The soldier's pocket-book for field service, by Lieutenant General Sir Garnet J. Wolseley

Publication/Creation

1882

Persistent URL

https://wellcomecollection.org/works/tsnt6mby

License and attribution

You have permission to make copies of this work under a Creative Commons, Attribution, Non-commercial license.

Non-commercial use includes private study, academic research, teaching, and other activities that are not primarily intended for, or directed towards, commercial advantage or private monetary compensation. See the Legal Code for further information.

Image source should be attributed as specified in the full catalogue record. If no source is given the image should be attributed to Wellcome Collection.

Wellcome Collection
183 Euston Road
London NW1 2BE UK
T +44 (0)20 7611 8722
E library@wellcomecollection.org
https://wellcomecollection.org

THE SOLDIER'S POCKET-BOOK

FOR FIELD SERVICE

LIEUT.-GENERAL SIR G. J. WOLSELEY

RAMC 965

J. Edward Squire.

Suakin. 1885.

THE

SOLDIER'S POCKET-BOOK

FOR FIELD SERVICE

BY

LIEUT.-GENERAL SIR GARNET J. WOLSELEY

G.C.B. G.C.M.G.

ADJUTANT-GENERAL TO THE FORCES

FOURTH EDITION, REVISED AND ENLARGED

WITH ILLUSTRATIONS

London

MACMILLAN AND CO.

1882

LONDON :
PRINTED BY WILLIAM CLOWES AND SONS, LIMITED,
STAMFORD STREET AND CHARING CROSS.

PREFACE TO FOURTH EDITION.

WHEN the first Edition was published there were but very few modern Military works in our language, and the Military Education of the Army was at a very low level. The fourth Edition of 'THE SOLDIER'S POCKET BOOK' appears under a very altered aspect of affairs. We possess a considerable Military literature, and of Military text-books there are many. I have endeavoured to make this Edition equal to the standard of Military Education of to-day. I do not profess to write upon the science of war; those who would make that interesting topic their study can do so to the best advantage in the pages of Sir Edward Hamley's most admirable work. 'THE SOLDIER'S POCKET BOOK' deals with all subjects connected with the actual practice of warfare, especially under those phases in which it is most commonly presented to us in our wide-extending Empire. I regret very much that my departure for Egypt has prevented my seeing the proof sheets through the press, and adding a few articles on new subjects of interest. I feel, however, every confidence that this fourth Edition, despite its shortcomings, will be of great practical value to those for whose use it is written.

G. J. WOLSELEY.

6, HILL STREET, W.
August 2nd, 1882.

PREFACE TO FIRST EDITION.

DURING many campaigns, and particularly at the outset of my career as a soldier, I felt the great want of a practical and portable book upon the ordinary duties that fall to the lot of soldiers when in presence of an enemy. Much useful information can be obtained from the Queen's Regulations, and from the Field Exercise Book; but as the instructions published by authority for the use of our army are almost exclusively intended for peace service, they are likely to lead one into difficulties if adhered to in the field. Some few years ago, when Sir R. Airey was Q.M.G. of the army, he proposed to have a practical handbook for the staff, compiled by experienced officers of his department, and published for the use of the army. A little money was required for the purpose, which the War Office, from economical motives, would not allow. I was to have been one of those employed to write; so when the scheme failed, I resolved to bring out a work of that description on my own responsibility. The following pages are the result of that determination, and of my leisure hours for the last four years. No claim is made for them on the score of literary merit. Almost everything in them is deduced from my own personal experiences; whereas it is a curious circumstance, that nearly all the English books upon war, including the only one intended as an *aide mémoire* for field service, are from the pens of men who have never seen a shot fired in anger. Some of these books teach the theory of war admirably. It is most essential that every officer should have a good knowledge of his science, based upon the history of former wars; but to know how to apply that knowledge to any good purpose in the field cannot be acquired from such works. This Pocket-Book is intended to be a guide to officers from the moment war is declared: it enters into the most minute details on everything connected with the wild life one has to lead in the field, when cut adrift, perhaps entirely, from civilisation, but, at any rate, from cooks, clubs, tailors, and bootmakers. I make no apologies for its shortcomings, but publish it in the hope that it may be found useful by soldiers of all ranks in Her Majesty's army.

G. J. W.

MONTREAL: *March*, 1869.

CONTENTS.

PAGE

Preface to 4th edition iii
,, 1st ,, ... iv

PART I.

Advice to officers on service as regards their bearing towards their men . 1
Military spirit and discipline . . . 3
Volunteering for dangerous services 5
Advice to officers ordered on service 7
Field equipment for officers . . . 8
What all officers should carry in their heads 13
THE ORGANISATION OF OUR ARMY. 14
Cavalry 14
War establishment of a regiment of cavalry 16
Detail showing cavalry transport . . 19
Infantry 24
War establishment of a battalion . . 27
Detail of infantry transport . . . 32
Artillery 36
Detail of battery establishments . . 37
Detail of divisional and army-corps reserves, the latter in 3 sections . 45
Engineers 46
Tables of details . . . . . 47 to 50
Company of the commissariat and transport corps 52
Land transport 45

PAGE

Recapitulation of transport companies 60
Animals used for transport purposes 65
Horse 65
Mule 67
Ponies 68
Bullock 68
Camel 68
Elephant 69
Equipment gear of transport animals 70
Food for transport animals 74
Compressed forage 77
Food for men 78
Table of commissariat packages . . 82
Table of bulk of rations 83
Rations 85
,, Indian troops 86
Camp equipment 88
Ordnance store department . . . 92
Ammunition 93
The medical department 98
Ambulance 99
Establishment of a field hospital . . 130
Medical arrangements 109
Proportion of sick and wounded . . 110
Pay department 115
Graveyards 114
Veterinary department 116
The staff 118

	PAGE
Detail of staff (tables) . .	121 to 123
Commandant of Head-quarters . .	123
General duties of staff officers . . .	124
Correspondence	127
Orders	131
Detailing duties	132
Messages	132
Staff duties during an action . . .	134
Staff duties after an action . . .	138
Prisoners	139
Position of general officers in action	140
Line of communications	141
Base of operations	145
Station commandants	148
Field post office	155
Detail of troops and departments on line of communications	157
Prize money	158
Intelligence department	159
Police	163
Summary court martial	164
Passports	168
Newspaper correspondents . . .	171

PART II.

Composition and distribution of an army	173
Brigades of cavalry and infantry, division of infantry and army corps, tables showing . .	173 to 177
Cavalry	174
Artillery	178
Engineers	178
Sea transport	179
Capacity of H.M. troopships . . .	183
Fittings of transports	187
Equipment for transports	190
Fitting a ship for horses	192
Fitting up stalls in a ship	196
Horse medicines on board ship . .	200
Ship rations for horses	201
Ship rations for men	202
Scale of substitutes	203
Medical comforts at sea	205
Embarkations	206
Inspection of troopships	206
Sea-kits	211
Unopposed embarkation	212
Embarkation of horses	214
Troops during voyage	216
Routine for troops, bugle calls, &c.	217
Horses on board ship	219
Opposed embarkation	220
Disembarkations	220
Landing in a hostile country . . .	222
Disembarking horses	226
Selecting site for camps	227
Marching into camp	229
Q.-M. G.'s duties when encamped .	230
Internal arrangement of camp . .	231
Laying out the camp	232
Cooking places	240
Latrines	241
Watering and bathing places . . .	242
Daily camp duties	246
Huts	248
Hut stables	250
Billets	251
Bivouac	253
Campaigning	255
Cooking	258
Diet	262
Medical and surgical hints . .	264
The weather	269

PART III.

Outposts	272
Patrolling	283
Flags of truce	284
Armistice	287

PAGE

Defence of posts 287
Reconnaissances 289
Scouting 299
Maxims to be remembered by officers on reconnoitring duty . . 302
Balloons 302
Military indications 302
Marches 303
Orders for march of an army . . . 307
Duties of staff on march 319
Depth occupied by columns, table showing 324
Baggage 325
Advanced guards 326
Rear guards 329
Pursuits 335
Retreats 337
Positions 340
Gradations admitting of manœuvres and that may be ascended and descended singly, tables showing 344
Occupation of a selected position . 344
Defence of villages 351
Disposition of troops for the attack of positions 352
Attack of villages 357
Employment of cavalry in action . 359
Mounted Infantry 363
Infantry in action 364
Artillery in action 373
Passage of rivers 377
Defence of rivers 380
Sieges 384
Defence of places 390
Convoys 392
Street fighting 395
Wars with savage nations 396
Hill expeditions in India 401

PART IV.

PAGE

Military Bridges 404
Floating Bridges 408
Pontoons. 409
Casks, Rafts, and Bridges . . . 411
Cask Bridges 412
Boat Bridges 414
Rafts of Timber 415
Flying Bridges 417
Trestle Bridges 421
Frame Bridges 426
Various kinds of Knots 429
Custody of Ammunition 430
Road-Making 434
Wooden Tramways 440
Working of Railroads 441
Destruction of Railways 444
Movement of Troops by Railway . 449
Electric Telegraph 467
Cypher 472
Military Surveys 474
Form of Report for an Itinerary. . 480
Field Fortification 481
Profile of works 482
Demolitions 486
Mensuration and useful Formulæ . 489
Physical Memoranda 491
Natural Sines and Tangents . . . 495
English and French Weights and Measures 495
Table of Foreign Weights, Measures and Coinage most commonly in use, with their equivalents in English Measures, &c. 501
Foreign Money with its Value in British 503
Index 505

ILLUSTRATIONS AND DIAGRAMS.

FIG.	PAGE
1. Officer's valise	10
2 to 13. Fitment of Stalls on board ship	194
14. Fitment of Stalls on board ship	195
15. Headstall for horses	195
16. Sling for horses	195
17. Camp of battalion of infantry	234
18. Camp of regiment of cavalry	236
19. Camp of battery of Royal Artillery	238
20, 21. Water Filter	243, 244
22. Water barrel	245
23. Rear guard	334
24. Army corps formed in a plain	345
25. Superstructure of bridges.	405
26, 27. Cask bridges	412
28. Flying bridge.	418
29, 30. Trestles	422
31. Mode of launching trestles	424
32, 33. Crib Piers	425
34, 35, 36. Frame bridges	427
37. Mode of passing beams over openings	428
38. Various sorts of knots	429
39. Lashing spars	430
40, 41, 42. Field Powder Magazines	432
43, 44, 45, 46. Magazines in Field Works	433
47. Magazine under the parapet	433
48. Retaining walls	438
49, 50. Corduroy work	439
51. Plank roads	439
52. A makeshift wrench	445
53. Rail twisting	446
54. Rail straightening	448
55. Signalling	469
56. Pen and ink sketch of ground	477
57. The great bear	478
58. Abatis	485
59, 60. Measurement of width of rivers	492
61. Measuring heights	493
62. To lay out a right angle	494

LIST OF ABBREVIATIONS.

A.A.G. —Assistant Adjutant General.
A.C.G. — ,, Commissary ,,
A.D.C. —Aide de Camp.
A.G. —Adjutant General.
A.H.C. —Army Hospital Corps.
A.M.D. —Army Medical Department.
A.P.D. —Army Pay Department.
A.Q.M.G. —Assistant Quarter-Master-General.
A. & S. —Ammunition and Store.
A.S.C. —Army Service Corps.
B. —Breadth.
B.C. —Bursting Charge.
B.L.R. —Breech Loading Rifle.
B.M. —Brigade Major.
B. of O. —Base of Operations.
Cal. —Calibre.
C.G. —Commissary General.
C.G. of O. — ,, of Ordnance.
C.-in-C. —Commander-in-Chief.
C.M. —Court Martial.
C.O. —Commanding Officer.
C. of the S. —Chief of the Staff.
C.R.A. —Commanding Royal Artillery.
C.R.E. —Commanding Royal Engineers.
Ct. —Court.
C. and T. —Commissionist and Transport.
Cub. —Cubic.
D. —Depth.
D.A.A.G. —Deputy Assistant Adjutant General.
D.C.G. —Deputy Commissary General.
D.A.C.G. —Deputy Assistant Commissary General.
D.J.A.G. —Deputy Judge Advocate General.
Fd. Hospl. —Field Hospital.
F.O. —Field Officer.
Ft. —Feet.
G.O. —General Order.
G.O.C. —General Officer Commanding.
G. of C. —General of Communication.
G.S. Waggon. —General Service Waggon.
H.A. —Horse Artillery.
Hd. Qrs. —Head Quarters.
H.M. —Her Majesty's.
I.G. —Inspector General.
I.V.S. —Inspecting Veterinary Surgeon.
In. —Inches.
J.A.G. —Judge Advocate General.
L. —Length.
L. of C. —Line of Communication.
M.H. —Martini Henry.
M.L. —Muzzle Loader.
M.O. —Medical Officer.
M.V. —Muzzle Velocity.
N.C.O. —Non-Commissioned Officer.
O.C. —Officer Commanding.
O.C.R.A. —Officer Commanding Royal Artillery.
O.S.D. —Ordnance Store Department.
O.S.O. —Ordnance Store Officer.
P.M. —Provost-Marshal.
P.M.O. —Principal Medical Officer.
P.O. —Post Office.
Pr. —Pounder.
P.V.S. —Principal Veterinary Surgeon.
Q.M. —Quarter-Master.
Q.M.G. — ,, ,, General.
R.A. —Royal Artillery.
R.B.L. —Rifle Breech Loader.
R.E. —Royal Engineers.
R.M.L. —Rifle Muzzle Loader.
R.N. —Royal Navy.
S.A.A. —Small Arm Ammunition.
S.B. —Smooth Bore.
S.G. —Surgeon General.
S.N.O. —Senior Naval Officer.
S.O. —Staff Officer.
S.S. for War. —Secretary of State for War.
S. Sergt. —Staff Sergeant.
V.D. —Veterinary Department.
V.S. —Veterinary Surgeon.
W.D. —War Department.
W.O. —War Office.
Wt. —Weight.

