. The first part of the service was held at St. Peter's, Cranley Gardens, where he had been wont to worship, Dr. Ridgway (now Bishop of Kensington) officiating. The body was interred at Kingswood, Surrey.

Lady Fyers died in 1900, and was buried beside him.

By his wife, Mary Stuart Nepean, Sir William Augustus Fyers had three sons :—

I. Henry Stuart Fyers, born in London, 29th July, 1859 ; died at Calcutta, 23rd February, 1863.

II. Hubert Alcock Nepean Fyers, born at Simla on the 2nd September, 1862 ; Captain, late Rifle Brigade, M.V.O., Royal Rifle Reserve, 1900 ; married in London, on 15th July, 1897, Evangeline Blanche, eldest daughter (born 4th February, 1876) of Capt. Hon. Francis A. Chichester, 7th Hussars, and Lady Emily Stewart, daughter of Randolph, 9th Earl of Galloway. Capt. Hubert Fyers commanded at Osborne Queen Victoria's last Guard of Honour. In 1907-08 he was aide-de-camp to H.E. Lord Northcote, Governor-General of the Commonwealth of Australia. He has issue :—

(1). Fitzroy Hubert Fyers, born in London on the 13th March, 1899.

(2). Enid Elizabeth Blanche Fyers, born in London on the 5th January, 1902.

(3). Cynthia Armorel Emily Fyers, born in London on the 16th October, 1905.

III. Evan William Hamilton, born at Kingswood Warren, Surrey, on the 7th September, 1864 ; B.A., Christ Church, Oxon., 1887, Lieut., Reserve of Officers, Captain and Honorary Major, 8th Battalion City of London Regiment (Post Office Rifles) ; married in London, on 28th January, 1897, Florence Mary Kent, daughter of David Kent, Esq. (marriage dissolved in 1904). Issue :—Mary Stuart Fyers, born in London 14th May, 1898.

Some of the descendants in the male line of Thomas Fyers, Overseer of the King's Works in Scotland, have not failed to claim their privilege to be enrolled among the Burgesses of Berwick-on-Tweed. As has been already stated, Thomas Fyers himself was enrolled on the 6th December, 1735 ; Lieut.-General William Fyers, his eldest son, on the 15th September, 1786 ; Major-General Peter Fyers, his youngest son, on the 6th November, 1827 ; William Augustus Fyers, son of Major-General Peter Fyers, on the 17th November, 1879 ; and Hubert Alcock Nepean Fyers, grandson of Major-General Peter Fyers, and great-grandson of Thomas Fyers, on the 16th February, 1888.

(To be continued).

MEMOIRS.

MAJOR DAVID CHARLES COURTNEY, LATE R.E.

WE have recently lost a man who, for the combination of ability power of hard work and devotion to duty taken together, was probably unequalled in the Corps.

His abilities were high, for although he never occupied any position absolutely of the first rank, yet he was capable of carrying out successfully any work that came to him whatever its nature might be, and was always well informed of the events and movements of the time. In power of work he was unrivalled. He enjoyed it, and never seemed to tire, whatever the subject might be which he had in hand.

He was born on 27th January, 1845, the elder son of Henry Courtney Esq., of 24, FitzWilliam Place, Dublin. He was educated at Blackheath Proprietary School from his 10th year continuously, till he went to Woolwich. He passed 3rd into the Academy in "Watson's" batch, and got his commission in the R.E. on 17th April, 1866.

After about four years at Chatham and Aldershot, he went to Malta for five years. While there he met and married the eldest daughter of the C.R.E., Lieut.-Colonel Gother Frederick Mann, a representative of an old Corps family.

After about three years at home, spent at Dover, he went to the Cape of Good Hope for the Zulu War of 1879, getting his step to Captain shortly after landing. He was posted to the 2nd Company, just converted from "Fortress" to "Field," under Capt. Wynne. The company was sent up at once to the Lower Tugela, and started from there on 18th January, 1879, as part of Colonel Pearson's column, directed on the capital town, Ulundi. On its way it was to form a depôt at Etshowe. On 22nd January the column, while on the march, was surrounded by some 8,000 Zulus. Courtney and the company were employed at the time in mending the drift over the Inyezane River, and part of the main body had passed over when suddenly firing came from all directions. Courtney at once dropped pick and shovel, and extending his men to cover the drift, kept off the Zulus near him for at least half an hour, until he was relieved by the infantry. Colonel Pearson said that Courtney had saved the Column.

On the 23rd inst. Colonel Pearson's column arrived at Etshowe and began an earthwork. On the 28th inst. news arrived from Lord Chelmsford of the disaster at Isandula, where the 1st Column was wiped out by the Zulus, and Colonel Pearson was told to retire or remain as he thought best.

At the Council of War which followed, Capt. Courtney's voice was for holding on. He pointed out that if they retired Natal would probably be overrun by the Zulus. Nevertheless, a retirement was nearly brought about, when fortunately two senior Staff officers, who had been absent during the first part of the proceedings, returned, and strongly backed Capt. Courtney's views. They were adopted, and the column held on to Etshowe where it remained until April, when it was relieved by fresh troops. The hardships were considerable and caused much illness, but Courtney seemed all the better for them. On the death of Capt. Wynne he succeeded to the command of the company, and after Etshowe served with it in the advance of the 2nd Division on Ulundi, and also with Baker Russel's Column to the close of the operations.

He was noticed during this campaign for the great care he took of his men, and for the way in which he would insist on all tools, etc., being packed away and in their places, even after a hard day's work, so that they were always ready for emergencies.

For this campaign he was mentioned in despatches and received the Medal, with clasp.

On his return from Zululand he went to the Royal Arsenal, Woolwich for three years, during which time his work was much appreciated.

In 1884-5 he saw some more active service in the Nile Expedition. He arrived in Cairo on 4th September, 1884, and was then ordered to proceed up the Nile and report upon possible portage roads to turn the various minor cataracts south of Sawas as far as Hannek, the "Third" Cataract. He had completed this work and sent in all his reports and sketches by the middle of November. In January, 1885, he joined the River Column under General Earle, and was employed on survey work about the "Fourth" Cataract. He was present at the action of Kirbekan, on 10th February, and returned to England in August, 1885.

For this campaign he was mentioned in despatches, and received the Medal, with two clasps, Bronze Star, and Brevet of Major.

A brother officer who saw a great deal of him on the Nile writes :— "He was the most absolutely unselfish companion I have ever been with. On service, when necessaries were not to be got, it was not with him a case of sharing his things with others—he simply gave them away."

After the Nile Campaign he was posted to the Royal Small Arms Factory at Enfield for about a year and a-half.

At this time the appointment of Assistant Superintendent at the India Store Depôt was offered to him, one of the conditions of holding which was that he should retire from the Army, as the India Office did not wish for a divided allegiance. Although he did not particularly wish to leave the Corps, he nevertheless took the appointment and retired.

It was characteristic of Courtney that although he might have retired with the honorary rank of Lieut.-Colonel, as such a step was at that time given to retiring officers, yet as he did not wish to appear to be of a rank the duties of which he had never exercised, he retained his title of Major. In this way he did not seem quite even with his contemporaries, who from their nominal rank would appear to have had longer service than he.

The following appreciation of his services in the India Store Depôt is supplied by a former Director-General of Stores under whom he served :—

"Major Courtney was appointed Assistant Superintendent of the India Store Depôt in 1887, and retired 1898, on the ground of ill-health, after rather more than 11 years' service. His physical powers were on the verge of breakdown, not only under the strain of heavy official work, but also under that of the extra duties he voluntarily undertook. His devotion to duty was a marked feature of his character; a master of detail, he left nothing of importance to even the ablest of his assistants, but insisted on tackling the most laborious and intricate calculations himself."

"He had a wide knowledge of material, combined with a somewhat rare capacity for appreciating the practical side of production, and these enabled him to revise and systematize the preparation of specifications for the infinitely varied supplies demanded for India, to the great advantage both of the Department and of the manufacturers of Great Britain."

"He prepared many pages combining practical principles with theoretical details, to enable officers in India to prefer demands in such forms as would ensure exact compliance with actual requirements. As an example I may quote his 'Notes on Indents for Pipes and other Stores for Waterworks,' published as Paper VII. of Vol. XXII. in the *Professional Papers of the Corps of Royal Engineers* (Occasional Paper Series), a paper which has become a handbook for the Services in India."

"His goodness of heart prompted many an act of helpful assistance to members of the establishment, over which he exercised so beneficial a control, acts which were never heard of till after his retirement. His work and his example for good remain an invaluable heritage to his successors of to-day."

After the India Store Depôt, Courtney stayed on for a time in London; but he had made up his mind that he wished to live in

Dublin, where he had landed property, and which used to be his home. Consequently he bought a house at Mill Town, in the environs of Dublin, where he set himself to do all the good he could in connection with anything that wanted helping. Though he specially devoted himself to hospitals, he became Treasurer of the "Veterans' Club," for the benefit of old soldiers, and he was a member and one of the Hon. Treasurers of the City of Dublin Unionist Registration Association. At his death some 15 of these societies passed resolutions of condolence with his family and of appreciation of his services.

A quotation from *The Church of Ireland Gazette*, of December 3rd, 1909, may be given as summing up Courtney's qualities:—"The death of Major Courtney removes from our midst a man whose personal charities were splendid and secret. His soldierly nature made him incapable of self-advertisement, while he gave freely of his means, his time, and his sympathy to innumerable public charities, and contributed with noble generosity to the funds of the Church of Ireland. The loss of one who was in every sense a high type of Christian gentleman, marked by an unfailing courtesy, kindness, and devotion to duty, is greater than can be readily estimated."