' over a figure indicates feet; " indicates inches.

THE

SOLDIERS' POCKET BOOK.

PART I.

Advice to Officers on Service as regards their bearing towards their Men.—The relation existing between the rank and file and officers of our army, although peculiar, is not a subject upon which much reflection is common. To officers brought up in regiments, accustomed to see the ordinary routine of military life go on as a machine, it seldom occurs that any change could be made for the better. In fact, many pass their lives without discovering that the military career has any higher aim than that of moving men on parade by a most complicated process called drill, and that of keeping order amongst them at all times by a rigid system of espionage, which is believed to be discipline. There is but little real sympathy between them and their men. Forgetting that the feudal system has passed away, as long as they do their duty by their soldiers, they expect to find them always ready to obey their nod, and to stand by them in all moments of peril. Pages might easily be filled in narrating the gallant deeds of our officers, and in recounting instances of their reckless personal exposure to save the lives of those under their command. Creditable as such conduct is, more still is expected of them. They must make themselves loved as well as respected. In our intercourse with the rank and file, we must make them realise that all our interests are identical, causing the latest-joined recruit to feel that success is of as much real moment to him as it can be to the general. Let us sink as far as possible the respective titles of officers, sergeants, and privates, merging them into the one great professional cognomen of soldier, causing all ranks to feel that it is a noble title of which the general as well as the private may well be proud. Let us give up the phrase 'officer and gentleman,' substituting that of 'soldier' for it; let the word officer be used as seldom as possible, so that the private may really feel that there is no gulf between him and his commander, but

that they are merely separated by a ladder, the rungs of which all can equally aspire to mount.

The only rewards that are justly our due are the gratitude of our country and the praise of our superiors. Company officers should remember that it is always in their power to bestow the latter, and they should never lose an opportunity of calling attention publicly to the gallantry of their men, distinguishing individuals and holding them up to the admiration of others. In an army praise is the greatest of all moral levers, if administered with discrimination; it is a trump card, costing nothing, that is always at the disposal of the officer, be he commander or captain, which enables him to win if he knows how to use it. The bestowal of praise creates an intimacy between the giver and receiver which it is most desirable to establish between all ranks. Study to be familiar without being vulgar, and habit, if not intuition, will soon enable you to be gracious and intimate with your men without any loss of dignity. In all regiments some officers are immense favourites with their men, and others the reverse. This is especially the case on active service, where community of danger, and constant association create comradeship unknown in peace. Many privates only know their officers as men who award them punishment, and although they know they are always treated with justice, such a condition of affairs must ever be prejudicial to the interests of our service; you must be intimate with your men before they will love you, and they must love you before you can hope to get the most out of them. You should study their prejudices, learn their individual characters, and by a knowledge of their respective sensitiveness, guard against wounding their feelings, for in every company there will be men of actual refinement in comparison to others. Strive to raise the majority to a level with that small minority.

The officer should take a lively interest in their amusements, encouraging them in the practice of all manly sports. In fine he should sympathise with their likes and dislikes, their pleasures and annoyances, being ready at all times to listen attentively to their grievances, be they supposed or real, until at last they regard him as one of themselves, a companion and a friend. For and with such a man they will brave any danger or endure any amount of privation. Upon all occasions appeal to their honour and chivalrous feelings: show them that you have confidence in them and trust them. Cease to treat them as unreasoning children unable to take care of themselves. You will thus develop and create in their breasts feelings of honour even if they had previously been devoid of them. In your punishments make the most marked distinction between ordinary offences and those committed when on duty, treating the latter with great severity. In fact, spare no pains to create and foster the growth of military spirit, by impressing upon all ranks the importance of their duties. Whatever may be the reason of it, it is nevertheless a fact that up to the present time we

have never had an English commander who succeeded in calling forth any great enthusiasm for himself or the cause in hand. We are too prone to fall down before the great Duke, and think that everything he did was right, and that his method with soldiers was the best. Without wishing for a moment to depreciate either the General or his services, let any one read the history of his wars, and what he accomplished, and then picture to himself what the Duke might have done if his soldiers had had for him the feelings that the French had for their Emperor. Napoleon was above all a student of character and of the passions and feelings that influence men's conduct. By means of spirit-stirring proclamations, by appeals to their love of glory and all those points upon which he knew Frenchmen to be susceptible, he was able to extract from his soldiers everything that they were capable of. It is not true that Englishmen are utterly devoid of such high sentiments, but it is only special nourishment and treatment that will develop feelings so long ignored. Let any General arise who knows how to do so, and a new era of victory will be arrived at in British history. Let officers of all ranks ponder on this subject, and in their own sphere, no matter how humble that may be, let them endeavour to call out the finer and better qualities of those serving under them. No man can respond with greater alacrity than the British soldier will, when an officer who understands him makes an appeal to his honour, his love of country, his loyalty, and to all those subtle but powerful influences which alone can convert mobs into armies. 'The greatest talent of a General,' says Plutarch, 'is to secure obedience through the affection he inspires.' In fact, if you want to win battles, make yourself loved by those who serve under you.

MILITARY SPIRIT AND DISCIPLINE.—There has been a tendency of late to make all regiments alike in their outward appearance, and to consider them so in their feelings. Machines into which the individual talents and disposition of men enter so largely, as into those called regiments, are never calculated to keep time alike as watches do. The idiosyncrasies of C. Os., historical traditions, and established customs, affect the character of regiments more than might be imagined by those who draw their idea of our service from 'H. M. Regulations.' The endeavour to assimilate them has not been happy; like democracy, it has had a tendency to pull down the best to a level with the worst, instead of raising the latter. *Esprit de corps* is made up of trifles; a rose by any other name smells differently to military nostrils. The guardsman reduced to a linesman is not the fine guardsman any longer. Take the best Rifle battalion and clothe it in red, it would soon cease to be the dashing body of skirmishers it is now. No man who knew soldiers or their peculiar way of thinking, or who was acquainted with the many little trifles that go to make up *esprit de corps*,

and that form as it were a *lien* between it and discipline, would ever deprive a soldier of any peculiarity that he prided himself on, without having some overpowering reasons for doing so.*

The soldier is a peculiar animal that can alone be brought to the highest efficiency by inducing him to believe that he belongs to a regiment which is infinitely superior to the others around him. In their endeavours to foster this spirit, colonels are greatly aided by being able to point to some peculiarity in dress or title. The spirit of general assimilation has been borrowed from France ; but in carrying it out we have gone into extremes, as we always do. An attempt to change the dress of the Madras army led to the mutiny of Vellore. The Duke of Wellington said of his officers in Spain, that many of his best men were the greatest dandies. The better you dress a soldier, the more highly he will be thought of by women, and consequently by himself. Dress is of much more consequence than civil ministers imagine. Before the Crimean war our dress regulations had been carried out so strictly to the letter of the law, that there was a rebound as soon as men got free from the surveillance of town-majors. This feeling was fostered, amongst the younger officers especially, by the spirit of the public press, which went towards inculcating the idea that everything old was bad. Many men before Sebastopol seemed to pride themselves upon looking as little like soldiers as possible. To be unshaven, and to be dirty, was supposed by some to be the sure sign of a good officer. The spirit runs like wildfire amongst an army. Whatever the officers think fine, the men will think so too. It is very difficult to make an Englishman at any time look like a soldier. He is fond of longish hair and uncut whiskers. Men who have never worn beards are apt to think that to wear one saves a great deal of trouble. It does so, if you do not clean it ; but to wear a long one, and keep it clean, demands more time and trouble than shaving. On service discipline deteriorates when but little attention is paid to dress, and when the men wear almost what they like. It is an incalculable drawback to an officer who is ordered on active service in command of a regiment, never to have had experience of real war and actual campaigning ; he is at a loss how to act ; to keep up the strict discipline of the home garrison-town in all its minutiæ, would be as impossible as it would be mad to attempt it. To know where to relax, where to remain firm, and where to tighten the reins, requires the exercise of great common sense, aided by experience in the customs of war. Allowance under all circumstances must be made for men who march daily. They cannot be expected to be shaved and have their clothes as well brushed as if in barracks : but without

* *Since writing the above, I have read a passage in 'Kinglake's Crimea,' which embodies my idea in such good language, that I beg to refer to it. See page No.* 150 *of Vol. III. beginning at, 'In the capital of many a State,' &c.*

wearying, or in any way bullying them, a great deal may be done by officers acting upon a good system.

The greater the individuality you give to the soldier himself and to his battalion, the more he feels that his individual conduct is of importance. No pains should be spared by officers in impressing upon their men the consequence that attaches itself to the behaviour of each of them. Make a man proud of himself and of his corps, and he can always be depended upon. He must believe that his duties are the noblest that fall to man's lot. He must be taught to despise all those of civil life. Soldiers, like missionaries, must be fanatics. An army thoroughly imbued with fanaticism can be killed, but never suffer disgrace; Napoleon, in speaking of it, said, 'Il en faut pour se faire tuer.'

It is difficult to devise punishments for all crimes not to be punished by death. This is particularly the case on the march. All the dirty fatigue-duties about a camp should be performed by defaulters. Care is required that punishments awarded may not in any way whatever affect the men's health or reduce their strength. When a force is marching daily, all extra drills must be avoided, lest the men to be punished should be overworked by them.

Soldiers, particularly old soldiers, are naturally grumblers. The self-abnegation which is necessary on service finds a safety-valve in a 'good growl.' The best and most faithful servants are often the greatest grumblers. This disposition cannot be treated too cautiously and with too light a hand. The tendency should be checked in young officers, for if they grumble, the privates will follow in a chorus that will soon grow too loud.

The only European war of which this generation of our soldiers know anything, is that against Russia. It taught us many useful lessons, not the least of which was the necessity that exists for watching over the morale of our men. We are apt to think that if the Briton is well fed, well looked after, and well led by his officers, everything he is capable of has been given a fair field, and that all will in consequence be brought out.

During the siege of Sebastopol, I verily believe that a large proportion of our men did not know the name of the G. O. C. They seldom saw him; he did not live amongst them. If he had feelings in common with them, they did not know it. No touching appeals were made to their feelings of honour and patriotism. All our attention was bestowed on their stomach; and the result was we never got much out of our men, and that in August 1855, our army was in a discreditable condition of demoralisation.

VOLUNTEERING FOR DANGEROUS SERVICES.—It is common for men to say that volunteers in war 'come to no good,' that the system of calling for them when there is any particularly dangerous service to be performed is pernicious, that men should content themselves with doing what they are

ordered, &c. Such expressions were invented, and are still repeated, by men who do not like danger—men whom no glorious impulse could ever induce to volunteer for anything—men who have no courage for deeds that bring fame and honour with them, and who are consequently jealous of men who have. They are therefore anxious to prevent others availing themselves of opportunities that occur for acquiring distinction. Let no soldier be deceived by such twaddle. If you are ambitious and 'covet honour,' never lose a chance of leading or taking part in storming parties and all enterprises that put you in contact with the enemy. If this reasoning of timid men once gets hold of an army, it is enough of itself to stifle all enthusiasm and noble daring, without which no one can be a good soldier, and without which an army of the most talented men in the world is useless ; it is a dead body, incapable perhaps of cowardice, but powerless for great deeds. Love of country, disregard of personal comfort, and the constant exposure of one's life for the safety of others and the honour of one's Sovereign, are sentiments and actions without which no army can long exist. We have been too much educated to believe that the British soldier is simply a machine, incapable of noble impulses. Let us eradicate such an impression, and foster the wish for distinction, by calling for volunteers to perform all services of unusual danger, or those that require more than ordinary courage. The officer, be he general or captain, who acts upon the principle that all his soldiers are equally brave, will some day find out his error to his cost. The longing for distinction, which is, one may say, the mainspring to all military feeling, enters largely into this subject. If volunteers are called for, and succeed in their undertaking, they must be petted and rewarded. It is to be hoped that in our next war the G. O. C. may have the power to confer the ribbon of the Victoria Cross on the spot, subject to Her Majesty's approval afterwards. It is a great stifler to military enthusiasm that a man who has distinguished himself must wait a long tedious reference to England before he can obtain any formal recognition of his service. A reward conferred on the spot is doubly efficacious : it is more highly prized by the recipient, and has a greater influence upon others to go and do likewise. A general should rather seek for instances of courage to reward, than wait until they are reported to him : courage in a man is the highest of all virtues, and it should be fostered in an army in every possible way. One man who volunteers for any special service of danger, is worth two men taken at hazard from the ranks.

In action, to be cool and to seem ignorant that any danger exists, is of the first consequence ; you must at the same time, however, evince a lively interest in all that is going on : come what may, have a smiling face. If your men are under a fire to which they are not replying, walk about in front of them as they are lying down. I do not mean that you are never to avail yourself of cover, for when skirmishing it is your duty to do so,

but under the above-mentioned circumstances the best troops are prone to become unsteady, and it is then the especial duty of officers to set an example of coolness and steadiness. When wounded, officers should take a pride in refusing the assistance of their men to take them to the rear; men are only too fond of helping their wounded comrades out of fire, and when once away, it is difficult to get them back again. All must learn to wait for the ambulance. It should be impressed upon them by their officers, that the wounded of a victorious army are always taken care of, whilst those of the beaten side fare badly. It is more essential, therefore, for the wounded than for others, that their army should win, and the fewer men withdrawn from the front line to take charge of wounded the greater is their chance of success.

Advice to Officers ordered on Service.—The army having been distributed into its several divisions, &c., the general officers to command them, and the staff having been carefully selected, it behoves all officers ordered to take part in the operations, to decide upon their field kit, and make arrangements for living beyond the reach of shops and tradesmen. If they have not been vaccinated, they should be so at once.

In the Article on Field Kit will be found the result of the author's personal experience in several campaigns. Previous to embarkation the best maps of the intended theatre of war should be procured and studied at every spare moment. All good works throwing light upon its history, resources, geography, the manners and customs of the people, its climate, its military and naval strength, &c., are to be carefully studied, and a précis made of all such information, particularly as regards the military events that have taken place in it; the positions taken up by opposing parties, and those where battles were fought, sieges carried on, to be noted down in the pocket-book, so that such places may be examined whenever the subsequent movements of the army enable it to be done. The nature and description of rivers, where navigable and where fordable, the bridges over them, the chains of mountains, with the passes through them, the railroads, routes, and other communications. The natural productions, the nature of the timber, &c., &c., to be studied.

The same pocket-book to have noted in it the dates when the respective seasons begin and end. The composition and distribution of the enemy's forces; a page in the pocket-book should be devoted to each corps, giving all details as to divisions, batteries, brigades, regiments, battalions, and the names of C. Os. as far as possible; this will be of incalculable service when prisoners are taken, as the fact of a certain corps being there would indicate that such and such a division was in your immediate front. The description of guns should be given, and it must be noted whether the numbers given include officers and N. C. Os., and non-combatants, or only the rank and file of bayonets and sabres. It is almost needless to add that at least a

colloquial knowledge of the language is of incalculable value. All S. Os. are expected to speak French. If the war is to be carried on in a country whose language is unknown to the officer, he can at least do much towards acquiring a partial knowledge of it; he can learn from a vocabulary the names of things, and a few easy sentences.

There is no way by which a man of very inferior ability can obtain a reputation amongst us for cleverness and learning so easily as by the study of languages. The same amount of application bestowed upon them, as is frequently given without any result to other subjects, will often secure good posts for men who are wise enough to make languages their study. This fact comes home to all who have served much in India. Where the language of a country in which war is being carried on is not generally known in an army, the services of those men who can speak it are of such value that they cannot be neglected.

FIELD EQUIPMENT FOR OFFICERS.—It should be of the least possible weight, and contain the fewest articles compatible with the maintenance of health. Comfort must be disregarded when men take the field, as it is only a personal matter; but it is essential for the good of the State that they keep themselves in such good health that they are ready at all times to do the hardest work. Englishmen are so fond of their tub, and so particular as to the cleanliness of their persons, that many think it impossible to forego such luxuries; but it is surprising how soon one can learn to do without them. We are too prone to overload ourselves with baggage in the field; it is a saying abroad that 'chaque officier anglais a sa bassinoire.' This 'chaff' comes home to us with only too much truth. Formerly, men went campaigning prepared to lead a gipsy life, independent of all supplies in the way of clothes; wars lasted for years then, and the means of obtaining shirts, boots, &c., from home were small. Now, a few weeks is the utmost one can be separated from railway communication, and a few months will probably be about the duration of active operations carried on by regular armies. Supplies of socks, boots, trousers, shirts, soap, towels, &c. should be pushed well to the front in bulk, to be issued as required. The infantry must be content with less than mounted officers, who can carry extra things on their second chargers.

Officers' Baggage in the field is now restricted to 80 lbs. for each F. O.; 50 lbs. for other mounted officers having only one charger; and 40 lbs. for all dismounted officers, as proposed in the first edition of this pocket-book.

The Cooking for officers will in future be done by Companies and Troops, cooking utensils not to exceed 22 lbs. in weight, will be carried for the officers of each Troop and Company.*

* *A pattern set of cooking utensils weighing about 24 lbs. can be had from Mr. T. White, Military Outfitter, Aldershot.*

In addition to the valise or kit bag, which is to be looked upon as the light equipment of officers, there will be allowed to every officer a bullock-trunk to carry about 100 lbs. weight of personal baggage. This trunk to be embarked with officers, but to be left at the base of operations during active movements in the field, and to be brought up only when it may be deemed convenient to the service by the C. in C.*

An Infantry officer's kit will be as follows :—

Worn or carried on the Person.—Shako, tunic, trousers, shooting-boots, socks (woollen), drawers, flannel shirt, silk pocket-handerchief, gaiters, clasp-knife (with a tweezers in it), drinking-cup and water-bottle,† pocket-book,‡ telescope or field-glass (having compass attached to it), watch, water-proof-coat, haversack, and a map of the country.

To be carried in Valise, forming Bed.—A great-coat with cape—new pattern (8 lbs.), 1 blanket (4½ lbs.), 1 pr. of trousers (2 lbs. 2 oz.), 1 pr. of shooting-boots and 6 spare boot-laces (2 lbs. 14 oz.), 2 pr. of worsted socks (8 oz.), 1 pr. of drawers (10 oz.), 1 flannel shirt (13 oz.), 1 silk pocket-handkerchief (1½ oz.), 1 woollen nightcap (4 oz.), 2 towels (1 lb.), a holdall containing 1 comb, 1 small hair-brush, 1 tooth-brush, 1 small clothes-brush, 1 pr. of scissors, and a metal soap box (1 lb. 6 oz.), 1 small sponge in bag (3 oz.), 1 housewife (4 oz.), 1 tin of dubbing (3 oz.), 1 portfolio, containing pen, ink, and paper (15 oz.), 1 journal book (9 oz.), 1 cholera belt (6 oz.), 1 calico bandage § (3 oz.), 1 candle lamp with a few candles (1 lb.), 1 tin match-box ‖ (3 oz.), 2 tin plates (14 oz.), 1 cup (in leather bag), containing knife, fork, spoon, pepper and salt pots (1 lb.), 1 India rubber basin (1 lb.), some tobacco, and 'The Soldiers' Pocket Book' (1 lb.). The total weight of these articles is 29 lbs. 14 oz., and as the valise in which they are contained weighs 9 lbs., the whole kit weighs, say 40 lbs.

The valise forming the bed and holding the above detailed kit measures, when packed, 10″ in diameter, and is 28″ long, as shown in sketch (p. 10).

* *One of these bullock trunks is to be seen in the pattern-room, Horse Guards.*

† *The best water bottles are those made of ebonite, and covered with felt: they can be had at Silver & Co., Cornhill: those holding a little less than* 1½ *pints, weigh when empty* 13¼ *oz.: when full* 2 *lbs.* 3¾ *oz. The Sardinian water-bottle, that is now the newest pattern for our army kept in store, is of wood, holds* 1½ *pints, weighs when empty* 1 *lb.* 0½ *oz., when full,* 2 *lbs.* 10 *oz.*

‡ *The most convenient size is* 7 *in. by* 4 *in. I strongly recommend metallic memorandum books ruled, with the corners rounded off, as the best for field service.*

§ *To be carried on persons when in actual presence of the enemy.*

‖ *In damp climates, matches having sulphur on them should be selected.*

Fig. 1 also shows the valise in plain when opened out for use as a bed, and a longitudinal section through it then. It consists of a waterproof sheet 26″ wide, ending in a cylindrically shaped bag which holds the kit and forms the pillow. The opening in this bag (*a b* in sketch) is secured by a couple of straps or strings of soft cord. The bag should be made of light waterproof material except the portion of it (8″) which will rest on the

fig.1

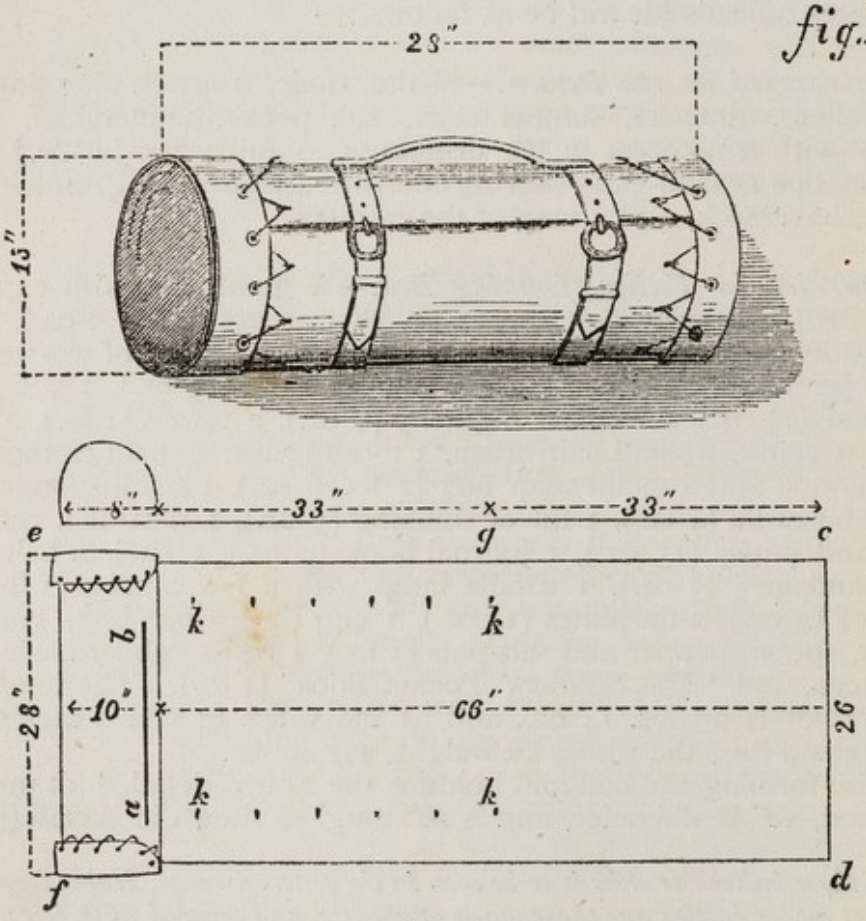


Fig. 1.

ground when the bed is opened out, which is in one piece with the ground sheet that is made of stout waterproof stuff (such as is now used for mail bags) as far as *g*, the portion *g c* (33″) being, for the sake of lightness, of less heavy waterproof material. In folding up the bed, the end *c d*, is first doubled back on the pillow at *e*, *f*, the ground sheet in that condition being then rolled round the valise or pillow. In this way no part of the sheet that

may have been dirtied from contact with the ground is brought next the bedding. A piece of light serge, 66″ long and 30″ wide, is fastened along the sides and the valise end of the sheet ; being open at the end *c d*, a sort of bag is thus formed which if filled with straw, hay, leaves, &c., &c., forms a good palliasse : it is necessary for health to have a woollen substance of this kind between the body and the waterproof sheet. The valise and bedding when rolled up are secured by two leather straps, which are sewn to the sheet for 30″ from *g* towards *e ;* they are united close to *g* by a cross strap, which forms a handle (when the valise is rolled up), after the fashion of the straps commonly used to fasten railway rugs, &c. The valise ends at each side in a cap with edges 3″ deep, pierced with seven brass-bound eyelet holes. This cap is of the same strong material that the portion of the ground sheet near the valise is made of. Beginning at *g*, at 4″ from each edge of the ground sheet, is a line of strong brass hooks, *k k* in sketch, 6″ apart, and extending to the end of the stout waterproof material under valise. Rove loose through the eyelet holes in the cap at end of the valise is a strong soft cord about as thick as a pipe-stopper : this is kept there permanently, so that each time the bed is rolled up there is no lacing in and out through eyelet holes, but the caps are secured to the ground sheet by the slack between every two eyelet holes being passed over the hooks already described as attached to it. Another method for securing the cap, is by substituting loops of a similar cord for these hooks : they are permanently fastened to the ground sheet in the positions indicated for the hooks in the sketch, and the lacing in the other method is dispensed with. The valise and caps are secured by passing the loops through their corresponding eyelet holes in the cap, and then through one another, the end one being fastened by a small leather strap fixed for that purpose to the ground sheet.

The caps may also be entirely dispensed with by making the ground sheet with side flaps of light waterproof material, which, being about 4″ wide, are turned inwards before rolling it up, so that when secured by the straps already described the ends of the cylindrical package thus formed are waterproof. The bed in this form, although not quite so proof against wet as when the valise is provided with caps, is much simplified, and a little cheaper.

When used in bivouac, the ground should be scraped away to form a hollow for the hips ; this adds greatly to comfort. When time or circumstances enable you to raise your bed off the ground, never fail to do so : a couple of planks or a hurdle raised at one or both ends upon some stones are sufficient for this purpose.

For ordinary climates one blanket with a good great-coat reaching down to the ankles is sufficient. I strongly recommend having the blanket doubled, and sewed together along one end, and two-thirds along the side.

I have always found it a good plan to sleep in a woollen cap of some

sort, particularly when bivouacking. I should like to see one served out to every soldier. When tents are used and it is safe to do so, it is a great luxury to take off your boots at night; if you cannot do this, loosen the lacing as much as possible.

Arms.—The sword should be light but sharp. Officers of all ranks and of all branches of the service should have a central fire revolver carrying the regulation pistol ammunition.

S. Os. should have, in addition to the above, a 50 ft. measuring tape, a prismatic compass, a little tin colour-box containing Indian ink, burnt siena, Prussian blue, green, and a brush. A couple of pencils, some good steel pens, a block of sketching-paper, and a pair of compasses (a pedometer is useful). An almanack should be specially prepared by the Intelligence Department in England for the use of offrs. embarking for a military expedition, the calculations being made for the latitude and longitude of some central town in the intended theatre of operations. These almanacks should be printed on slips of a size to fit the pocket-book into which they could be pasted. The following useful form is that in which they were supplied to officers for the Ashantee war.

OCTOBER, 1873.

Lat. 7° 0′ *N.* *Lon.* 2 0′ *W.*

BEARINGS, MAGNETIC. VARIATION, 18° 23′ W.

MOON'S PHASES.