On these works he was employed to within a week of his death, which took place suddenly on 28th November, 1909, from heart failure.

One of his sons still carries on the name in the Corps.

J.F.L.

MAJOR ALAN EDWARD GERRARD WATHERSTON, C.M.G., R.E.

ALAN WATHERSTON was born in London on the 29th October, 1867: educated at Clifton and the Royal Military Academy, Woolwich, and received a commission in the Royal Engineers on the 16th February, 1887.

After the usual two years at Chatham he went to Hong Kong where he was employed on Corps duties until his return to England in 1891. He then went to Aldershot, following this by service in Cairo until he came home to take up the appointment of Instructor in Survey at the School of Military Engineering in 1895.

In 1898 he went to East Africa as Assistant Commissioner of the Anglo-Portuguese Boundary Commission. Two years later he was appointed Chief British Commissioner for the delimitation of the boundary between the French Colony of the Ivory Coast and the British Colony of the Gold Coast. In the following year he was made Director of Surveys of the Gold Coast and Ashanti, and early in 1905 received the important appointment of Chief Commissioner of the Northern Territories of the Gold Coast.

The first eleven years of Alan Watherston's service were much like those of other officers of the Corps. Then, with his appointment as Assistant Commissioner on the Anglo-Portuguese Boundary Commission in East Africa, came his opportunity, and he grasped it with both hands. He threw himself heart and soul into the work, and, what with his technical skill as a surveyor, his organizing powers and his energy, his social qualities—no mean asset in an International Boundary Commission,—and his ready tact and judgment, the value of his work was such that he was appointed Chief British Commissioner in 1900 on the Franco-British Boundary between the Ivory and Gold Coasts.

About this time the question of land leases for gold-mining purposes in the Gold Coast and Ashanti had risen to great importance. For many years prospectors had been at work and European companies had been acquiring properties from the local chiefs. But no reliable survey of the country existed, and when Major Sir Matthew Nathan, R.E., took over the Governorship of the Gold Coast, an extraordinary state of confusion prevailed. Not only were Government officials and mining companies calling urgently for a map to show the position

of the various gold mines, but such concessions as had been demarcated had been very badly surveyed: boundaries overlapped on all sides, and litigation crowded the law courts. Previous administrators had feared the expense of a general survey: not so Sir Matthew Nathan. Acting with his customary promptness he at once initiated a Survey Department by obtaining for Watherston the appointment of Director of Surveys, leaving the whole system for him to organize and start.

The task was a greater one than it may appear, for, besides the difficulties of a scientific survey of great accuracy in a country of the nature of the Gold Coast, there was the financial and business side of the work. The country is one of dense forest, extensive stagnant swamp, and intolerable damp heat, with one of the most enervating and unhealthy climates in the world. Triangulation was found to be impossible, a new system of survey had to be created, and a staff adapted to both cadastral and topographical work formed. Watherston naturally turned to the Corps for officers and men, but sufficient to form the whole staff could not be spared, and a large number of Australian and New Zealand surveyors had to be obtained by cablegram.

It may safely be said that from the time he started operations in July, 1901, until he left the department at the beginning of 1905, Watherston did not rest for a single day. Besides carrying on the Survey Department, he also continued his arduous work on the International Boundary, for the successful conclusion of which he was created a Companion of the Order of St. Michael and St. George in 1903. No man ever better earned the distinction, for the boundary work included such varied factors as survey, diplomacy, and fighting.

Eight months in the year were spent on the Coast, but the remainder were also full of work for Watherston. The voyages were occupied in compiling returns, making plans for future work, ordering stores, and organizing generally for the next year's expedition. The day after landing, an office was opened in London and draughtsmen set to work on maps and plans while Watherston conducted a series of interviews with directors and secretaries of mining companies, and attended to a great mass of correspondence.

It was only a man of Alan Watherston's energy, common sense, and great business capacity who could have carried through such strenuous work in the successful manner he did. He was not possessed of the best of health—the climate was telling on him. Many a time did he turn in at night with an attack of fever with his temperature up to 104, and arrive smiling at his desk at 7 o'clock the next morning. His indomitable will pulled him through the day until the evening often brought another attack.

Besides his qualities as a worker, Watherston possessed many others that brought him the affection and loyal support of his staff.

His social disposition, his cheery infectious laugh, his ready advice and help, and his sporting inclinations, gained him a host of friends and made him welcome everywhere, especially in the deadly depressing climate in which he spent so many years.

In April, 1905, he was made Chief Commissioner of the Northern Territories of the Gold Coast, a Colonial Office appointment which foreshadowed future distinctions. Again he threw himself heart and soul into his work, and his manner of governing this great block of country proved that he was an ideal Chief Commissioner. He had a big task in front of him—that of altering the government from a military to a civil basis. This he successfully accomplished, and then began developing the natural resources of the country. But he had already suffered several times from "blackwater fever," and it was only his characteristic pluck that enabled him to go on with his work.

On his return home in 1908, Alan Watherston was married, and the large gathering of old friends and brother officers who were present little thought that it was the last time many of them would see him. He returned to the Northern Territories at the end of the year and took up again the reins of government.

The climate, however, would no longer be denied, and he, no more than others, could escape the penalty of long residence in a remote and unhealthy region. To the grief of all who knew him, Alan Watherston died of fever at Tamale, his seat of government, on the 12th December, 1909.

He died, I think, as he would have wished to die—in harness.

F.G.G.

TRANSCRIPTS.

RECONNAISSANCE AND SKETCHING.

By MAJOR A. H. D. RIACH, R.E.

Transcribed with the kind permission of the R.U.S.I. of India from a lecture delivered at Ahmadnagar on 28th June, 1905.

"*A commander without information is like a man blindfolded; he knows neither where to strike, nor from what quarter to expect attack.*"

"*The acquisition of accurate information is one of the most difficult tasks of a commander in the field.*"

"*Unless he can pierce the* fog *that surrounds his adversary, he will be unable to devise a scheme either to compass that adversary's overthrow, or to ensure his own safety.*"

"*Reconnaissance is usually understood to mean the acquisition of information about an enemy, or about a country, by personal observation.*"

"*It is by means of reconnaissance chiefly that a commander endeavours to ascertain the numbers, disposition and movements of his enemy, and to obtain such detailed information about the theatre of operations as may be necessary to supplement the maps at his disposal.*"

The foregoing are extracted from "Art of Reconnaissance" by Colonel Henderson.

Now information about ground can be best conveyed, and in many cases only conveyed, by means of sketches, and the inability on the part of a scout, or the officer commanding a patrol, to produce an intelligible sketch, may prevent some most valuable information gained by him from being understood and made use of by the commander. No skill in word painting can make up for ignorance in this most useful branch of military training. It is therefore the duty of every soldier who can read and write and understand a map, to pick up the rudiments of this art.

This does not mean that everyone should be able to produce an accurate and neatly executed map or a picturesque sketch. To again quote:—

"Mapping which is frankly inaccurate, and pretends only to give, in reasonable proportion the main features of a district, can nearly always be carried out, and is often of great value. Maps drawn roughly by eye with perhaps a few compass bearings as guides, or maps sketched in from memory, after the ground has been crossed and observed, may, and often do, present exactly the information which is required."

To prepare such a sketch is within the capacity of anyone who has read the elements of field sketching. It is merely a matter of practice, of eye, of appreciating the features of the ground it is necessary to put

on to paper, and of hand, in being able to draw a reasonably firm line. *Anyone* can learn to do it, but it is harder for the man who has not inherited the knack of using his pencil. My object is to show what may be done by an inferior draftsman, and the great utility, in certain circumstances, of even a poorly executed plan or panorama.

To have had a sound training in field sketching is a great help, but the means employed to produce a sketch which will win a star in "C" can seldom be fully made use of in the face of the enemy. Pacing, contouring, taking slopes with the clinometer and filling in detail in a triangulation made with the plane table or compass, are generally out of the question. These are the methods by which one learns, and they bear the same relation to the reconnaissance of an enemy's position, as the exercises learnt in the barrack square do to the attack on that position. Just as, without the preliminary drill which has taught us to march and turn to close and extend as matters of *habit*, the best of material will be of little use in the rush and excitement of attack, so in the same way without the habit of seeing, noting, measuring and putting on paper, slopes, angles, and features of ground, the best artist in the world will often fail to produce a reconnaissance sketch which will be of value to the commander of an attacking force.

What is required in reconnaissance is, first, to note the things which will be of use, and, secondly, to make the facts learnt available. If to do this requires that a sketch be prepared (and this will usually be the case in an attack), then that sketch should embody just what is wanted, and no more.

It should be the best possible "fudge" which can be made in the time available; and the time available is, generally, the shortest possible time.

Now to execute a "fudge" one naturally makes use of any means at hand to help. Such means, in the case in point, usually exist in the form of maps of some sort. The task then is often to verify and add to the details on the map, so as to give the commander definite knowledge as to the accessibility of his objective, and the routes available.

If you have a map, use it fully, if not do the best you can to supply the want.

The most usual maps available are small scale ones, and to add the essential detail they have to be enlarged.

I have dismal recollections of the topographical sketches one had to execute as a cadet, pacing solemnly along a road, marking the direction of every fence, the size and exact position of the pigsty (with a note "pigs invisible, probably two or more"), and other details of equal value. A rate of progression of a mile an hour was good, and if after a hard morning's work one had gone round the sides of a square mile of country, one had done well, even though prominent features of tactical importance lying close to the route had been put in in a most shadowy manner, because time had not sufficed to take accurate shots at them in the way laid down in the textbooks.