			H. M.	
October	6th	○ Full Moon	5 31	A.M.
,,	13th	☾ Last Quarter	6 25	,,
,,	21st	● New Moon	10 55	,,
,,	29th	☽ First Quarter	0 10	,,

Date.		Sun.		Sun's bearing at		Moon.		Moon's bearing at	
		Rises.	Sets.	Rising.	Setting.	Rises.	Sets.	Rising.	Setting.
	*	H. M.	H. M.	°	°	H. M.	H. M.	°	°
1	T	6 2	5 58	E. 21 S.	W. 15 N.	2 14 P.M.	—	E. .	—

The S. O. should carry with him, strapped to his saddle, a waterproof coat

* *Initial letter of the week.*

(rolled up with his great-coat if there is any likelihood of being separated from his baggage), and a leather case containing pencils, pens, and paper. He should carry all his kit in saddle-bags on one of his spare horses. If heavy rains or very bad weather are to be anticipated, I recommend most strongly that one of the two pairs of boots should be made to come well up the thigh, being so finished inside that the tops can be turned down below the knee in fine weather. A pair of good shooting-boots, made to buckle with straps, are very convenient, after a march, to wear when walking about in camp. For cavalry and all mounted offrs. good butcher boots are indispensable ; the soles should be thick with a broad, low heel, and made to fit easily ; they should be slit up over the instep, with a soft tongue sewn all round to make it waterproof, and the opening fastened by lacing ; the spur strap to cover the opening and the lacing.

Messing is always a difficult matter, for English offrs. will carry their preconceived notions of comfort into the field with them. They must learn to live as much like the private soldier as possible, and officers commanding battalions should positively forbid the conveyance of private stores with the regimental baggage. As has been said before, all future campaigns must be of short duration, and any offr. who cannot make up his mind to live upon the same fare as his men, had better remain at home with his mother.

S. Os. should mess in threes or fours, having provided themselves with a canteen for each mess similar to that recommended for other officers.

The attempt to carry about a table or chair during the active work of a campaign is ridiculous ; officers, like their men, must eat their dinners sitting on their beds, or on any large stone that may be at hand.

WHAT ALL OFFICERS SHOULD CARRY IN THEIR HEADS.—Taking it for granted that all offrs. are well acquainted with the Queen's regulations and the customs of the service, they should endeavour to carry in their heads certain easy mathematical formulæ regarding the measurement of distances, &c. A great deal of course depends on their disposition and their power of perception. Make it a practice to note carefully, even as you whiz along in a railway carriage, the peculiar features of the country, the nature of its fences, &c. This is commonly done by hunting-men from habit, so much so that with them it is a mental operation gone through almost mechanically. Accustom yourself to time the pace at which you travel, to count the number of telegraph poles there are to a mile, and so ascertain how many yards they are apart, &c. As time and distance are the two elements upon which all military movements hinge, offrs. cannot accustom themselves too much to every-day calculations, regarding them as they bear upon their amusements, or their ordinary routine of duty. I think men accustomed to keep horses are more in the habit of doing so than men who don't ride much. To keep a journal is very good practice ; in it should be noted one's daily habits, the

events of the day, and general opinions upon them, together with remarks upon the books one reads, the politics of the time, foreign affairs, &c. All such practices tend to impress useful facts on the memory. It is taken for granted that every offr. has a fair knowledge of arithmetic, of at least the first two books of Euclid, of plane trigonometry, of algebra, as far as quadratic equations, and of permanent fortification. They should be able at a glance to distinguish the common vegetable productions, including the various species of timber. For facilitating the measurement of distances, &c., every one should know the exact length of his ordinary pace, and be able to pace yards accurately; he should know the exact length of his foot, hand, cubit, and arms from tips of fingers of left hand to right ear; he should know the height of his knee, waist, and eye, and also the exact proportion that his drinking-cup bears to a pint. The more information regarding the strength, composition, and distribution of the contending armies that an offr. can carry in his head the better.

THE ORGANISATION OF OUR ARMY.

Cavalry.—The organisation of the English cavalry is as follows:—

1. The Household Cavalry; 2. Heavy Cavalry; 3. Lancers; 4. Hussars. There are only 3 regiments of household cavalry; they are armed with cuirass, and steel helmet, heavy sword, revolver, and B.L.R. carbine. The N.C. Os. and men must be 6 feet in height. There are 4 regiments of heavy and 11 regiments of medium cavalry; 5 regiments of which are lancers armed with lance, carbine and sword (26 N. C. O's. and trumpeters have revolvers), the rest being armed with sword and B.L.R. carbines, and, with the exception of the Scots Greys, wearing brass helmets. There are 13 regiments of hussars armed as the heavies, except that they have no helmets. The sword used by the 4 regiments of heavy cavalry is $35\frac{1}{2}''$ in the blade, weight 2 lbs. 8 oz., or, with scabbard, 4 lbs. 9 oz. That used by all other regiments is the same in length, but is 6 oz. lighter, the sword and scabbard together only weighing 4 lbs. $1\frac{3}{4}$ oz., or $7\frac{1}{4}$ oz. lighter than the old pattern which is still used by the heavy regiments. In future manufacture the universal pattern for all mounted services, except the household and the 4 regiments of heavy cavalry, will be a sword weighing 31 oz., or, together with scabbard, 3 lbs. 9 oz., the length of blade being 33". The lance is 9 ft. long, weight 3 lbs. $13\frac{3}{4}$ oz.; the staves are bamboo.

The M.H. carbine weighs $7\frac{1}{2}$ lbs., is 3' 2" long, and can fire the ammunition of the small rifle, although it has an ammunition of its own (see article on Ammunition); it is sighted up to 1000 yards. Arm-chests holding 20 carbines weigh when empty 70 lbs., and measure 3' 7" — 1' $7\frac{1}{2}$" — 1' 2" (outside). The service revolver weighs $2\frac{1}{4}$ lbs.

The officers' chargers are their private property. The average height of cavalry horses is 15½ hands.

The average net weight of a dragoon is about 11½ stone; of a lancer 11 stone, and of a hussar 10 st. 3 lbs. The weight of their dress, arms, accoutrements, ammunition, saddlery, and equipment, is in round numbers about 103 lbs. for all. Adding the weight of water in water-bottle (2 lbs. 4½ oz.), and of 2 days' rations for the man (4 lbs.), the total weight carried by the horses of our cavalry will therefore be in future:

About 19 stone 4 lbs.—Heavies.
,, 18 ,, 10 ,, —Lancers.
,, 18 ,, 0 ,, —Hussars.

To these weights must be added at least one day's corn for the horse.

Our cavalry equipment is still much too heavy, and the men are dressed too much for appearance and too little for the work they have to do on service. It is to be hoped that the helmet now given to the infantry may be also issued to our hussars and lancers. The tunics are still far too tight, preventing the full and free play of the muscles about the throat, arms, and chest. The use of pipeclayed belts should be abolished for ever in every branch of the army; the leather that is best for bridles is also best for accoutrements. The sling sword-belt is an abomination, and with the steel scabbard, no sword can ever be kept in serviceable order. The sword is only for use on horseback, it should therefore be fastened to the saddle, and the dragoon thereby relieved of its weight. The carbine or pistol should be carried on the man's person, so that when separated from his horse by any accident, he may still be effectively armed. The regulation bridle and bit are heavy and cumbrous, and the present headstall might easily be dispensed with by making the bits removable so that the head portion of the bridle should serve as a headstall. All brass bosses should be removed from our saddlery, they are useless, and entail trouble upon the soldier in keeping them clean. Revolvers used by mounted men, should invariably be secured to a lanyard passing round the neck in the manner that sailors do with their knives.

To clean Brown Belts, &c.—When wet they should be dried in the sun or in a warm room, but they will crack if placed close to a fire. Dirt should be removed by a damp (not wet) piece of sponge or rag. Soft soap should be applied to polish when the belts, &c., are clean and dry by dipping a corner of a sponge or rag in water and then rubbing it on the soap until it lathers, then apply to the leather, and when dry polish with a dry rag: this softens as well as polishes the leather.

Soft Soap is made with 8 oz. common yellow soap and 4 oz. of beeswax; the former should be cut in small pieces and boiled with the beeswax.

WAR ESTABLISHMENT OF A REGIMENT OF CAVALRY.

Officers, Non-commissioned Officers, and Men.	Numbers.	Horses. Chargers.	Troops.	Draught.
Lieutenant Colonel	2	8		
Majors	3	12		
Captains	5	15		
Subalterns	16	48		
Adjutant	1	3		
Paymaster	1	2		
Quartermaster	1	2		
Medical Officer	1	2		
Veterinary Surgeon	1	2		
Total	31	94		
Sergeant Major	1			
Q.M. Sergeant	1			
Band Sergeant	1			
Paymaster Sergeant	1			
*Armourer Sergeant	1			
Saddler Sergeant	1			
Farrier Sergeant	1			
Sergeant Cook	1			
Trumpet Major	1			
Orderly Room Clerk	1			
Transport Sergeant	1			
Troop Sergeant Majors	8	..	480	
Sergeants	24			
Farriers	8			
Saddlers	4			
Shoeing Smiths	8			
Wheelers and Saddletree makers	2			
Trumpeters	8			
Corporals	32			
Bandsmen	15			
Privates	480			
Drivers (Transport)	22			
Total of N.C.Os. Rank and File	622	94	480	44
Detail with Regtl. Hd. Qrs —				
Officers	8	22	..	..
S. Ss. & Transpt. Sergt. & Sergt. Cook	10	..	..	..
Artificers	6	..	..	..
Bâtmen	14	..	..	..
Drivers	14	..	..	28
Total Officers and Men	14 / 38	22	..	28

Transport.	Carriages.	Drivers.	Dt. Horses.
1st Line, without tents.—			
Carts, S.A A.	1	2	4
Waggons, Forge	1	2	4
,, G.S.	8	16	32
,, spare	..	2	4
Total	10	22	44
2nd Line, for tents, &c.—			
Waggons, G.S. (attached)	4	8	16
Grand Total	14	30	60

Ammunition.	
Carbine, in possession 30 rds. per carbine	16500
Regtl. Reserve	10080
Pistol, in possession 36 rds. per pistol	936
Regtl. Reserve, 36 rds. per pistol	1200

Estabmt. of a Squadn.†	Nos.	C.	T.	D.
Officers	6	19		
Trp. Sergt. Majors	2			
Sergeants	6			
Corporals	8	..	120	
Artificers	4			
Trumpeters	2			
Privates	120			
Drivers	2	..	..	4
Total Offrs. and Men	150	18	120	4

C. T. and D. in the above table stand for Chargers, Troops and Draught horses.

* Armourer Sergt. to be left at base of operations

The bâtmen shown in black as attached to Hd. Qrs. are included in the number of privates in the Establishment of a Squadron. The blankets of the Hd. Qrs. detail are carried in No. 1 Waggon. The kettles for all except S. Ss. are conveyed in the Squad. Waggons. The Band on taking the field is broken up and distributed among the Squadrons.

† One Squadron not having a Major in command will only have 13 Officers' chargers, and one furnishing the Transport Officer will have one Officer and three chargers less.

Articles worn or carried by the soldier in marching order.

	lbs.	oz.
Full head-dress {Lancers	1	13½
Full head-dress {Hussars	1	12½
Tunic	3	0
Flannel shirt	1	1½
Drawers	0	12½
Pantaloons	2	6
Braces	0	4
Socks	0	4½
Boots	4	11
Spurs	0	13½
Gloves	0	3½
Gauntlets (Lancers)	0	12
Girdle (Lancers')	0	2½
Total {Lancers	16	4½
Total {Hussars	15	4½

(*Arms, Accoutrements, &c.*)

	lbs.	oz.
Sword and belt, &c.	5	12
Haversack	0	9½
Water bottle, full, and strap	2	9
Pocket-knife and lanyard	0	5
Pouch belt	0	9
Pouch & 30 rds. of ammtn.*	3	13½
Carbine†	7	8
Lance	4	0
Pistol	2	4
Total {Lancer	25	2
Total {Hussar	24	6

Articles carried on the horse, and horse equipment.

(*Saddlery.*)

Saddle complete	22	0
Bridle complete	4	0
Breast plate	1	3
Crupper	0	12
Wallets, pair of	2	12½
Head rope	0	15
2 Shoe cases & 4 shoes	5	13
Numnah	2	12
Total	40	3½

(*Equipment on saddle.*)

Hoof picker	0	2
Nosebag	1	1
Heel rope and shackle	1	2
Picketing peg	0	12½
Lasso equipment, with long trace‡	10	0
Mess tin	1	3½
Mallet§	3	0
Carbine bucket	2	0
Total	6	5

(*Articles in wallets.*)

1 flannel shirt	1	1½
1 pair drawers	0	12½
1 hold-all (containing spoon, comb, and housewife)	1	0
1 pair socks	0	4½
1 towel	0	8
1 polishing brush	0	4
1 tin of grease	0	10
1 horse brush	0	9
1 curry comb	0	12
1 horse rubber	0	9
1 stable sponge	0	1
1 oil bottle	0	4
Pipeclay and sponge	0	5
1 pocket ledger	0	4
Total	7	4½

(*Articles in front of the saddle.*)

1 pair ankle boots, strapped on outside the wallets, as directed for farriers in the Cavalry Regulations	4	0

* An expense pouch will be issued for the additional 10 rounds of ammunition.
† 16 carbines for each squadron in Lancer Regiments.
‡ In regulated proportions.
§ When sabretache is worn, add 1 lb. 7 oz.

Articles carried on the horse, and horse equipment—continued.

(*Articles in front of the saddle*—cont.)

Forage cap	0	5
Cape	2	12
Total	7	1

(*Articles behind the saddle.*)

Cloak	7	1
Canvas or serge trousers	1	9
Corn sack	1	13
Picketing peg	0	12¼
Total	11	3¼

(*Articles behind the saddle*—cont.)

(The cloak to be rolled with the sleeves turned in at each end, so as to make the roll smaller in the centre. The jacket to be carried on the top of the cloak. The corn sack to be folded flat and placed in the jacket. The picketing peg on the top of all. The whole to be secured by the valise straps.)

	st.	lb.	oz.
Grand totals { Lancers	8	1	7¼
Grand totals { Hussars	7	12	12

DETAIL SHOWING HOW EQUIPMENT, STORES, &C., OF CAVALRY REGIMENTS ARE CARRIED.

No. I. Waggon

Head Quarters. Axes, felling, helved, 4½ lbs.	2
Blankets, grey, field service	62
Blankets, horse, coloured	4
Buckets, canvas	9
Buckets, leather	2
Hook, handled, bill	1
Kettles, camp, Flanders	2
Lanterns, brass, globular	2
Mallets	2
Mauls, wood, helved	2
Pads, for surcingles	4
Posts, wood, picket, 2½ feet	9
Rope, picket, 25 yards	1
Surcingles, web	4
Axes, pick, helved	2
Bar, iron, crow, 4 ft. 6 in.	1
Shovel, helved, universal	1
Spade, helved universal	1
Tools, sets of, carpenters', light	1
Tools, sets of, collarmakers	1
Tools, sets of, saddletree-makers'	1
Brush, carriage	1
Grease . . . . . lb.	6
Boxes, tin, half-round	2
Jack, lifting	1
Pin, linch	1
Rope, lashing	1
Washer, drag	1
Sacks, corn	4
Officers' baggage	8
,, cooking pots	3
Kits, Staff Sergeants'	10
Regimental books and stationery, in boxes	3

	Cwt.	qrs.	lbs.
Total weight	32	3	24

2 Drivers.
4 Draught horses.

No. II. Waggon

Qt. Mr. Stores. Flags, lance (Lancers only) spare	8
Matls. for repair of accoutrmts.	All
Axes, felling, helved, 4½ lbs.	2
Axes, hand, 2 lbs., handled	3
Blankets, grey, general service	2
Buckets, leather	2
Cords, forage, white 21ft. spare	31
Hook, handled, bill	1
Mallets, wood, handled, heel peg	2
Mauls, wood, helved	2
Pegs, wood, heel rope . spare	31
Posts, wood, picket, 2½ feet	14
Ropes, tarred, head with ring . spare	31
Ropes, tarred, picket, 3-inch, 25 yards	2
Axe, pick, helved	2
Bar, iron, crow, 5 ft. 6 in.	1
Shovel, helved, universal	1
Spade, helved, universal	1
Harness, spare, articles of	All
Bags, canvas, nose . spare	9
Materials for repair of harness	All
Signalling implements in chest	1
Tools, sets of, opening packages . . . . . in chest	1
Brush, carriage	1
Grease . . . . . lb.	7½
Oil, colza, for lanterns quarts	2
Oil, linseed ,,	½
Oil, rape, or sweet ,,	4
Other miscellaneous articles in Equipment Regulations.	
Boxes, tin, half-round	2
Jack, lifting	1
Pin, linch . . . . . spare	1
Rope, lashing	1
Shafts, framed, G.S., spare, pair	1
Washer, drag . . . spare	1
Wheel, spare, fore, if locked under	1
Wheel, spare, hind, if locked under	1
G.S. fore or hind, if equirotal	1
Implemts., butchery, in a case set	1
Oats, sacks, 5-bushel	4

	Cwt.	qrs.	lbs.
Total weight	32	3	0

2 Drivers.
4 Draught horses.

EQUIPMENT AND STORES OF CAVALRY REGIMENT: HOW CARRIED (*continued*).

	No. III. Waggon.		No. IV. Waggon.	
	No.	Gross weight.	No.	Gross Weight.
		lbs.		lbs.
Preserved meat, boxes	10	550	9	495
Biscuit, bags	4	408	3	306
Tea, canister	1	8	..	..
Coffee, case	..	..	1	16
Sugar, cases	1	60	1	60
Salt, canisters	1	13	1	13
Pepper, canister	..	..	1	2
Vegetables, compressed	..	..	..	48
Rum, 5-gallon kegs	1	60	1	60
Oats, sacks	8	1,312	8	1,312
Gross weight of Provisions		2,411		2,312
Axe, felling, helved, 4½ lbs.	1	..	1	..
Blankets, grey, general service	2	..	2	..
Buckets, leather	2	..	2	..
Hook, handled, bill	1	..	1	..
Mallets, wood, handled, heel peg	2	..	2	..
Mauls, wood, helved	2	..	2	..
Posts, wood, picket, 2½ ft.	6	..	6	..
Rope, picket, 25 yds.	1	..	1	..
Axe, pick, helved	1	..	1	..
Shovel, helved, universal	1	..	1	..
Spade, helved, universal	1	..	1	..
Brush, carriage	1	..	1	..
Grease lbs.	6	..	6	..
Boxes, tin, half-round	2	..	2	..
Pin, linch spare	1	..	1	..
Rope, lashing	1	..	1	..
Washer, drag spare	1	..	1	..
Oats, sacks, 5-bushel	4	..	4	..
Gross weight of Equipment	..		..	
Total weight	..	Cwt. qrs. lbs.	..	Cwt. qrs. lbs.
2 Drivers and 2 Draught horses each.				

N.B.—These tables are in course of alteration, and those here given represent the corrections up to the end of July, 1882.

EQUIPMENT AND STORES OF CAVALRY REGIMENT: HOW CARRIED (*continued*).

No. V. Cart S.A.A.	No.	No. VI. Waggon, Forge.	No.
Blanket, grey, field service .	2	Axe, felling, helved, 4½ lbs. .	1
Bucket, leather . . .	1	Blankets, grey, field service .	2
Tools, set of, small arm-cart .	1	Buckets, leather . . .	2
Brush, carriage . . .	1	Hook, handled, bill . .	1
Grease . . . . lbs.	3	Maul, wood, helved . .	1
Box, tin, half round . .	1	Posts, wood, picket, 2½ feet .	6
		Rope, picket, 25 yards . .	1
Boxes wood S.A. Ammunition ball, B.L. — Martini-Henry carbine 630 rounds (10,080); Revolver pistol 240 rounds (1200) . . .	16 5	Axe, pick, helved . . .	1
		Shovel, helved, universal .	1
		Spade, helved, universal . .	1
		Chests, veterinary appliances .	2
		Brush, carriage . . .	1
Pin, linch	1	Grease . . . . lbs.	6
Rope, drag, light . . pairs	1	Boxes, tin, half-round . .	2
Washer, drag	1	Jack, lifting	1
Sack, corn	1	Pin, linch	1
		Rope, lashing . . .	1
		Washer, drag	1
		Sacks, corn	4
		Tools, farriers' . . set	1
		Cwt. qrs. lbs.	
		Total weight 25 0 0	
2 Drivers.		2 Drivers.	
4 Draught horses.		4 Draught horses.	

EQUIPMENT AND STORES OF CAVALRY REGIMENT: HOW CARRIED (*continued*).

NO. VII. VIII. IX. & X. SQUADRON TRANSPORT WAGGONS.

	No. in each Wagon.	Total in the 4 Wagons.		No. in each Wagon.	Total in the 4 Wagons.
Axes, felling, helved, 4½ lbs.	1	4	Shovels, helved, universal	12	48
Axes, hand, 2 lb., handled	6	24	Spades, helved, universal	2	8
Bags, canvas, Flanders kettle	10	40	Tools, set of saddlers'	1	4
Blankets { grey, field service	144	575*	Brushes, carriage	1	4
Blankets { horse, with pads and surcingles	4†	16†	Grease . lbs.	6	24
Buckets { canvas	18	72	Oil, colza . quarts	2	8
Buckets { leather	2	8	Boxes, tin, half-round	2	8
Hooks, handled { bill	1	4	Pins, linch . spare	1	4
Hooks, handled { reaping	16	64	Ropes, lashing	1	4
Kettles, camp, Flanders	10	40	Washers, drag . spare	1	4
Lanterns, brass, globular	2	8	Troop books and stationery	..	..
Mallets, wood, handled, heel peg	18	72	Officers' baggage sets	6	23‡
Mauls, wood, helved	2	8	Oats, sacks, 5-bushel	4	16
Posts, wood, picket, 2½ feet	62	248			
Ropes, picket, 25 yards	10	40	Total weight { Cwt. qrs. lbs.		
Axes, pick, helved	5	20	2 Drivers and 4 Draught horses each.		

* 16 bâtmen for head-quarters deducted and 15 bandsmen added to total of four squadrons, *see* note on page 16.

† Part of veterinary stores.

‡ One Officer attached to head-quarters as Transport Officer.

RECAPITULATION OF TRANSPORT FOR A CAVALRY REGIMENT.

	Purpose.	Drivers.	Horses.
No. I. Waggon . . .	Hd. Qrs. Equipment, &c. .	2	4
,, II. ,, . . .	Q. M.'s Stores . . .	2	4
,, III. & IV. Waggon . .	Supply	4	8
,, V. Cart	S. A. A.	2	4
,, VI. Waggon . . .	Forge	2	4
,, VII. VIII. IX. & X. Waggon	Squadron Equipment, &c. .	8	16
Spare	.. ..	2	4
Total	.. ..	22	44
2nd Line, attached for Tents, &c.			
Four 4-horsed waggons . .	.. ..	8	16
GRAND TOTAL . .	.. ..	30	60

The drivers for the Regtl. Transport are supplied from the ranks of the Regt., and all Regtl. transport is under the command, and in direct charge of the O. C. the Regt.

There is no fixed war establishment for Cavy. Regts. in India ; the ordinary establishments are as follows :—British Cavy. Regt. consists of 6 Troops, 1 Lt.-Colonel, 1 Major, 6 Captains, 6 Lieutenants, 6 Sub-Lieutenants, 1 Pay Master, 1 Adjt., 1 Riding Master, 1 Q. M., 3 Medl. Offrs., 1 Vet. Surgeon, 1 Regtl. Sergt. Major, 1 Q. M. Sergt., 1 Band Master, 1 Pay Master Sergt., 1 Sergt. Instructor in Fencing, 1 Armourer Sergt., 1 Farrier Major, 1 Saddler Sergt., 1 Hospital Sergt., 1 Trumpet Major, 1 Orderly Room Clerk, 6 Troop Sergt. Majors, 18 Sergts., 6 Farriers, 6 Trumpeters, 24 Corporals, 384 Privates, and 436 troop Horses. In Bengal its native establishment of followers, &c., is :—Subt. Medl. and Hospl. Estabt., 62, 6 Farriers, 2 Jemadars of Syces, 2 Hospital Syces, 250 Troop Syces, 436 Grass Cutters, 35 for Q. M. estabt., and 15 for conservancy. In Madras, Subt. Medl. and Hospl. Establishment 4 : Jemadars of Syces 6 : Syces 162 : Grass Cutters 436 : and Q. M. estabt. 15. In Bombay, 47 for Subt. Medl. and Hospl. Estabt., 2 Jemadars of Syces, 2 Hospital Syces, 6 Muccadums of Syces, and 6 of Grass Cutters, 193 Syces, 146 Grass Cutters, 27 for Q. M., and 16 for Conservancy Establishments. In Bengal there are 24 Regts. of Native Cavalry, each consisting of 6 Troops, with 1 Commandant, 1 Second in Command, 2 Squadron Offrs., 1 Adjt., 2 Squadn. Subs., 1 Medl. Offr. (8 British Offrs.), 3 Russuldars, 3 Ressaidars, 1 Woordie Major, 6 Jemadars, 52 Duffadars, 1 Farrier Major, 1 Salootrie, 6 Trumpeters, 1 Assist. Salootrie, 6 Farriers, and 377 Sowars, or 457 Natives of all ranks. Its Native followers are 12, and 9 for Subt. Medl. and Hospl. Estabt. In Madras there are 4 Regts. of Native Cavly., in

which the British officers are the same as in Bengal. The Regt. consists of 6 Troops. It has 6 Subadars, 6 Jemadars, 31 Havildars, 24 Naicks, 7 Trumpeters, 13 Farriers, 300 Privates, and 40 Recruit and Pension Boys, or 427 Natives of all ranks. Its Native Estabts. are, 6 for Subt. Medl. and Hospl. Estabt., 16 Qr. M.'s Estabt., 6 Jemadars of Syces, 166 Syces, and 391 Grass Cutters. In Bombay there are 7 Regts. of Native Cavalry, each consisting of 6 Troops, and of 1 Commandant, 1 Second in Command, 2 Squadron Officers, 1 Adjutant, 2 Squadron Subalterns, 1 Medical Officer, 1 Russuldar Major, 5 Russuldars, 1 Wordee Major, 6 Naib Russuldars, 6 Jemadars, 1 Kote Duffadar Major, 1 Farrier Major, 6 Kote Duffadars, 30 Duffadars, 6 Trumpeters, 30 Naiks, and 400 Sowars. Total 493 Assamees. Its followers are, 9 Subt. Medl. and Hospl. Estabts., 5 for Q. M.'s Estabt., and 10 others. Besides the above, which may be termed the Regts. of Regular Native Cavalry, there is a very large number of other corps with various establishments. The native cavalry regiments sent to Malta in 1878 (those sent to Abyssinia were of similar strength) consisted of (each) 10 British Officers (2 being M. Os.), 14 Native Officers, 462 Rk. & File, 504 horses (including officers' chargers), 414 native followers (including officers' servants), 249 ponies and 13 bullocks. The Hospl. estabt. consisted of 3 Hospl. Assists., 8 other native servants, and 74 Dooly-bearers (these 85 natives included in the 414 native followers), with 5 Doolies, 9 Dandies, and 2 stretchers. Each British officer was allowed to embark 1 personal servant, and 1 for each of his chargers. The English officers were allowed to take 1 bhistee to every 6, and 1 Dhobee and 1 sweeper to every 10 officers; F. Os. to take 320 lbs. of baggage, other ranks 240 lbs., 1 personal servant was allowed to embark for every 2 native officers, each native officer was allowed 40 lbs. of baggage. For the officers' mess, 3 native servants and 1280 lbs. of baggage were permitted; 80 lbs. was allowed to the Adjt. and to the Q. M. for their offices. For Q. M.'s stores for 3 months' supply 320 lbs. was allowed to each regiment. The following tools packed in 2 prs. of camel Khajawahs were taken with each regiment. Each native officer was allowed to take a second charger, but whether he did or not was obliged to keep up at his own cost, 1 pony and 1 servant as syce and grasscutter; the N. C. Os. and privates were obliged to keep the same between every two.