The futility of much of this work, and the false ideal it set up, has at last been recognized—*vide* "General remarks" in *The Manual of Map Reading and Field Sketching*.

2. "A military map or field sketch should show all the features of, or in, a country, natural and artificial, which are of importance from a military point of view, *i.e.*, those which might affect the dispositions, movements, security, or supply of troops. A military *map* is the proper work of a trained *surveyor*, using special instruments and elaborate methods, with unlimited time at his disposal, and aiming at minute accuracy. A field *sketch* is a sketch of ground such as any officer or non-commissioned officer, of average attainments, ought to be able to make, working with such instruments and under such conditions regarding time, weather, etc., as generally exist in the field. Therefore, while every effort should be made to be as accurate as time and the means available will permit, that minute accuracy which is required by the *surveyor* in the production of his map is not expected, and should not be attempted."

For field sketching, as opposed to mapping or surveying, rapidity is essential, and with it intelligibility, clearness and simplicity; accuracy is a minor consideration. It is all a matter of judgment plus previous training.

As I have said, a sketch should be the best "fudge" that can be made under the circumstances. I qualify this by adding that it must never be a "*fake*."

Everything on the sketch should exist, and if some important detail has been sketched in approximately by eye, a note to that effect should be added.

Instruments are of assistance only so far as they will help to produce the result aimed at. A ruled line is unnecessary when you can draw a sufficiently straight one freehand. A measured angle is needed only when you require the point observed as a "Ruling point" to form the framework on which you have to build up your sketch. In short, use your instruments as you should use an orderly and don't *make* work for them.

To return to our examples and the means of producing a reasonably correct sketch in limited time, under possible fire, and with but little in the way of appliances:—

Sketch 1 explains itself (see *Plate*). It was produced from the pocket handkerchief map and is an enlargement made on squared paper, such as one has in the Service note book, Army Book 153.*

What we need are—board or card to sketch on, paper, pencil, knife, rubber, compass, straightedge, and perhaps chalks.

The framework should be built up in the following order:—Roads and ruling points such as hills, villages, water courses, and lastly form lines.

Using squared paper enlargements, sketches can be done in sections and joined together.

Sketch 2 is the finished product, not very highly polished but something like what could be done under the conditions. The route followed is shown, and practically every line on the sketch (except a few tracks) can be seen from this route. It lies for a great part out of sight of the enemy and is almost entirely out of rifle range.

* *Note.*—The "Memo" on the title page of this book and the note on p. 66, *The Manual of Map Reading, etc.*, as to the size of these squares are both incorrect.

Note differences between 1 and 2 such as correction of position of Shahpur village, addition of East Ridge Barracks, etc., and extra form lines.

On reaching A, Sketch 3 was roughed in, and finished up after return.

It is popularly considered that to draw a landscape sketch is beyond the capacity of anyone, not an artist, without long and wearisome training. *This is not so.*

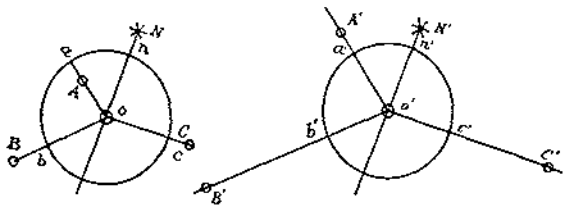
Many books give useful hints as to how to proceed. The frame, recommended in *The Active Service Pocket Book*, is likely to be an assistance to the learner. *The Manual of Map Reading, etc.*, devotes a chapter to the subject, and gives examples, but they rather frighten the beginner by their excellence. Read the instructions and try for yourself.

Personally, I recommend the following procedure for a "stiff 'un" with the pencil:—

1. Decide what you want to draw, and from what point.
2. Decide length of panorama.
3. Select prominent distant points, such as hilltops, villages, etc., etc.
4. Estimate roughly (or measure) total angle included, and angles between each pair of prominent points.
5. Using squared paper, select on it the number of squares you wish to represent the above angles, and tick them off. (In Sketch 3 one large square of 1" represents 10°, and the sketch includes about 80°. Taking the nek as the centre, the tomb is 10° left, and One Tree Hill 5° right. Peak B is 14° left of tomb, peak C 15° left of B).
6. Next decide maximum height of sketch, angularly, from highest peak to nearest point of foreground it is intended to show, and also vertical angles of one point above another, and tick these off on the squared paper.
7. In this way, starting with sky line, or else the most prominent line you wish to depict, jot in the lesser features in their proper positions, and, so far as you can, at the proper size.
8. Unless the foreground is of tactical interest (it seldom is?), *leave it out.* Also shading, unless you mean something by it and are able to do it fairly well. Show forests and trees, ridges and spurs, lines of roads, etc., as well as you can.
9. Label the prominent important points, and, if you can, take or estimate ranges to them, and note on sketch.
10. Don't exaggerate hills too much, but clearly show all important villages, knolls, etc., even if not really very conspicuous. Show courses of nullahs as far as possible, by labels.
11. Fake in nothing.
12. If you have a plan, the panorama should be referred to it, *and the point whence taken marked on it.* If not, give a rough plan diagram to show where you sat, and put a north point.

If you have no squared paper, or your map itself is not marked off in squares, then, instead of drawing them, a more rapid method of making an enlargement, or a copy, is as follows:—Suppose the enlargement is from 1" to 1 mile to 2" to 1 mile, then on the plan describe a circle somewhere in the middle of the piece to be enlarged, and from its centre

O draw rays to the prominent points, as A, B, C, and another ray to mark the direction of the north point N.



These rays cut the circle at *a*, *b*, *c* and *n* respectively. On the blank paper describe a similar circle and draw the north point N', cutting the circle at *n'*. Measure *na* and lay off *n'a'* on the other circle. Similarly make *a'b'* and *b'c'* equal to *ab* and *bc* respectively.

Draw rays through *a' b'* and *c'* from centre O'. Set off O'A' along O'*a'* and make it equal to twice OA. Similarly make O'B' and O'C' equal to twice OB and OC respectively.

The points A' B' C' will then be plotted correctly on the enlargement, and the intermediate detail can be filled in by eye, as when using squared paper.

This takes a lot of description, but in practice it can be done very quickly, and is simple and accurate. If no compasses are available, draw the circles by making two holes in a card. Put a pin in one as the centre and describe the circles with a pencil point in the other hole. Use the edge of the card to measure and lay off the necessary lengths.

The best time to see a landscape is when the sun is shining across it, and is not directly behind your object or yourself.

Like the plan, the preliminary work of the landscape sketch may be done beforehand. The drawing of panorama sketches from the map alone, as now taught, must bear the same relation to a sketch drawn on the ground, as Plan 1 does to Plan 2.

The measuring of angles has been referred to, but to do this with a compass may take too long, except for the preliminary skeleton of the plan. Now, if the distance to the eye from an object held in the fingers with the arm extended is $28\frac{1}{2}$, (as is the case with many people), then a ruler graduated in inches will cover 2° per inch, if so held out, and viewed with one eye. A four-fold, 1' rule is easily carried, and can conveniently be used in this way. Opened to 6" it will subtend 12°; to 12", 24°; angles, vertical and horizontal, can thus be quickly estimated. Each individual should test this for himself, and see what correction is necessary.

The span of the open hand, with arm extended, covers from 16° to 19°, the palm 6° or 7°, one finger 1° to 2°, and so on. These should be tried and learnt.

The angle viewed without moving the eyes is roughly 60°.

As regards scale for plans 2" to 1 mile is convenient for open, and 3" to 4" per mile for close country is useful.

Note north point always. Finishing up in ink is often better than pencil. Printing, as on Sketches 1 and 2 with long-tailed letters is recommended, as it is easier to make this look straight and even:—

AHMEDNAGAR

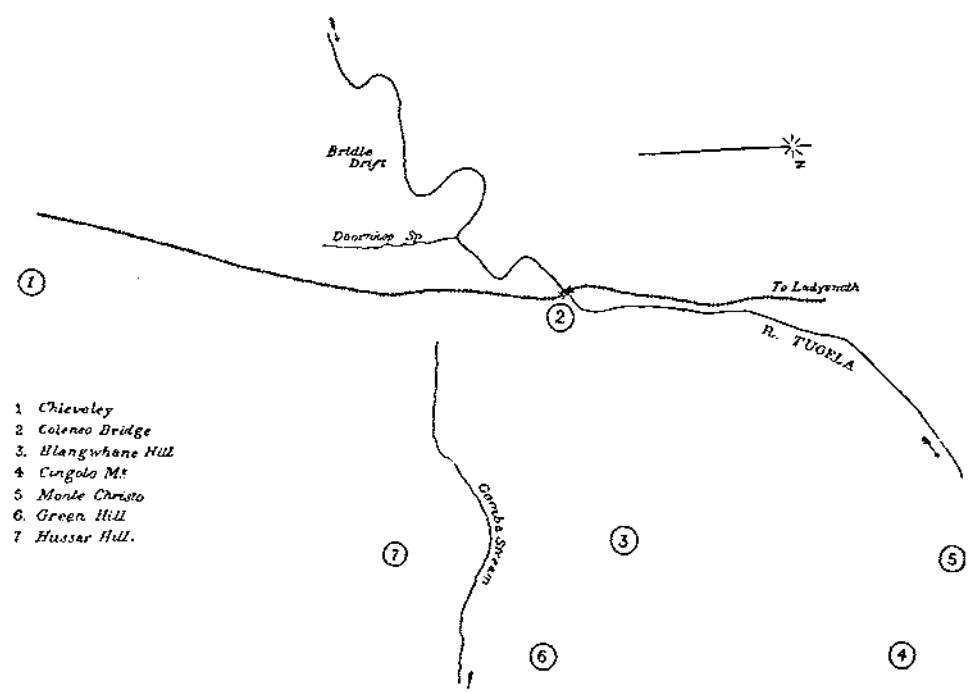
If you have no instruments, make an eye sketch; if no map then try and get some framework and a base to work on. Pace, use milestones or telegraph posts, or take range with range-finder.

A plan sketch made from one point with a range-finder and a compass, with intermediate detail filled in by eye, may be exceedingly useful.

Is the advantage to be gained ever worth the trouble, on active service? Will not a simple freehand diagram be sufficient and easier to understand?

I reply with a question: "If you were called on to attack the position delineated in Sketches 2 and 3, not having seen the ground, what course of action would appear to you likely to be suitable?" The obvious answer is "hold the enemy in front, and turn his left flank."

Now as no battle is known to have been fought over this ground, and as an ounce of practice is worth pounds of theory, let us take examples from history. Our sketches serve very well to illustrate a piece of ground which was much in our minds a few years ago. The numbers in the following extracts refer to the numbers in circles and letters on Sketch 2, as can be realised by reference to the following Skeleton Key. The Difference of North Point however should be noted.



Extract from orders by Lieut.-General Sir Francis Clery, K.C.B., Commanding South Natal Field Force :—

CHIEVELEY,
14th December, 1899, 10 *p.m.*

1. The enemy is entrenched in the Kopjes north of Colenso Bridge. One large camp is reported to be near the Ladysmith Road about 5 miles N.W. of Colenso. Another large camp is reported in the hills which lie north of the Tugela, in a northerly direction from Hlangwhane Hill.

2. It is the intention of the G.O.C. to force the passage of the Tugela to-morrow.

3. The 5th Brigade will move from its present camping ground at 4.30 a.m. and march towards the Bridle Drift, immediately west of the junction of Doornkop Spruit and the Tugela. The Brigade will cross at this point, and after crossing move along the left bank of the river towards the Kopjes north of the Iron Bridge.

* * * * *

General Hart, Commanding the 5th Brigade, had been provided with a tracing of a map, a Kaffir guide, and an interpreter to assist him to find the "Bridle Drift."

The map was a plane table sketch prepared shortly before the action, an attempt to fill into a farm survey, made for land registration, as many of the topographical features as could be seen from a distance. It had not been verified by close reconnaissance of the river and both the sketch and the orders were misleading. The sketch was defective in three particulars; it showed the Spruit as running into the Tugela at the west bend of the loop, the Bridle Drift close to the junction of the Spruit, and also another loop of the river, west of the drift.*

Hart's Brigade of Irishmen were led straight into the loop, fought their way up it with loss; found no drift, (though it afterwards transpired that there were two available) and after some hours were recalled and fell back, growling and unbeaten, ready to go for the enemy again if they could.

The attack on the Iron Bridge was mown down, Long's guns, unable to get fresh supplies of ammunition, were finally abandoned, the attack round to the right was recalled, and the Battle of Colenso was lost.

Does this not show the usefulness of efficient reconnaissance sketches? It may be said the disaster was entirely due to the lack of such. We are told that Sir Redvers Buller was for some time under the impression that the Tugela ran to the south of Hlangwhane (*i.e.*, along the line of the Gomba Stream), and that this misunderstanding modified his whole course of action.

It is as though the officer who filled in Sketch 2 had failed to push forward as far as the route shown on the plan, and knowing a deep river flowed across his front, had shown it quite incorrectly at F, and also as following the line of the nullah from Shahpur, past Sarpola Hadi.

* "Official History of the War in S. Africa, 1899-1902," Vol. I.

The utility of the panorama sketch was again well illustrated by a sketch executed by two R.A. officers, with a range-finder which showed the true position of Hlangwhane, relatively to the river.

After Colenso, which was fought on 15th December, 1899, came the Acton Homes, Spionkop, Vaal Krantz Campaign, and it was not till the middle of February, 1900, that Buller decided to try *viâ* Hlangwhane.

Here again he was hampered, and lost time, for want of proper reconnaissance sketches. The official history, referring to their series of actions,* says that Sir Redvers Buller either gave verbal instructions to his generals, or supplemented written orders by oral explanation. This was on account of the difficulty of describing in writing the features of this hilly country. It had been surveyed, but solely with a view to settling the boundaries of farms, and the map hurriedly compiled from these farm surveys often misrepresented or wholly ignored the military features of the ground. Great efforts had been made to correct the defects, but the only information obtainable was not that of soldiers trained to study country from a professional standpoint. The map, though far better than none at all, was frequently very misleading.

The difficulty was increased by the absence of landmarks, by which the ground could be described.

Moving from Chieveley (1), *viâ* Gun Hill, Buller re-occupied Hussar Hill (7). Thence he reconnoitred Green Hill (6) and in succession captured this hill, Cingolo Mountain (4), Monte Christo (5) and Hlangwhane (3). Pushing on to Naval Hill he bridged the river and fought his way to Ladysmith.

One more remark :— It is often our duty to check the survey maps of large tracts of country, and this is a task imposed with the definite object of ensuring that these maps will not play a commander false, as Buller's maps did. Bearing this object in mind, and regarding the work as an exercise in reading ground, as a soldier is required to do, tactically and strategically, the irksomeness will be at least decreased. If in addition we look on the result of our labour as a record, the falsity or inaccuracy of which may lead to loss or disaster in actual warfare (it is conceivable that officers were employed in peace time verifying plans of Natal),† we shall then be willing to put our best into the performance and carry it out with interest.

* Vol. II., p. 435.
† [They were not.—Ed.].

REFORMS IN THE RUSSIAN ARMY SINCE THE WAR IN MANCHURIA, WITH A NOTE ON THE NEW RUSSIAN FIELD FORTIFICATION MANUAL.

(Adapted from the *Revue Militaire des Armées Étrangères* and the *Kriegstechnische Zeitschrift* by 2nd Lieut. A. H. SCOTT, R.E.).

IT was not till soon after the Russo-Japanese War that the Russian Army assumed a really national character, thanks to the law of the 20th March, 1906, which reduced the time of active service to three or four years. This law allows of men being passed more rapidly through the active army, and of more men being trained than formerly. Moreover, the peace establishment of the army has been increased from 320,000 to 456,000, and in a few years Russia will have at her disposal from five to six million trained men.

Not only have the methods of recruiting the army, but also its organization, administration, and system of training been changed. The cost of these reforms was estimated by Count Witte, in a speech made by him to the Council of the Empire, at 200 million roubles.

The details of the changes which have been made up to September, 1909, are as follows:—

(1). *Organization of the Higher Commands and of the General Staff.*—The principle of placing all important billets of the army in the hands of members of the Royal Family had—previous to 1906—caused the absolute necessity of unity of thought and action between the higher commanders and the War Office to be completely forgotten. Thus the "Council of National Defence" and the artillery and engineer inspections were under the direction of royal Grand Dukes, and, to all intents and purposes, independent of the War Minister and his department. In 1905 the Inspector-General of Infantry was instituted, and placed under the direct control of the War Office, and in 1908 the artillery and engineer inspections also came under his control. Since then the two latter inspections have been subdivided, the troops and technical services having been placed under different commanders in each case; all are however under the War Minister. The "Council of National Defence" has been abolished. This abolition is only temporary; it will soon reappear under a different organization. In 1905 the General Staff was likewise serving two masters—the Chief of the General Staff and the War Minister; but since 1908 this state of affairs has ceased to exist.

(2). *Officers.*—After the war public opinion largely exaggerated the share of the defeat due to the corps of officers as a whole. Their consequent unpopularity, the poor pay they received, the somewhat

irregular rules of promotion, the privileges granted to officers holding administrative billets, to those on the General Staff, and to those in the Guards in the matter of rapid promotion, all combined to make a military career unpopular. In 1906 matters came to a head, the deficit in officers having got as high as 18 per cent., and steps were taken to remedy this state of affairs.

The system of promotion in the Russian Army is one of certificates, which are sent up by officers to a committee, the composition of which varies with the rank of the officer to be promoted. The advantages which used to be conferred by the passing of divers courses, have now been abolished. Few officers are promoted out of their turn, and seniority lists have been drawn up for each army corps in the case of the infantry, and on the whole arm in the case of the other branches.

The pay of officers has been slightly increased, field training allowances have been instituted, and more garrisons than formerly now confer on the officers stationed in them the right of drawing lodging allowance. In addition to this an increased rate of pensions has been in force since the 1st January, 1909, and the restrictions to officers' marriages formerly existing have been almost entirely done away with. Now the bride-elect has only to meet with the approval of a court of honour, composed of the officers of her future husband's regiment, or, in case of appeal, with his commanding officer's approval. No officer is however allowed to marry before the age of 23.

The number of schools of "Younkers" has been reduced from 13 to 9. These schools correspond to the French establishments of St. Maxient and Versailles, *i.e.*, they train intelligent N.C.O.'s for the commissioned ranks. The number of "Military colleges" has, on the other hand, been increased from 6 to 10. These schools correspond to our R.M.A. and R.M.C.

A manual on the duties of officers has been published, and lays down the duties of all ranks, the chain of command, and the degree of initiative expected of subordinate officers. It attaches special importance to the practice of war games in winter and of field exercises in summer. It further indicates the duties of staff officers in these exercises.

In order to prepare officers for the command of a fire-unit in the field, all Second-captains who are due to command an infantry company, are obliged to go through a course of musketry and field firing. Commanders of companies have to go through a similar course at the School of Musketry before attaining the rank of battalion-commander.

Similar courses exist for the artillery.