Infantry in our army, is really only of two sorts, the guards and the line; for although the latter are divided nominally into fusileers, light infantry, rifles, and heavy regiments, there is no material difference in their arms or practical equipment. The standard of height in the guards is always some 3 or 4 in. higher than for other regiments. At present the height for the foot guards is 5′ 8″, and for the line 5′ 4″, the chest measurement of 34″ being the same for both. All are armed with the M. H. rifle, which is issued of two sizes, "Long butts" and "Short butts," 49½″ and 49″ in length respectively without bayonet; when bayonets or sword bayonets are fixed those lengths are 71½″ and 71″. The weights without bayonet are, 8 lbs. 10½ oz. and 8 lbs. 8 oz.: with bayonet or sword bayonet those weights

are, 9 lbs. 10 oz. and 9 lbs. 7½ oz. The bayonet or sword bayonet weighs 15½ oz. and the scabbard 7½ oz. The Henry barrel is 33″ in length, the diameter of bore is 0·45″ ; it has 7 grooves. The powder charge is 85 grs., the bullet weighs 480 grs., and is 1·27″ long. The cartridge is 3·15″ long, and a bundle of 10 weighs 17 oz. The rifle is sighted up to 1450 yds, but it shoots well up to over 3000 yds. Its muzzle velocity is about ·1353′. The bullet has a penetration 12″ or 13″ into loose soil. *The sword bayonet*, saw-backed, weighs 25½ oz., or with scabbard 33 oz. ; its extreme length is 24″. Of all the new arms now in use by the great military nations, the M. H. has the largest calibre, the heaviest bullet, heaviest charge, and the lowest muzzle velocity.

The names of the rifles in use by foreign armies are, the Werndl in Austria, the Gras in France, the Mauser in Germany, the Vetterli in Italy, and the Berdau in Russia.

The Militia, Volunteers, and native troops of India are unfortunately still armed with the *Snider rifle*. It is of two sizes, the "Long butt" and the "Short butt" ; the former weighs 9 lbs. 0¾ oz., the latter 8 lbs. 14¾ oz. The bayonet weighs 13½ oz., and when fixed extends 17½″ beyond the muzzle. The "Long butt" rifle is 55″ and the "Short butt" 54″ long. There is also the "Short" Snider with which our Rifle Regts. were formerly armed, it weighs from 8 lbs. 4 oz. to 8 lb. 11 oz., and is from 48¾″ to 49″ long, according to the pattern. The calibre of all patterns is 0·577″. It is only sighted up to 950 yds. The bullet weighs 480 grs. ; the powder charge is 70 grs. ; a packet of 10 cartridges weighs 16 oz.

There are 3 regts. of Guards (7 battalions in all) ; they do not serve abroad, except in big wars. The line consists of 69 regts., all of two line battals. and from one to five battals. of militia each, except the Cameron Highlanders, which has but one line battal., and the King's Royal Rifles and the Rifle Brigade, which have four line battals. each. There are thus 141 battalions of the line and 68 battalions of militia. Each of these regts. has a depot permanently located in the county or town to which it belongs. In a normal condition of peace one-half of the line battalions will be abroad, the other half at home.

The Regimental Entrenching Tools to accompany a battalion of infantry are carried in one cart, and Os. C. battalions will be held responsible for their safety. When not in use they should always be kept packed in the cart ; they are to be used for all regimental purposes, such as making trenches round tents, digging latrines, &c., &c., as well as for entrenchments, so as to render unnecessary the issue of a second set of tools for such work. They should be under the immediate charge of the regimental Q. M., who will issue them as required to captains of companies, receiving them back again as soon as they are done with.

Regimental Reserve Ammunition to consist of 30 rounds per man; as each soldier is to carry 70 rounds (40 in pouch, 10 in expense bag, and 20 in valise), there will be with the battalion 100 rounds for every man in it. Three ammunition carts (new pattern) will carry 28,800 rounds of Martini-Henry (each cart carries 9600 rounds), or 26,880 rounds of Snider (each cart carries 8960 rounds). See page 93.

This regimental transport will be supplied to each battalion immediately it takes the field; the O. C. the battalion to be responsible for its efficiency; the drivers are selected by him from the ranks of the battalion.

To look after the officers' chargers and other horses belonging to each infantry brigade, a vet. surgeon is attached to its staff; the repairs to harness and shoeing of regimental transport will be done by the regimental artificers; the repair of all regimental transport carriages, and shoeing of S. Os. horses will be done by the artificers of the transport section attached to the brigade, who will also execute any repairs, &c., which the regimental artificers are unequal to perform.

Indian Establishments.—There is no war establishment for troops in India; the normal establishment of infantry is, British, 8 companies, 30 offrs., 49 N. C. Os. and 836 rk. and file. Native, companies, 7 British offrs., 16 N. offrs., 40 N. C. Os., and 656 rk. and file.

WAR ESTABLISHMENT OF A BATTALION. (8 comps.)

Ranks.	Nos.	Nos.	Horses Riding. C.	Horses Riding. P.	Horses D.
Lieut. Colonels	2	..	4	..	
Majors	4	..	4	..	
Captains	4				
Subalterns	16	..	..	1*	
Adjutant	1	30	1	..	
Paymaster	1	..	..	1	
Quarter-Master	1	..	..	1	
Medical Officer	1	..	..	1	
Sergeant-Major	1				
Q. M. Sergeant	1				
Band Sergeant	1				
Drum-Major	1				
Orderly-Room Clerk	1	10			
Armourer Sergt.†	1				
Paymaster Sergt.	1				
Regtl. Transpt. Sergt.	1	..	..	1	
Sergeant Cook	1				
Pioneer Sergeant	1				
Colour Sergeants	8	40			
Sergeants	32				
Drumms. or Bugls.	16	16			
Corpls. (1 Band Corpl.)	41				
Pioneers & Artificers	13	1000			
Band	20				
Privates	904				
Drivers §	22				44
Totals	1097	1096	7	5	44

Establmt. of a Comp.	
Officers	3
Sergeants	5
Drumms. or Bugls.	2
Corporals	5
Privates	113
Drivers	1
Totals	129

In this table, C. stands for chargers, P. for riding horses that are public property, and D. for draught horses.

Ranks.	Nos.
Detail attached to the Battn. Hd.-Qrs.	
Officers, including Transpt. Officer	8
S. Ss. including Transpt. Sergt. and Sergt. Cook	8
Pioneers	14
Band	22
Rk. & Fl. as Bâtmen	16‡
Drivers	14
Total	16‡ / 66

Transport.	Nos.	Drivers.	D. Horses.
1st Line, without tents			
Carts { intrench. tools	1	1	2
Carts { S. A. A.	3	3	6
Waggons, G. S.	8	16	32
Spare	..	2	4
Total	12	22	44
2nd Line, for tents § Waggons, G. S. (attached)	3	6	12
Grand Total	15	28	56

Ammunition.	In Pouch.	Regl. Reserve.
Rifle	68·950	28·800
Pistol	168	720

* For Transport Officer.
† To remain at Base of operations.
‡ These Bâtmen, although attached to the Battn. Hd. Qrs., are included in the establishment of the companies.
§ If tents are carried, 6 drivers and 12 horses are attached from departmental transport.

LIST OF EQUIPMENT, S.A.A., STORES, &c., CONVEYED BY A BATTALION.

	No.	Weight of each article.
Axes, felling, helved	25	4½ lbs.
,, hand, handled	54	2 lbs.
,, pick, helved	9	6½ lbs.
Bags, canvas, camp kettle, Torrens'	208	3½ lbs.
,, nose	spare 2	
Bars, iron, crow { 5′ 6″	2	
Bars, iron, crow { 4′ 6″	2	
Blankets, grey, field service	1115	4 10/16
,, horse, coloured	5	6¼
Boxes, tin, grease, half-round	20	18 oz.
Brushes, carriage, water	12	
Buckets { canvas	38	
Buckets { leather	20	
Cartridges, B. L. { M. H.	28,800	
Cartridges, B. L. { pistol	600	
Cords, forage	spare 5	
Cooking pots, sets for officers		
Grease for wheels	16s. 112	
Haversacks	spare 10	
Hooks, handled, bill	50	1¾
,, ,, reaping	5	10 oz.
Harness and saddlery, spare sets of		
Implements, butchery, in a chest	set 1	
Jacks, lifting	3	19
Kettles, camp, Flanders	3	3½
,, ,, Torrens'	208	3½
Kits, Staff Sergeants'	8	
Lanterns, brass, globular, in a box	2	
Mallet, handled, picket peg	1	
Materials for repairing arms		
,, ,, accoutrements		
,, ,, saddlery		
Miscellaneous stores		
Officers' baggage	31	
Oil, colza	qts. 5	
Pads for surcingles	5	
Pegs, wood, picket	spare 5	
Picks, light, helved	150	
Pins, linch	spare 12	4 oz.
Regimental books and stationery		

LIST OF EQUIPMENT, S.A.A., STORES, &C., CONVEYED BY A BATTALION—*continued.*

	No.	Weight of each article.
Ropes, drag, light . . . . . pairs	3	
,, lashing	8	1¼
,, picket, white, 16 yds	8	
Sacks, corn, cavalry	22	
Shafts, spare, S.A.A., cart	1	
,, ,, framed G.S. . . . . pair	1	
Shovels, helved, light	150	
,, ,, universal	9	
Signalling implements, chest of	1	
Spades, helved	10	
Stretchers, ambulance	8	
Surcingles, web	5	
Tools, sets of, carpenters', plain	1	77
,, ,, collarmakers'	1	
,, ,, opening packages	1	
,, ,, S.A.A. cart	3	
Washers, spare	12	19 oz.
Wheels, spare, hind	1	

INFANTRY SOLDIER'S EQUIPMENT IN THE FIELD.

Arms and Accoutrements.	Weight.	Articles Worn by the Soldier.	Weight.	Valise and Articles Carried in it.	Weight.
	lbs. oz.		lbs. oz.		lbs. oz.
Pouches . . .	1 0	Helmet . . .	0 15	Great-coat and cape . .	6 10
Waistbelt & frog	0 13	Frock . . .	2 6		
Ammunition (70 rounds . .	7 13	Shirt (flannel) .	1 2	Shirt (flannel) .	1 2
		Trousers . .	2 4	Socks	0 4½
Rifle (complete) .	8 14	Braces . . .	0 3½	Towel . . .	0 8
Bayonet . . .	1 8	Socks . . .	0 4½	Spoon . . .	0 1¾
Scabbard . . .	0 9	Leggings . .	0 13	Comb	0 0½
Knife & lanyard	0 6	Boots . . .	3 3	Polishing brush .	0 4½
Water-bottle (full)	2 9			Tin of grease .	0 6½
Mess tin . . .	1 6½			Housewife . .	0 4½
Haversack . .	0 8½			Sponge . . .	0 0½
				Boots	3 3
				Glengarry cap .	0 4
				Pocket ledger .	0 2
				Valise & straps .	4 4
Total . .	25 7	Total . .	11 2¾	* Total . .	18 7¾

Recapitulation, valise and kit 18 lbs. 7¾ oz., arm and accoutrements 25 lbs. 7 oz., clothes worn 11 lbs. 2¾ oz.

* The regulations lay down that a holdall and a pair of trousers should also be included in the soldier's field kit. I don't think them necessary, and have therefore omitted them.

TRANSPORT FOR A BATTALION.

		Purpose.	Drivers.	Horses.
No. I.	Waggon . .	Head-Quarters, Equipment, &c.	2	4
,, II.	,, ...	Quarter-Masters' Stores . .	2	4
,, III.	Cart	Intrenching tools	1	2
,, IV. ,, V. ,, VI.	Carts	S. A. Ammunition	3	6
,, VII. ,, VIII.	Waggons . . .	Supply	4	8
,, IX. ,, X. ,, XI. ,, XII.	Waggons . . .	Transport for two companies	8	16
Spare		. . . . .	2	4
Total		. . . . .	22	44
2nd Line, attached for Tents, &c.				
Three—4-horse waggons . .		. . . . .	6	12
GRAND TOTAL . . .		. . . . .	28	56

DETAIL OF INFANTRY TRANSPORT.

No. I. Waggon.—Head-quarters.	No.
Axe { felling, 4½ lbs. helved	1
Axe { hand, 2 lbs., handled	6
Blankets, grey, field service	49
Buckets, leather	2
Hook, bill, handled	1
Rope, picket, white, 16 yds.	1
Axe, pick, helved, 6½ lbs.	1
Shovel, helved, universal	1
Spade, helved	1
Tools, artificers, sets of { carpenters',	1
Tools, artificers, sets of { plain	1
Tools, artificers, sets of { collarmakers'	1
Brush, carriage, water	1
Grease, for wheels . . . . lb.	6
Boxes, tin, grease, half-round	2
Jack, lifting	1
Pin, linch, spare	1
Rope, lashing	1
Washer, spare	1
Sacks, corn, Cavalry	2
Officers' baggage	8
Cooking pots	All
Kits, Staff Sergeants'	8
Regimental books and stationery	..
Total weight. cwt. 32 qrs. 3 lbs. 4	
2 Drivers.	
4 Draught horses.	