(3). *Mobilization.*—The mobilization scheme in force in 1903 dated from 1891. A new scheme was devised in 1907, but having proved unsatisfactory, the old one has been reverted to. Improvements can, however, be shortly expected.

The organization of the depôt battalions, which proved so unsatisfactory in 1903, has been revised. These battalions are now allotted definite regiments, which they have to supply with recruits, and they are also brigaded, one brigade to each army corps.

(4). *Training*.—The "Training Committee" have decided, after much deliberation, to issue only one manual, which will be divided into five parts, viz.:—General Rules; Infantry; Cavalry; Artillery; and Engineers. "General Rules" will include the manual on the duties of officers, which has already been referred to above, and also different circulars on the development of the spirit of initiative which have been issued from time to time. The Cavalry and Artillery Regulations have not as yet been published; the first part of *Regulations for the Special Training of Engineer Units* is gone into in detail in the appendix.

As regards the infantry, the books issued so far are *Infantry Training*, 1908, *Musketry Regulations*, 1909, and the *Fieldworks Manual of the Infantry*. A handbook entitled *Instructions for Battle*—which was to complete infantry training, give details on the formations to be adopted on active service, and also on the adaptation of the fundamental principles to suit different occasions—has, however, not been published as yet. All these new regulations insist on the importance of impressing on every soldier that he must use his common sense on all occasions, and, where necessary, take the initiative.

Two subjects, to the importance of which the war has drawn particular attention, are field fortification and signalling. Two systems of signals are used, the one alphabetical, and the other one of abbreviations. The latter must be known to everybody except recruits; the former is only learnt by officers, N.C.O. scouts, and eight other men per unit. The last manœuvres have shown the practical value of these systems and the high standard of efficiency of the Russian Army in this means of communication.

Special attention is devoted to the physical training of both officers and men, and in most regiments the methods of the "sokols" of Bohemia are employed, in addition to the obligatory Swedish gymnastics. Since 1909 a high school of gymnastics has been formed, which trains 100 officers per annum in both gymnastics and fencing.

(5). *Arms and Matériel*.—The Russian rifle of 1891, calibre 7·62 m.m., was used in Manchuria, and gave rise to no complaints.

The 1902 field gun has all the modern improvements. Long recoil and a shield and panoramic sights will soon be added. It is curious to note that, even after the lessons they received at the Yalu and at Wafangu, the Russian artillery is by no means anxious to have shielded guns. This gun has been introduced since the war, during which the 1900 model was employed. The 1907 field howitzers are quite up to date, but nevertheless both they and the mountain artillery equipment are to be replaced by quicker firing guns.

All infantry regiments possess a machine-gun section of four Maxims, which are either carried on pack animals or have a carriage. Each cavalry regiment is equipped with two Mardson machine guns. The number of tools carried by the infantry has been increased since the war; a company now carries 140 shovels, 30 picks, and 30 axes.

A matter of technical organization, in which the Russian Army is really in advance of most other armies, is the organization of communications in the field. The various army corps are united by means of the telegraph

troops; further communications are carried out by means of telephones—which are manipulated not by the engineers, but by the troops themselves, and which are centralized in each infantry division. Each division possesses 45 kilometres of line and one central station.

(6). *Clothing and Equipment.*—After a large number of experiments in 1908, a grey-green uniform has been adopted, and has proved to be quite invisible at the last manœuvres. This year a reversible coat, green one side and khaki on the other, has been tried.

(7). *Administration.*—Since 1908 the Ordnance Department has taken over the furnishing of linen, clothing, and footgear to the troops—articles which had previous to this date to be manufactured regimentally.

Such are, up to September, 1909, the reforms which have taken place in the Russian Army, as a direct result of the Manchurian Campaign. It is extremely probable that before long still more important changes will take place, viz., the redistribution of the troops all over the Empire, the reorganization of the system of defence on the eastern frontier, and a more modern mobilization scheme; but as yet no official indications of these changes have been given.

APPENDIX.

THE NEW RUSSIAN FIELD FORTIFICATION MANUAL (PART I.).

(Taken from the *Kriegstechnische Zeitschrift*).

This manual was issued in the summer of 1908, contains 204 plates, and is divided into seven chapters and ten appendices.

Chap. 1 gives details on the various types of fire trenches, communication trenches, and shelters for machine guns; enumerates the advantages and disadvantages of each type, and the kind of country it is suited to.

All types of machine guns in use are mentioned, and the cover they need, either if used as a battery or as single guns in infantry fire-trenches, is described, a special feature being the description of an emplacement for four guns placed in a free space in front of the general firing line.

Chap. 2 deals with the protection of artillery, the erection of observation posts for battery commanders, the cover for the ammunition wagons, the preparation of the means of approach to artillery positions, and tactical considerations affecting the choice of an artillery position are given.

It includes plates showing the type of emplacements required for all Russian guns—76-m.m. Q.F. of 1900 and 1902, 76-m.m. Q.F. mountain gun, 12·2 and 12-c.m. howitzers, and the 152-m.m. field mortar.

Chap. 3.—The fortification of points of support, *i.e.*, the building of redoubts, of posts of observation, the improvement of existing communications and overhead cover. The methods to be employed on commanding ground at the edge of a wood and in rocky or marshy ground are also gone into.

Chap. 4.—Sanitary and watering arrangements in a semi-permanent position.

Chap. 5.—The improvement of existing cover. Four examples are given, viz., the defence of a wood and of German, Russian, and Chinese villages.

Chap. 6.—Artificial obstacles—chiefly wire entanglements, land mines, fougasses, and inundations, which, according to the manual, will not often be used in field operations.

Chap. 7 deals very practically with the invisibility of all fieldworks, and recommends the use of "sham" gun positions.

The Appendices contain tables on the resistance of materials to penetration, extracts from the range tables of various guns, and other such data.

NOTICES OF MAGAZINES.

Electrical Review.

7th January.

Large Induction Coils.—Examples are given of a large induction coil which gives a 5½″ spark with a current of 25 ampères in the primary circuit. The secondary winding is made of different gauge wires, the heavier sections being used as the winding approaches the ends.

Physical Society's Exhibition.—Fool-proof galvanometer with suspended moving coil. Direct reading Wheatstone bridge. Resistances are arranged in dial form and there are no loose plugs. Dudell oscillograph and thermogalvanometer.

Fuel Supply Contracts on Heat Unit Basis.—Samples are taken during delivery, and payment is made not for tons received, but for the heat units according to a prearranged formula.

28th January.

Enamel Insulation for Wires.—This enamel is not melted by heat, and is said to stand temperatures of 300° F. to 400° F. for several hours without damage. It is not affected by weak acids and alkalis. Its insulation resistance is twice that of rubber. A great advantage is the great reduction in space compared with cotton or silk insulated wire.

A. E. Davidson.

Revue du Génie Militaire.

October, 1909.

The Flight of Birds.—The writer shows by mathematical calculations that a bird or aeroplane which flaps its wings, will remain in the air longer than one that merely glides. These calculations do not assume the existence of any valves in the wings. In the same way, a floating plank that has not sufficient buoyancy to support the weight of a man, will nevertheless support him if he dances upon it instead of standing still.—*To be continued.*

THE ORGANIZATION OF MINES IN A FORTRESS.—This article begins with a description of the Russian countermines at Port Arthur, taken from the *Eenzhenernee Zhoornal*. No work had been done before the commencement of the siege. If any system of countermines had been designed it was not available, as all the plans of Port Arthur were with Kuropatkin's field army. The Russian engineers were unwilling to commence any countermines, as they believed that the fate of the fortress would be decided before the galleries could be driven to any effective distance. Finally, when a beginning was made, the Japanese had driven their saps and mines too close up to the forts for the countermines to cause them any serious delay. At Kikwan North Fort the Russians began two countermine galleries. Through some miscalculation one of these came to the surface of the glacis a short distance from the crest. To remedy this a shaft about 14′ deep was sunk a little distance back, and another gallery was started. When it was estimated that the Japanese gallery had come within about a yard of the Russian gallery, the countermine was charged with 80 kilogrammes of powder and fired. The Japanese gallery was destroyed, but the explosion also laid bare the concrete roof of the counterscarp gallery. The Japanese at once established themselves in the crater, breached the counterscarp gallery, and drove the Russians out of it. The other countermine gallery at Kikwan North did not come sufficiently near the Japanese gallery to be used effectively. This countermine was charged and fired four times. On the first occasion it failed to damage the Japanese in any way. The second charge destroyed part of the counterscarp gallery wall, the third did considerable damage to the Japanese saps, but the fourth destroyed the counterscarp wall altogether. A certain amount of countermining was done at Hatchimaki, Ehrlong, and Long-shu-shan, but none of these mines were charged or fired.—*To be continued.*

J. E. E. CRASTER.

REVUE MILITAIRE DES ARMÉES ÉTRANGÈRES.

October, 1909.

LEGISLATION AND THE ITALIAN ARMY, FROM JANUARY, 1907, TO OCTOBER, 1909.—Since 1906 there have been, especially in the military periodicals, numerous articles in the Italian papers pointing out to the Italian public both the backward state of the army and the ever-increasing *matériel* and *personnel* which Austria was accumulating on the eastern frontier. It is undeniable that, at the end of 1907, the Italian Army was not in possession of Q.F. field guns with which most other European armies were at that period equipped, that the system of fortifications on the N.E. frontier was quite insufficient, and, in many places, left the country at the mercy of an Austrian invader, and that there was at that time a species of "moral crisis" taking place in the army. As a result, the

complaints of officers, and especially of N.C.O.'s, were listened to less absent-mindedly than hitherto, both in political circles and by the press. In February, 1906, an article by General Biancardi, "Our Artillery-less Army," caused a lively discussion in the press on the state of the army. In February, 1907, the War Minister announced in Parliament that he had been for some time in private treaty with the Krupp firm, and had given them an order for 39 complete batteries of 75 m.m., and for 68 batteries to be completed in Italy. This announcement was received somewhat coldly by Parliament, who objected to the contract having been made without any reference to it, and finally a Commission was appointed to enquire into the following points:—(1), To decide if the existing military organization was sufficient for the requirements of the country, and duly proportional to its economic resources; (2), to settle if this organization yielded a maximum result with a minimum effort; (3), to find if Italy could concentrate on her frontiers as many troops as possible in a minimum time; (4), to see if the frontiers were sufficiently protected; (5), to look into the question of armaments, especially the question of artillery *matériel*, both for the coast and fortress artillery, as well as for the field artillery, and to enquire whether an increase of power could be attained by that arm were it provided with newer weapons; (6), to see if the auxiliary services were well organized; and (7), to discover if any savings could be effected without hurting the value of the military organization.

The Commission was composed of:—Six senators, including a former War Minister; six Members of Parliament, including the Vice-President of the Lower House and three former Ministers or Under-Secretaries of State; and five State Councillors, including Admiral Bettolo, Chief of the Naval General Staff, and M. di Broglio, President of the Audit Chamber.

The Commission decided to examine matters on the spot as far as possible, and subdivided itself into several sub-commissions, each of which had a definite portion of territory allotted to it.

With regard to the artillery, the Commission was present at the practice ground of Cirié, near Turin, at a series of trials of the new Krupp gun (selected by the War Minister), of a Creusot gun, and also of an Erhardt gun.

The Commission made the result of its enquiries public by means of reports.

The first report, published in May, 1908, dealt with:—The defence of the frontiers. The Commission considered this insufficient, and asked for 140 million francs for the reorganization of land defences, and 50 million for that of coast defences. It also recommended that the garrisons of the infantry regiments on the northern frontier, and in ports, should always be the same. Finally, it agreed to the increase in pay of officers, and to their promotion by the time system; it approved of divers ameliorations that had recently been made in the conditions of service of N.C.O.'s, and it demanded an improvement in the food of the troops.

The second report, published in June, 1908, dealt with the artillery question. The Commission pronounced itself in favour of the Krupp

guns, but commented on the divers transactions that had taken place between that firm and the War Office from 1899 to 1906, declaring that they had led to the adoption of an insufficiently studied equipment, the cost of which was too great for Italy.

The third report, published in December, 1908, dealt with the organization of the army generally, and asked for the simplification of the administration.

A series of less important reports appeared in May, 1909, dealing with:—(1), The recruiting of the army; (2), the length of service; (3), the reorganization of the administrative branches; (4), the question of remounts; (5), the question of clothing; (6), the reorganization of the veterinary department; (7), certain modifications necessary in the disciplinary regulations; (8), the abolition of the "military dowry," which every officer has hitherto had to have before he was granted leave to marry.

The powers of the Commission ended legally in June, 1909, but, on the recommendation of the President of the Council and of the War Minister, they were extended for one year, *i.e.*, till June, 1910. The decisions of the Commission have been made law, from time to time, by the various War Ministers who have been in power since it first sat. Before studying in detail the improvements which have taken place in the Italian Army as a result of its enquiries, however, it is necessary to examine the variations in the Army Estimates between the years 1907 and 1909.

The Italian Army Estimates are divided in two parts—the "ordinary estimates," for the foreseen expenses of the army during the ensuing year, and the "extraordinary estimates," to meet unexpected demands for money during the year.

The following are the "ordinary estimates" for the years 1907—1911:—1907—1908, 270 million francs; 1908—1909, 285 million francs; 1910—1911, 296 million francs.

The "extraordinary estimates" between the years 1906 and 1917 have been voted at 465 million francs, of which 150 million are to be devoted to the re-arming of the field artillery, and 200 million to the reorganization and construction of permanent works.

Modifications in the Organization of the Army.—(1). Alpine Troops.—Three new companies have been created. There are now 78 companies, organized in 8 regiments (26 battalions), instead of 75 companies, organized in 7 regiments (22 battalions).

2. Cavalry.—The twenty-four 6-squadron regiments have been reorganized into twenty-nine 5-squadron regiments; this allows an increase to be made in the independent cavalry (4 divisions of 2 brigades each). The squadrons of the cavalry division are 150 strong; those attached to army corps, 110.

(3). Mountain Artillery.—Nine new batteries have been added to the 15 already in existence. A second mountain artillery regiment has been organized, and when the new 65-m.m. equipment has been distributed to all the units, they will probably be reorganized into 4-gun batteries, instead of 6, as at present.

Improvements Made in the Condition of Officers.—The main causes of

complaint at the beginning of 1907 were:—(1), The "block" in promotion; (2), the fact that the pay of officers was too small to face the ever-increasing cost of living in Italy. In July, 1909, a law was passed that all lieutenants were to become captains after 15 years' service, even if there were no vacancies; the surplus of captains to be compensated by vacancies in the junior ranks. Supernumerary captains of the three arms and of engineers, who desire to do so, can be placed on half-pay (*aspettativa speciale*), and receive three-fifths of their pay, until there are vacancies for them. An article in the *Esercito Militare* of the 14th July, 1909, states that this law will only be of a temporary nature, as by 1915 promotion will be normal once more, and the rank of captain attainable in 12 or 13 years.

As regards pay, it has been considerably improved since 1904, and varies from 2,000 frs. per annum for a 2nd lieutenant to 8,000 frs. per annum for a colonel.

Improvements made in the Conditions of Service of N.C.O.'s.—The following are the ranks and daily pay of N.C.O.'s:—Sergeant, 2 fr. 10; sergeant-major, 2 fr. 50; warrant officer, 3rd class, 3 frs.; warrant officer, 2nd class, 3 fr. 50; warrant officer, 1st class, 4 frs. For every additional 5 years' service up to 15 years a N.C.O. gets an increase of 30 centimes per diem.

A sergeant-major of 12 years' service has the right, on retiring, to a billet in the railways or in some administrative department of the State. A warrant officer of 30 years' service can occupy a post in the "sedentary services" up to a total of 40 years' service. Every N.C.O. is entitled to a pension after 20 years' service, and at the age of 42.

Changes Affecting the Conditions of Service of Corporals and Soldiers.—These are:—(1), The voting in 1908—1909 of 3 million francs to improve regimental schools, libraries, and recreation rooms; (2), a vote of 1 million francs to improve the soldier's food; (3), the adoption in 1909 of a grey-green uniform by the infantry, alpine troops, bersaglieri, and engineers; (4), an increase in the travelling allowances of corporals and men; (5), new disciplinary regulations; (6), a new law, making it easier for corporals who wish to continue in the army and attain the rank of N.C.O. to do so.

Reorganization of the Artillery.—The Commission had to report which field gun it considered the most suitable for adoption in the Italian Army, and selected the Krupp gun, several of which had already been ordered by the War Minister. In February, 1909, a fresh order was given to Krupp, amounting in all to 861 guns, of which 356 were to be delivered finished, and the remainder to be finished in Italy. Thus in two or three years' time Italy will possess some 1,500 guns of 75 m.m. As regards howitzers, Krupp have received an order to deliver twenty-nine 4-gun batteries of 149-m.m. howitzers.

110 Maxims (fifty-five 2-gun sections) have been instituted; more are to follow; experiments are being made with two Italian machine guns. The mountain artillery is to be re-armed with the 65-m.m. gun.

Fortifications.—200 million francs have been voted to reorganize the system of fortification on the N.E. frontier, and to re-arm those forts with

heavier guns. The main decisions of the Commission on this subject have however been kept secret. The purchase of about 100 armoured cupolæ for these forts (6" guns) is at present being studied.

Schools for the Training of N.C.O.'s in the Norwegian Army.—The selection and subsequent training of N.C.O.'s, even in a regular army, is by no means an easy matter, and in an army composed of Militia units the difficulty is much increased. The Norwegian military authorities seem to have found however an ideal solution to the question, for although their army is exclusively composed of men who come up for training for a few days only each year, the classes for those who aspire to become N.C.O.'s cover a period of three years. The State is saved the expense of having subsequently to provide billets for those who elect to go through these classes by the fact that, in all large business houses, old pupils are much appreciated and good berths kept open for them, owing to the excellent general and military education they receive at these schools.

For the infantry there are five "brigade schools," one per brigade. Each school is under a captain, and has 165 pupils. Candidates for admission must come from one of two sources. They must either be men of 18 who pass certain theoretical examinations and certain military exercises but have not yet been called up for service, or be soldiers who have satisfied the same conditions, and who have also been well reported on during their summer training.

The pupils are divided into three "years." At the end of each year's course they have to undergo an examination. The theoretical work takes up 33 weeks per annum, which include three days' military training per month. Twelve weeks (June to August) are devoted to manœuvres and field training, which includes two weeks' topography.

The syllabus of instruction includes the study of the Norwegian language, history, geography, elementary mathematics, natural history, chemistry and physics, handwriting, drawing, book-keeping, English (optional), singing (optional), tactics, musketry, gymnastics, military administration and organization, military law, topography, hygiene and first aid, swimming, ski-ing, and bicycling. After satisfactorily passing their final examination, the pupils are posted as corporals of the reserve to the units in which they would have served.

The same system applies to the other arms.

In the cavalry there is an "instructional squadron" of 76 men.

The field artillery has two schools—one at Christiania of 160 pupils, and one at Trondhjem of 24. The fortress artillery has a school of 166 pupils. The corporals' class lasts two years, and the sergeants' four. The mine and signal specialists undergo a machinery course.