No. II. Waggon.—Q. M.'s Stores.	No.
Materials for repairing arms	All
Haversacks	10
Materials for repairing accoutrements	All
Axe, felling, 4½ lbs., helved	1
Blankets { grey, field service	50
Blankets { horse, coloured	5
Buckets { canvas	6
Buckets { leather	2
Cords, forage, or head rope	5
Hooks, handled { bill	1
Hooks, handled { reaping	5
Kettles, camp, Flanders	3
Lanterns, brass, globular	2
Mallet, handled, picket peg	1
Pads for surcingles	5
Pegs, wood, picket	5
Rope, picket, white, 16 yards	1
Surcingles, web	5
Axe, pick, helved, 6½ lbs.	1
Shovel, helved, universal	1
Spade, helved	1
Harness and saddlery, spare, { parts of	All
Bags, nose	2
Materials for repair of saddlery	All
Tools, artificers, opening packages, sets of	1
Signalling implements, chest of	1
Brush, carriage, water	1
Grease for wheels . . . . lb.	58
Oil, colza . . . . . quarts	5
Miscellaneous stores	All
Boxes, tin, grease, half-round	2
Jack, lifting	1
Pin, linch, spare	1
Rope, lashing	1
Shaft, spare, ammunition cart	1
,, ,, framed G.S.	1
Washer, spare	1
Wheels, spare, hind	1
Implements, butchery, sets, in chest	1
Sacks, corn, Cavalry	2
Total weight. cwt. 28 qrs. 2 lbs. 0	
2 Drivers.	
4 Draught horses.	

DETAIL OF INFANTRY TRANSPORT—*continued.*

No. III. Cart. Intrenching Tools.	No.	No. IV., V., VI. Class. S.A.A.	In each Cart.	In 3 Carts.
Axes, felling, 4½ lbs., helved	17	Blankets, grey, fd. service	1	3
Blanket, grey, field service	1	Buckets, leather	1	3
Bucket, leather	1	Tools, artfs., S.A.A. cart sets of	1	3
Hooks, bill, handled . . .	42	Brushes, carriage water .	1	3
Axe, pick, helved, 6½ lbs. .	1	Grease for wheels . lbs.	3	9
Bars, iron, crow { 5 ft. 6 in. / 4 ft. 6 in.	2 / 2	Boxes, tin, grease . . .	1	3
Picks, light, helved . . .	150	Cartridges, B.L. { M. H . / pistol .	9,600 / 200	28,800 / 600
Shovels { light . . . . / universal . . .	150 / 1	Pins, linch, spare . . .	1	3
Spades, helved	2	Ropes, drag, light . pairs	1	3
Brush, carriage, water . .	1	Washers, spare	1	3
Grease for wheels . . lb.	3	Sacks, corn, Cavalry . .	1	3
Box, tin, grease, half-round	1			
Pin, linch, spare	1			
Washer, spare	1			
Sacks, corn, Cavalry . . .	3			
cwt. qrs. lbs.		cwt. qrs. lbs.		
Total . 18 3 0		Total wt. for each 6 3 0		
1 Driver. 2 Draught horses.		1 Driver and 2 Draught horses each.		

DETAIL OF INFANTRY TRANSPORT—*continued.*

Waggons. [Nos. / Supply Purposes.	VII. No.	VII. Gross Wt.	VIII. No.	VIII. Gross Wt.	Nos. IX., X., XI., XII. Waggons, For 2 Companies.	In each Waggon.	In 4 Waggons.
		lbs.		lbs.			
Preserved Meat, boxes	16	880	15	825	Axes { felling, 4½ lbs., helved	1	4
Biscuit, bags	6	618	5	515	Axes { hand, 2 lbs., handled	12	48
Tea, canister	1	40	..	..	Bags, canvas, camp kettle	52	208
Coffee, case	..	..	1	40	Blankets, grey, field service	252	1,008
Sugar, cases	1	60	2	120	Buckets { canvas	8	32
Salt, canisters	2	25	1	13	Buckets { leather	2	8
Rum, 10-gallon kegs	1	119	1	119	Hooks, bill, handled	1	4
Oats, sacks	1½	250	2	330	Kettles, camp, Torrens'	52	208
Gross wt. of Provisions	..	1992	..	1962	Ropes, picket, white, 16 yds.	1	4
Axes, felling, 4½ lbs., helved	1	..	1	..	Axes, pick, helved, 6½ lbs.	1	4
Blankets, grey, field service	2	..	2	..	Shovels, universal, helved	4	4
Buckets, leather	2	..	2	..	Spades, helved	1	4
Hook, bill, handled	1	..	1	..	Brushes, carriage, water	1	4
Rope, picket, white, 16 yds.	1	..	1	..	Grease, for wheels lbs.	6	24
Axe, pick, helved, 6½ lbs.	1	..	1	..	Boxes, tin, grease	2	8
Shovel, helved universal	1	..	1	..	Pins, linch, spare	1	4
Spade, helved	1	..	1	..	Ropes, lashing	1	4
Brush, carriage, water	1	..	1	..	Stretchers, ambulance	2	8
Grease for wheels lbs.	6	..	6	..	Washers, spare	1	4
Boxes, tin, grease	2	..	2	..	Sacks, corn, Cavalry	2	8
Jack, lifting	1	..	1	..			
Pin, linch, spare	1	..	1	..			
Rope, lashing	1	..	1	..			
Washer, spare	1	..	1	..			
Sacks, corn, Cavalry	2	..	2	..			
Gross wt. of Equipment	..	..	..	..			
cwt. qrs. lbs. Total wt. 2 Drivers and 4 Draught horses each.					cwt. qrs. lbs. Total wt. 28 3 0 2 Drivers and 4 Draught horses each.		

The Establishment of a Battn. of British Infy. in India consists of 8 Companies, and of 1 Lieut.-Colonel, 2 Majors, 8 Captains, 10 Lieutenants, 6 Sub-Lieutenants, 1 Paymaster, 1 Adjutant, 1 Quarter Master, 1 Sergeant Major, 1 Trained Band Master, 1 Quarter-Master Sergeant, 1 Paymaster Sergeant, 1 Sergeant Instructor of Musketry, 1 Armourer Sergeant, 1 Hospital Sergeant, 1 Drum Major, 1 Orderly Room Clerk, 8 Colour Sergeants, 32 Sergeants, 16 Drummers, 40 Corporals, and 780 Privates.

Its Native estabts. consist of, in Bengal, Subt. Medl. and Hospl. Estabt., 75; Q.M.'s Estabt. 45, and for conservancy purposes, 24. In Madras of 19 Native followers and 3 Medl. Subordinates; and in Bombay of, Subt. Medl. Estabt. 47; Q.M.'s Estabt. 35, and for conservancy 22.

The establishments of Native Infantry are as follows:—8 Companies, 1 Commandant, 1 second in command, 1 Wing Officer, 1 Adjt., 1 Qr. Master, 2 Wing Subs., and 1 M. O.; that is 8 British Officers for the Regts. of all 3 Presidencies. In Bengal there are 60 Regts. Each Regt. has 8 Subedars, 8 Jemadars, 40 Havildars, 40 Naicks, 16 Drummers, and 600 Sepoys, or 712 Natives of all ranks, together with 14 for Subt. Medl. and Hospl. Estabt., and 31 Native followers.

In Madras there are 40 Regts., the detail is the same as in Bengal, except they have 1 extra Havildar, and 56 Pension and recruit boys, making the total strength in Natives of all ranks 769 for each Regt., together with 4 for Subt. Medl. and Hospl. Estabt., and 20 Native followers.

In Bombay there are 30 Regts. Each Regt. consists of 8 Subedars, 8 Jemadars, 40 Havildars, 40 Naiks, 16 Drummers, 600 Sepoys, and 24 boys, or 736 of all Ranks (Native). Non-effective Native Staff (included in these foregoing numbers), 1 Subedar Major, 1 Native Adjutant, 1 Drill Havildar, 1 Drill Naik, 8 Colour Havildars, 8 Pay Havildars, 1 Drum Major, 1 Fife Major; this is in addition to 14 for Subt. Medl. and Hospl. Estabt., and 11 Native followers.

In addition to these Regts. there is in all 3 Presidencies a large number of other Infantry corps of various establishments.

The N. I. Regts. sent to Malta in 1788 (those employed in Abyssinia were of about similar strength) consisted of 8 Combatant and 2 Medl. Os. (10 British Offrs.), 14 Native Offrs., 701 Rk. and Fl. With each of the Bengal Regts. there were 141 public and 38 private followers, and with each from Bombay the numbers were 138 and 132 respectively. 10 Offrs. chargers, and 4 bullocks. The Hospl. Estabt. sent with each Regt. (their numbers are included in the public followers) consisted of 3 Hospl. Assists., 7 Native servants, and 86 Dooley-bearers, 7 Doolies, 9 dandies and 2 stretchers. The British Officers were each allowed to embark 1 personal servant, and 1 servant for each charger; F. Os. 320 lbs. of baggage, all other ranks 240 lbs. Each Regtl. mess allowed to embark 3 servants and 1280 lbs. of stores, &c.; 80 lbs. for the Adjt's., and 80 lbs. for the Q.M.'s offices. The British Offrs. were allowed to have 1 Bhistee to every 6, 1 Dhobee and 1 sweeper to every 10 officers. Every 2 N. Offrs. were allowed to take 1 servant.

Artillery is divided in our army into horse, field, and garrison batteries. The tactical unit is the battery, but for purposes of administration, the corps is divided into brigades, having generally 8 batteries in each. The men of the horse and field batteries are divided into gunners, drivers, and artificers. There is a battery of H. A. to each cavalry brigade; the artillery with each army division consists of 3 fd. batts., and the army corps artillery of 3 batts. of H. A. and 2 batts. of fd. artilly. The batty. consists of 6 pieces told off into 3 divisions of 2 guns each, and into 6 sub-divisions of one gun each. In Austria and Russia the batty. consists of 8 pieces. Our artillery is now being slowly rearmed, the very inferior R. M. L. 9 pr. being replaced by the K. B. L. 13 pr., and it is intended to replace the R. M. L. 16 pr. by a B. L. gun of heavier calibre. At present we have for the H, A. the old R. M. L. 9 pr., the R. M. L. 13 pr., and the R. B. L. 13 pr. For the mountain artillery we have the R. M. L. 7 pr. of 3 patterns weighing 150, 200, and 400 lbs. respectively; the last pattern is in two pieces which, when required for action, are screwed together.

DETAIL OF BATTERY ESTABLISHMENTS.

Officers and Men.	R.H.A.	Field. 16-pr.	Field. 9-pr.	Field. 13-pr.	Garrison.
Major	1	1	1	1	1
Captain	1	1	1	1	1
Lieutenants	3	3	3	3	2
Surgeon	1	1	1	1	..
Vet.-Surgeon	1	1	1	1	..
	7	7	7	7	
Sergeant-Major	1	1	1	1	1
Qr.-Mr.-Sergeant	1	1	1	1	..
Sergeants	6	6	6	6	5
Corporals	6	6	6	6	5
Bombardiers	6	6	6	6	5
Gunners	70	87	72	72	120
Drivers	72	75	64	65	..
Trumpeters	2	2	2	2	2
Farrier	1	1	1	1	..
Shoeing Smiths	5	4	4	4	..
Collarmakers	2	2	2	2	..
Wheelers	2	2	2	2	..
Totals	181	200	174	175	142
Rounds per gun	148	100	148	142	..

Horses.	R.H.A.	Field. 16-pr.	Field. 9- & 13-prs
Officers { Private	15	2	2
Officers { Public	..	6	6
Staff Sergeants	2	2	2
Non-Com. Officers	12	12	12
Farrier	1	1	1
Shoeing Smiths	3	1	1
Trumpeters	2	2	2
Gunners	36	..	..
Spare, Riding	6	4	4
Total	77	30	30
Guns	36	48	86
Waggons—			
gun ammunition	36	48	36
forage limber up	6	6	6
ammunition & store	12	12	12
do. do. for supply	4	4	4
Spare, Draught	12	10	8
Total Horses	183	158	132
Waggons—			
ammunition R.M.L.	6	6	6
forge, limber up	1	1	1
ammunition & store	3	3	3
Total	16	16	16

When tents and horse blankets are carried 2 G. S. waggons, 4 drivers, and 8 horses are attached to each battery from departmental transport.

The Mountain Battery has the same number of officers, N. C. Os., trumpeters, gunners, and artificers as the 9-pr. battery, but in lieu of the 64 drivers it has 94 hired muleteers. Each officer is allowed one horse (the V. S. has 2, one being his private property). A horse is allowed to each S. sergt.; each sergeant, farrier, and trumpeter, and one of the 4 shoeing smiths is also mounted, and 4 spare riding horses are allowed, making a

total of 28 riding horses, 110 mules to carry the guns, ammunition, &c., &c., but if tents are to be carried extra pack animals will be required.

The establishments of Batteries serving in India are as follows :—

Battery of H. A.—1 Major, 1 Captain, 3 Lieutenants, 1 Assistant Surgeon, 2 Staff Sergeants, 6 Sergeants, 6 Corporals, 6 Bombardiers, 76 Gunners, 54 Drivers, 2 Trumpeters, 1 Farrier, 2 Shoeing Smiths, 1 Collar-maker, 1 Wheeler. Total number 163. Horses, 178. Its Native estabt. for all 5 Presidencies is, 3 Jemadars of Syces and 118 Syces, 178 Grasscutters; in Bengal there are of Artificers and others 37, for Conservancy and the Subt. Medl. and Hospl. estabt. consists of 25. In Madras 3 Bullock Drivers, and 29 others, with a Subordt. Medl. establishment smaller than in Bengal. In Bombay there are 4 Bullock Drivers, 7 for Conservancy establishment, 27 others and a Subt. Medl. and Hospl. estabt. about the same as in Madras.