The Engineers' School has 64 pupils, with a 4-year course.

In the Transport Corps (Train) School there are 70 pupils, chosen from men fit to serve in the cavalry or from N.C.O.'s of the infantry. The course only lasts 100 days, and the graduates afterwards are seldom called out.

The Supply Corps School has 25 pupils; a 72-day course.

The Medical Corps School includes a school for sergeants, in which the courses last six months, and are attended by 15 pupils, and a school for corporals, attended by 130 men, for a period of 24 to 30 days.

These schools have hitherto proved a great success, providing both excellent N.C.O.'s, and, in civil life, a class of men well educated and well disciplined.

MILITARY NEWS OF VARIOUS COUNTRIES.—*Austria.*—The time officers have to remain in the same rank is:—2nd lieutenants, 6½ years; lieutenants, 10 to 11; captains, 10 to 10½ for staff officers, 13 to 13½ for others; majors, 4½ years; lieut.-colonels, 3; colonels, 6 to 6½ years; brigade commanders, 4 years.

Germany.—It was noticeable in the Imperial manœuvres of 1908 that there were practically no white horses in the cavalry. Some of the officers' horses, although of a light colour, were such as not to be easily visible in the field. White horses are now to be found only in those units, like the transport services, where their conspicuous colour is of no importance.

Australia.—Before the Commonwealth was proclaimed, Australia could only call out 21,575 men for defence, and this was far too small a force to guard so large a continent. By a new law, the armed forces of Australia in a few years' time will amount to 260,000 men, ready to take the field at a moment's notice, and 115,000 reservists. These are obtained from the following sources:—Cadets under instruction, 152,000 (37,000 of whom over 18); Militia, 29,000; Reserve Militia (20 to 26), 80,000; Reserve Volunteers (under 26), 60,000.

A. H. SCOTT.

RIVISTA DI ARTIGLIERIA E GENIO.

October, 1909.

ON THE ORGANIZATION FOR THE DEFENCE OF LARGE FORTIFIED PLACES.—By A. Gentile, Colonnello del Genio.—In fortification, as in other branches of the art of war, nothing is absolute. Vauban has said that it is an art founded on common sense and experience, and while much has been published regarding the best system of attack to adopt, in order to obtain possession of a strong place furnished with all the means of defence provided by art and industry, little or nothing is said of the defensive dispositions which are necessary to increase the difficulties of the attack.

When we come to examine what has been agreed upon as to such defensive dispositions, in view of the terrible effects produced on walls and on ordinary structures by elongated shells charged with powerful explosives, we find that there are advocates for two systems: viz. the system of armoured forts at wide intervals, which has General Brialmont for its chief supporter, and the alternative system, advocated by Von Sauer,

of small forts with reciprocal action, arranged in more lines and near to one another.

In both these systems materials offering greater resistance to the penetration of projectiles are substituted for ordinary walls. Such structures being of cement iron and steel, have unavoidably necessitated a diminution in the number of forts in the first system, owing to the great cost of the materials, and this again necessitates an increase of forts of the second system.

When the first system is used, the defence has to provide occasional works in large numbers for reinforcing the intervals between the forts. This is unnecessary in the second system, and, indeed, induced Von Sauer to devise a method of rapid attack which has excited a good deal of attention in military circles and which is divided into four phases, viz. :— 1st.—A reconnaissance of the ground, and simultaneously an approach to the place. 2nd.—Advance of the attacking columns sustained by field artillery and occupation of the external ground. 3rd.—Posting (during the night) of bombarding batteries for curved fire. 4th.—Attack "de vive force," prepared for by the bombardment. Without entering into the merits of such a system of attack—which, it should be noted, depends essentially on the defensive conditions of the place, on its conformation, structure, armament, discipline and moral qualities of the garrison—it is evident that strong places organized in the manner suggested by Von Sauer should be completed in peace times, and would not be capable of resisting the regular systematic siege by an enemy provided with the powerful siege appliances with which armies are now provided.

Even though the system of a girdle of forts at wide intervals and at a distance of 6 or 7 k.m. from the nucleus be adopted, it is evident that when once the investment of the place is completed up to the commencement of the second period of the siege, the attack has an undoubted superiority over the defence. In fact, while the defenders are unable to conceal themselves from the view of the ground beyond the forts, the attackers can freely select places under cover from which they can commence firing from their batteries with security, observing the effects of the shots, and finally silencing the defenders. These latter, enclosed in a circle of iron, are endeavouring with inadequate means to carry on the defence, expending time and ammunition, sacrificing many men and much material, and ending in being overcome in a period more or less short according to the energy and activity displayed.

With regard to the expenditure of material Lieut.-Colonel von Schwatz of the Russian Army, who took an active part in the defence of Port Arthur when in command of the engineers at Fort Erlung, notes that of four pieces of 15 c.m. mounted in the fort, all were dismounted four hours after the commencement of the bombardment, the fort itself being reduced to silence.

The author next offers the following suggestions (*a*). To defend the position by means of lines at intervals not greater than 1,000 m., and distant from 7 to 8 k.m. from the nucleus of the place. These lines to be defended by largely employing field artillery, mitrailleuses,

and rifle fire. It is essential that the organization should be worked out in time of peace, so as to be able to assure completeness in time of mobilization. Along the concealed lines the necessary armoured and walled works should be provided to resist sudden attacks, and should only be brought into action as occasion required. (*b*). For the reinforcement of the troops employed in these lines of defence, and for bringing up men and material to strengthen the threatened points, a covered road of circumvallation should be constructed, with other roads radiating towards the nucleus, and towards the principal magazines of the place. (*c*). In rear of these lines of resistance the principal works should be established situated near the main roads leading to place. Their function is to act concealed from the enemy's view, with prepared fire on the area of the ground occupied by the attack, and they should be at an approximate distance of 7 k.m. from the nucleus. They should be closed works, limited in development and in depth to what is required for the firing of the guns and for the protection of the ammunition. They should be armed with powerful artillery for direct fire and also for curved fire, placed *en barbette*. Shields of steel with loopholes for the mitrailleuses and rifles should be provided at the angles. Artillery is also installed on the flanks with suitable walls for protection. The command of the works is very small; the ditches have the fronts and flanks of a triangular section, with a very gentle slope of earth, and counterscarp galleries with barbed wire obstacles. The ammunition for three or four days' fire or more (from 150 to 200 rounds a piece) should be kept in magazines and should be replenished at night. Shelters for the men will be provided in the terreplein of the work. (*d*). An adequate telegraphic and telephonic service should be provided for the transmission of orders and notices between the various positions of the defence; homing pigeons and wireless telegraphy for communication with the outside world and with the manœuvring troops; plant for the observatories as well as acetelyne searchlights for the illumination of the ground in front of the lines, are also necessary, and both dirigible and ordinary balloons for reconnoitring purposes, and for observation of the results of fire.

November, 1909.

APPARATUS FOR VISUAL SIGNALLING.—*Communication between two Stations separated by an Obstacle.*—In order that two stations may be able to communicate with one another by means of visual signalling, it is not indispensable that they should be able to see each other, since, when separated by an obstacle which prevents their pointing their apparatus one towards the other, they may exchange signals by indirect methods. One of these methods is to employ powerful electric searchlights with convex mirrors such as are used for signalling to a distance at sea.

The principle is as follows:—When at the transmitting station the searchlight has its axis directed towards the clouds in the direction of the receiving station, also provided with a searchlight, the occultations of the light situated at the focus of the lens of the apparatus, produce on the clouds, which act as a kind of opaque screen, a series of alter-

nating flashes. By this means, applying a conventional alphabet such as the Morse, communication can be established to a great distance. The use of these searchlights—the principle of which however is inconvenient as it depends upon the state of the atmosphere, requiring a cloudy sky—permits two observers whose direct view is impeded by inequality of the ground to communicate freely with one another up to a distance of 60 or 80 k.m.

Another indirect method of visual communication which is very useful on service to troops in the field, consists in the use of luminous balloons, both free and attached. The aeronauts are able to ascend to considerable heights and can transmit signals to each other.

It is generally forbidden to supply the aeronauts of the attached balloons with the electric generator required for the production of a powerful light, and communication with the ground is maintained by metallic wires for the transmission of energy; while as regards the free balloons the car is provided with a sufficient electric battery. The luminous signals are made with a Morse manipulating key. The engineer Yon proposes to suspend the luminous apparatus below the balloon, and to signal the transmission of messages in the same way as by visual telegraphy, by means of flashes and occultations of the light, using the Morse code.

Others however have proposed a system similar to that in use by warships for signalling at night. This system consists of attaching below the car a series of small balloonets in each of which is placed an incandescent lamp; each of these lamps is lighted by means of a special commutator which allows the composing of a particular alphabet, that is a series of signals visible at a great distance. The advantage of these balloonets consists in the fact, that when special precautions are taken they are not visible from all points of the horizon, and they admit of the sending of messages without being intercepted or impeded by the enemy.

The method of telegraphic communication by means of balloons is not new. In 1875 Léard communicated by this means from Algiers with the National forts distant 100 kilometres and separated by a high mountain.

Studies and experiments were made in 1883 by the French aeronaut Gabriel Mangin, and in 1884 by Buchholz in Austria and Bruce in England; and on the 13th April, 1886, a series of very interesting experiments were made by Schoenberg in the vicinity of Berlin, by the ascent of a balloon to a height of 60 m. carrying in the car an electric lamp in communication with a Siemens dynamo; the rays being projected in all directions and the ground becoming visible in detail at a considerable distance.

Mangin adopted in 1884 the following system:—An electric incandescent lamp, Swan type of two candles requiring 40 volts and 1 ampère, was placed in the centre of an attached balloon; the lamp communicated by means of two conducting wires with the electrical generator in the office where the operator worked. A Morse manipulator allowed the operator to reproduce at will, short and long occultations of the light

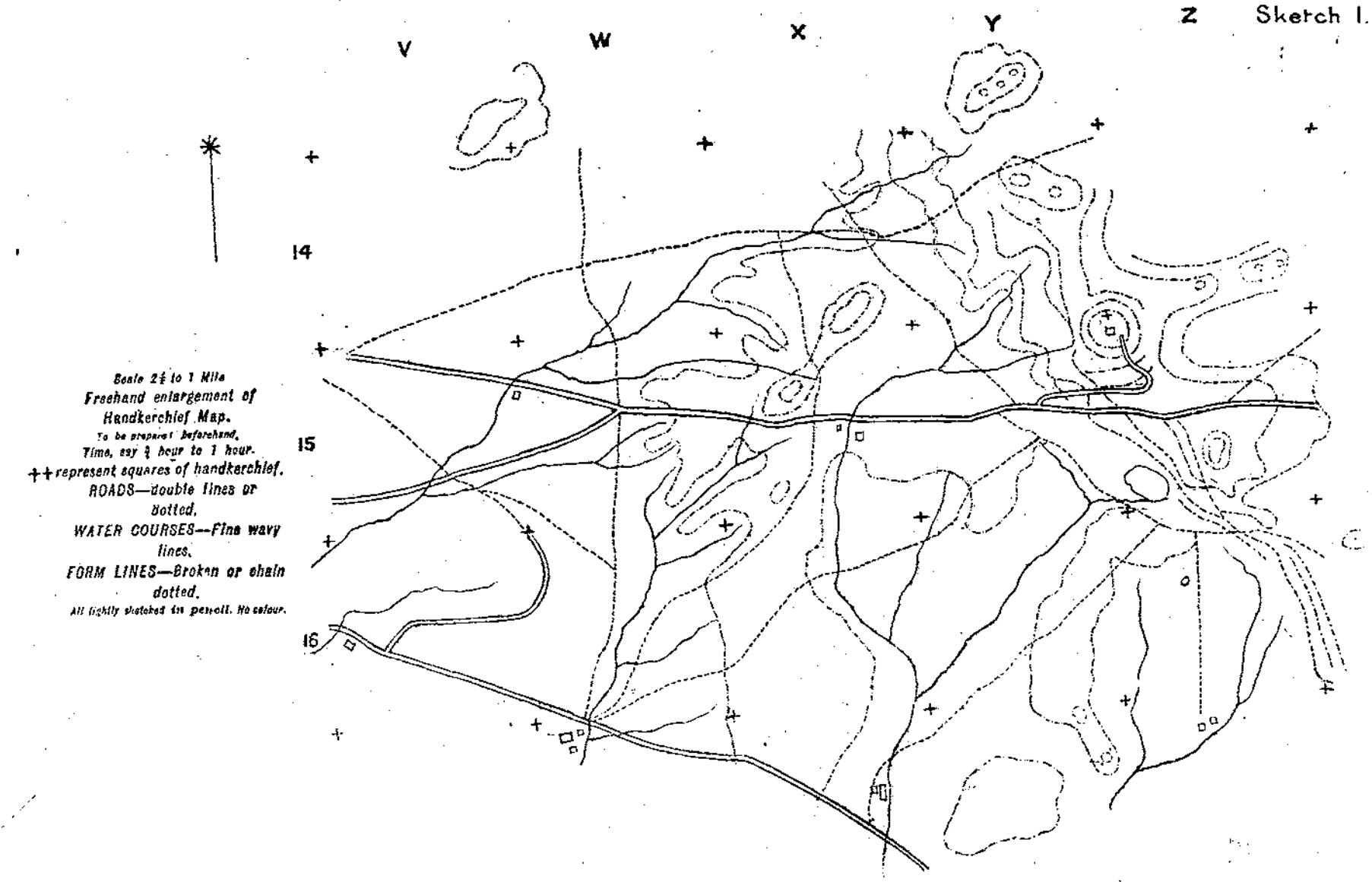
emitted from the interior of the balloon, which assumed the appearance of a luminous globe by the simple illumination of the incandescent lamp placed in its centre. The experiments proved very satisfactory and it is hoped that this system may prove of use to troops on service.

NOTICES.—AUSTRIA-HUNGARY.—*Courses of Telegraphy for the Infantry.*—The allotment of a certain quantity of telephonic material to the regiments of the Austro-Hungarian infantry has brought about the institution of a course of telegraphy for this arm. According to *l'Oester reich-Ungarische Heereszeitung* this course, which will take place at Tulln, will be attended in the year 1909–10 by one or two subalterns and two or three non-commissioned officers from each army corps in addition to one non-commissioned officer from each infantry regiment and rifle battalion. The instruction will commence on the 1st November and will end on the 31st July just before the manœuvres.

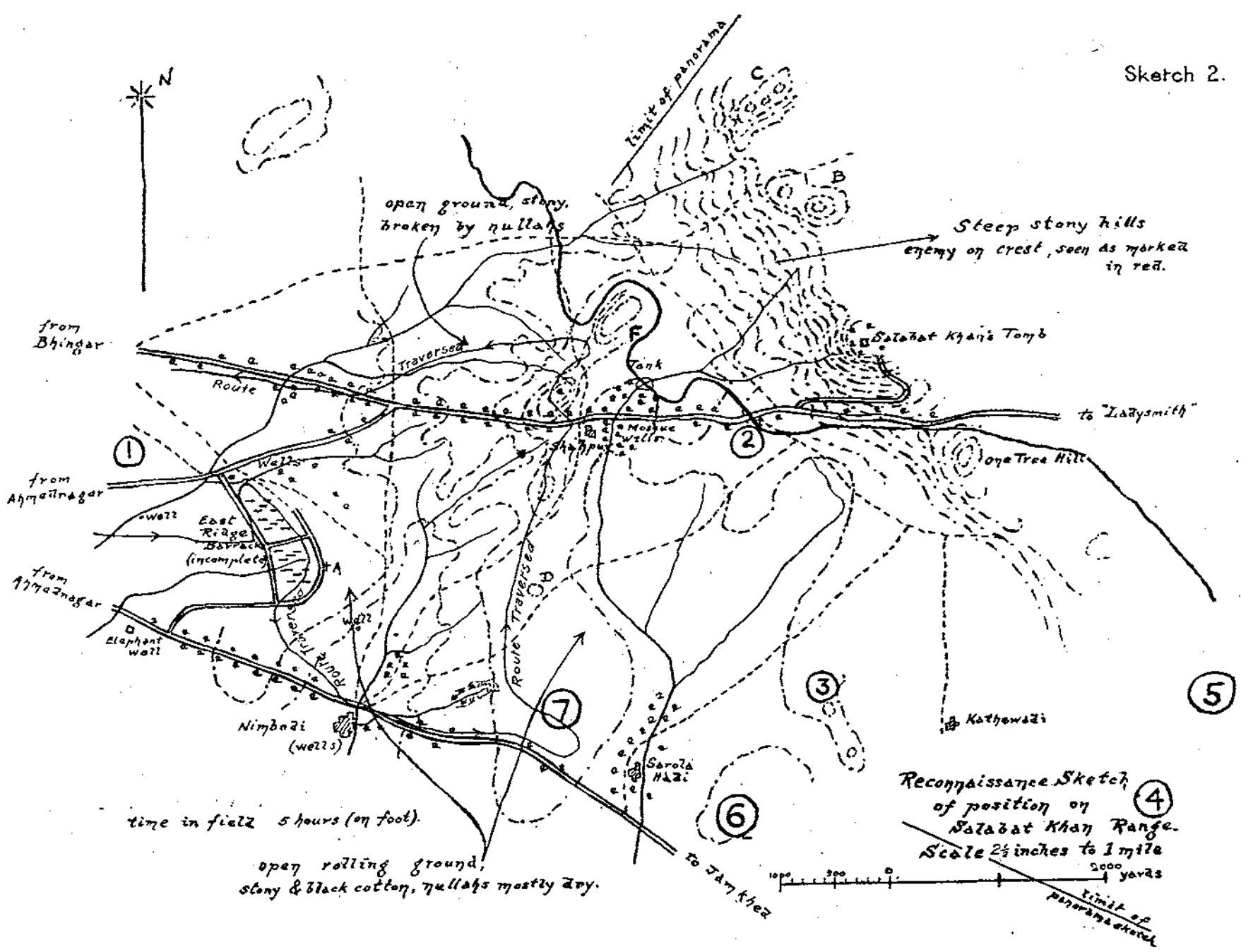
The Network of Wireless Telegraphy Stations.—From the *Militär-Zeitung* we learn that the network of wireless telegraphy stations is being continually developed. The principal stations are those at Vienna, Trieste, and Pola (this last is for marine purposes). Other stations are being constructed at Cattaro, Sebenico, Sarajewo and Lemberg to which will afterwards be added others at Budapest and Hermannstadt. In addition to this, after the completion of the network, the more central stations may be put into communication with the base of operations of the fleet, and possibly with the frontiers of Bosnia, Herzegovina, Italy and Russia.

EDWARD T. THACKERAY.

Sketch 1.



Sketch 2.



Sketch 3.

Peaks C 6000'

Peaks B 5600'

Shahpur 2700'

Salabat Khan's Tomb 5400'

Road over nek

One Tree Hill 6000'

Knoll D 2000'

Sarola Hadi (behind range)