Field Battery, R. A.—1 Major, 1 Captain, 3 Lieutenants, 1 Assistant Surgeon, 2 Staff Sergeants, 6 Sergeants, 6 Corporals, 6 Bombardiers, 76 Gunners, 54 Drivers, 2 Trumpeters, 1 Farrier, 2 Shoeing Smiths, 1 Collar-maker, 1 Wheeler. Total number, 163. Horses, 110. Its Native estabt. in all 3 Presidcs. consists of Jemadars of Syces, 71 Syces, 110 Grasscutters, 3 Bullock Drivers; in Bengal there are 34 Artificers and others, 6 for Conservancy, and 25 for Subt. Medl. and Hospl. estabts. In Madras it is 17 others, and a Hospl. estabt. somewhat smaller than in Bengal. In Bombay, there are besides 7 for Conservancy, 27 others, and only 37 instead of the 110 Grasscutters allowed in the other 2 Presidencs.; its Hospl. estabt. is about the same as in Madras.

Heavy Field Battery, R. A.—1 Major, 1 Captain, 3 Lieutenants, 1 Assistant Surgeon, 2 Staff Sergeants, 4 Sergeants, 4 Corporals, 4 Bombardiers, 72 Gunners, 2 Trumpeters. Total number, 82. Horses, 5. In Bengal its native estabt. is 17 for Subort. Medl. and Hospl. estabt.; 6 for Conservancy, 1 Jemadar, and 6 Sirdar Drivers, 145 Drivers, 1 Jemadar Mahout, and 9 Mahouts, and 42 others. In Madras it is 1 Jemadar and 6 Sirdar Drivers, and 145 Drivers, 1 Jemadar Mahout, and 9 Mahouts, and 53 others. Medical establishment smaller than in Bengal. In Bombay the number of Drivers and Mahouts is the same; 6 are allowed for Conservancy, 52 for other purposes, and a Hospl. estabt. about the same as in Madras. Its armament in all 3 Presidencies is, 2 18-pr. S.B. guns; 1 8-in. iron Howzr., 2 8-in. iron mortars, and 2 5½-in. bronze mortars, 7 gun and platform carriages, and 22 ammtn. waggons, 9 Elephants, and 290 Bullocks.

Garrison Battery, R. A.—1 Major, 1 Captain, 3 Lieutenants, 1 Staff Sergeant, 4 Sergeants, 4 Corporals, 4 Bombardiers, 72 Gunners, 2 Trumpeters. Total number, 92. In Bengal its native estabt. is, 16 for Subt. Medl. and Hospl. estabt.; 6 for Conservancy, and 15 others. In Madras it is 40 native followers; the Subt. Medl. estabt. is small. In Bombay, it is 17 followers with a Hospl. estabt. about the same as in Madras.

FIELD GUNS.—*The R. M. L.* 16 *pr.* Total L. 78″; L. of bore 68·4″;

cal. 3·6″ ; grooves, 3 ; Wt. 1355 lbs. *Common shell* filled with 18 oz. B. C., Wt. 16 lbs. 3 oz. ; *shrapnel* filled with 128 bullets (72 at 18 per lb. and 56 at 84) and 1½ oz. B. C., 17 lbs. 14½ oz. ; *case*, holding 176 balls at 16½ per lb. 15 lbs. 3 oz. *Charge*, 3 lbs. R. L. G. powder. M. V. 1355′. *Ammunition* 100 rds. per gun, carried on gun limber (24 rds.) and on ammunition waggon (48 rds.) and limber (24 rds.) with 4 rds. of case on the gun axletree : each box on limber and waggon contains 9 shrapnel and 3 common shells. *Range*, at an elevation of 10° 9′ its range is 3700 yds., and of 12° 12′, 4200 yds.

The R. M. L. 13 pr. Total L. 92″ : L. of bore 84″ ; cal. 3″ ; grooves 10 ; weight 8 cwt. ; *common shell* filled with 10 oz. B. C. = 13 lbs. 4 oz. : *shrapnel* filled with 116 balls (34 per lb.) and ¾ oz. B. C. = 13 lbs. 4 oz. : *case* holding 340 balls (34 per lb.) 13 lbs. 7½ oz. *Charge*, 3 lb. 2 oz. R. L. G. M. V. 1595′. *Range*, at an elevation of 10° 4′ its range is 4300 yds. and of 19° 6′ 6000 yds. *Ammunition*, 142 rds. per gun (30 common shell, 108 shrapnel, and 4 case) the gun-limber carries 34 and the waggon 104 shells : 2 rds of case are carried on the gun-carriage and 2 in the waggon.

The R. B. L. 13 pr. Total L. 88·5″ : L. of bore, 84″ : cal. 3″ : grooves 13 : weight 8½ cwt.

The R. M. L. 9 pr. Total L. 74·2″ : of bore 66″ : cal. 3″ : grooves 3 : wt. 6 cwt. : *common shell* filled with 7·5 oz. B. C. Wt. 7 lbs. 5 oz. : *shrapnel* filled with 63 balls 9 lbs. 12¾ oz. : *case* 110 balls, 9 lbs. 12 oz. *Charge*, 1¾ lbs. M. V. 1391′. *Ammunition*, 148 rds. per gun (36 rds. in 2 boxes, each holding 14 shrapnel and 4 common shells on limbers, and 72 rds. on waggon body in 4 boxes, each box same as those on limbers), and 4 rds. of case carried on axletree arm of gun. *Range*, at an elevation of 10° 21′ with shrapnel, 3300 yds.

The R. M. L. 7 pr. (150 lbs.) Total L. 29·125″ : of bore 2′ : cal. 3″ : grooves 3 : *common shell* filled with 7 oz. B. C. 9 lbs. 5 oz. : *double* with 1 lb. B. C. 12 lbs. : *shrapnel* filled with 42 balls and 8 drams B. C. 7 lbs. 6 oz. : *case* filled with 70 balls 6 lbs. 4 oz. *Charge* 6 oz. F. G. powder for common and shrapnel, and 4 oz. for double shell. M. V. 673′. *Range*, case effective to 200 yds. : shrapnel should not be fired beyond 650 yds. : double shell intended as a substitute for vertical fire from the old 4·4″ mortars : at an elevation of 10° 14′ with common shell, 1500 yds. The wt. of gun-carriage with wheels 306 lbs.

The R. M. L. 7 pr. (200 *lbs. pattern*). Total L. 41″ : of bore 36″ : cal. 3″ : grooves 3 : projectiles as for lighter guns. *Range* with double shell 12 lbs. and charge 4 oz. at 10° 20′ elevation 830 yds. : at 20° 14′ 1370 yds. : at 30° 16′ 1740 yds. : with common and shrapnel shell at 4° 25′ 800 yds. : at

10° 14′ 1500 yds. *Charges*, 12 oz. for common shell and shrapnel, and 8 and 4 oz. for double shell. M. V. 968′. The weight of gun-carriage with wheels 350 lbs. or when packed 550 lbs. : of limber with wheels 382 lbs., or packed with common shell 512 lbs. or with double shell 526 lbs. Each Mountain Batty. carries per gun, 48 common, 10 double, 32 shrapnel and 4 star shells and 12 rds. of case.

The R. M. L. 7 pr. (*400 lbs. pattern*) is in two pieces, the breech and the muzzle portion, weighing 201 and 199 lbs. respectively. When put together, L. of gun is 70 45″, of bore 66·5″ : cal. 2·5″ : grooves 8 : *common shell* filled with 4 oz. B. C. 7 lbs. ; *case* containing 159 balls (34 per lb.) 6 lbs. 12 oz.

Fuzes are of three sorts, the Time Fuze, the Percussion, and the Double Action or Time and Percussion Fuzes. They are packed by fives in tin cylinders. The 15 secs. wood time fuzes and the percussion R. L. fuzes are those now commonly used in our Field Artillery.

The draught per horse in all batteries armed with 9 pr. is about 657 lbs. and in those armed with 16 pr. about 789 lbs. (the gunners being dismounted in both instances).

All gunners and drivers in H. A. and Fd. Batts. should be armed with the regulation revolver (to be carried on the person) and with an Elcho sword-bayonet : the cavalry sword is a useless encumbrance to the artilleryman.

The ordinary charge for S. B. guns is $\frac{1}{4}$ to $\frac{1}{3}$ the weight of the shot ; for R. guns about $\frac{1}{8}$ of shot. Battering charges about $1\frac{1}{2}$ service charge. Field battery shells penetrate earth from 6 to 12 ft. ; guns of position from 12 to 16 ft. Field batteries can fire 2 rounds a minute, the pieces being laid each round, but as a rule the rate of firing is much slower and more deliberate.

From tip to tip of axle, the gun-carriages and waggons measure 6 ft. 5 in. ; gates and passages should therefore have a minimum width of 7 ft. 6 in. to allow artillery to pass. The diameter of field carriage-wheels is 5 ft. The track of all field artillery and of all W. D. carriages is 5 ft. 2 in. outside measurement, except that of the pontoon and wire waggons which is 5 ft. 10 in.

The proper establishment of men and horses for field artillery is to be estimated thus :—Having provided the exact number of gunners required to work the guns, and of drivers and horses required for the guns and waggons, add one-tenth as "spare."

War Rockets.—They are named according to their total weight. The Hale's rocket, which are those in use in our army, have no sticks, and are of two kinds, the 9 pr. and the 24 pr. The former is for field service, the latter is chiefly used in fortresses. Their length is $16\frac{3}{4}$″ and 23″, and their diameter $2\frac{1}{2}$″ and $3\frac{3}{4}$″ respectively. The troughs used in firing them are 27 lbs.

and 64¾ lbs. respectively. The range of the 9 pr. rocket at an elevation of 5° 25′ is 1000 yds.; at 8° 40′ is 1500; at 12° 20′ is 2000; and at 16° 32′ is 2500 yds.; its greatest range is 3400 yds. at an elevation of 2° 44′. War rockets are painted red.

Signal Rockets.—May be very useful in communicating between columns at night which are separated by practically impassable objects. They are of two sizes, viz. 1 lb. and ½ lb. with sticks 8′ 2″, and 6′ 6″ long; the former contains 28, the latter 20 stars. All signal rockets are painted stone-colour; they deteriorate rapidly in damp tropical climates, and should therefore be packed in tin-lined cases. The 1 lb. rocket ascends about 1800 ft. and it is said they may be seen in clear weather to a distance of from 30 to 40 miles.

Siege Trains will consist of any number of units of heavy or light ordnance according to the requirements of the service, each unit consisting of 8 Garrison Batteries, and of the following guns with 500 rds. per gun, and stores in proportion.

Description of Gun, &c.	One Heavy Siege Train Unit.	One Light Siege Train Unit.	Proportions.
64 pr., 64 cwt.	8	..	Siege travelling carriages.
40 ,, 35 ,,	8	10	Siege travelling carriages.
25 ,, 18 ,,	..	10	Siege travelling carriages.
8 in. howzr. 46 cwt.	14	..	Siege travelling carriages.
6·3 ,, 18 ,,	..	10	Siege travelling carriages.
Wt. iron Travelling Siege Carriages with Limbers. 64 pr.	9	..	1 spare over number required for each nature of Ordnance.
Wt. iron Travelling Siege Carriages with Limbers. 40 ,,	9	11	1 spare over number required for each nature of Ordnance.
Wt. iron Travelling Siege Carriages with Limbers. 25 ,,	..	11	1 spare over number required for each nature of Ordnance.
Wt. iron Travelling Siege Carriages with Limbers. 8 in. howzr.	15	..	1 spare over number required for each nature of Ordnance.
Wt. iron Travelling Siege Carriages with Limbers. 6·3 ,,	..	11	1 spare over number required for each nature of Ordnance.
Howzr. Beds with limbers. 8 in. ,,	7	..	1 to 2 howzrs.
Howzr. Beds with limbers. 6·3 ,,	..	5	1 to 2 howzrs.
Trench Carts	15	15	1 to 2 pieces of ordnance.
Waggons. Ammunition & Store	60	60	2 per piece of ordnance.
Waggons. Platform	12	2	1 per 64 pr. remainder for guns and stores.
Waggons. Service Sling	3	..	
Waggons. with limbers Forge	3	3	1 per 10 pieces of ordnance.
Waggons. with limbers Store	3	3	1 per 10 pieces of ordnance.

Guns, Carriages, and Bullocks in each Class of Siege Train.	1st Class Siege Train.		2nd Class Siege Train.		3rd Class Siege Train.		4th Class Siege Train.	
	Guns or Carriages.	Bullocks.	Guns or Carriages.	Bullocks.	Guns or Carriages.	Bullocks.	Guns or Carriages.	Bullocks.
24 pr. . . at 26 bullocks each	12	312	6	156	4	104	2	52
Spare carriages, 22 ,,	4	44	1	22	0	0	0	0
18 pr. . . 22 ,,	12	264	6	132	4	88	2	44
Spare carriages, 18 ,,	2	36	1	18	0	0	0	0
10" Howzr. . 26 ,,	4	104	2	52	1	26	2	52
Spare carriages, 22 ,,	1	22	0	0	0	0	0	0
8" Howzr. . . 22 ,,	6	132	4	88	2	44	2	44
Spare carriages, 18 ,,	1	18	1	18	0	0	0	0
Carts, Store, or Artificers . . } 6 ,,	30	180	16	96	8	48	6	36
Carts, platform . 6 ,,	26	162	15	90	9	54	6	36
Carriages, Transport, medium . } 12 ,,	3	36	2	24	1	12	1	12
Total Bullocks . . .		1310		696		376		276
Add Spare		218		116		62		46
Grand Total of Bullocks. .		1528		812		438		322
Total number of pieces of ordnance	34		18		11		8	

Large guns (*siege or position*). 64 *pr. R. M. L. gun*, total L. 118" : L. of bore 97·5" : cal. 6·3" : nominal wt. 64 cwt. : grooves, 3. Ammunition, battering shells filled with 33 oz. B. C. including gas-check, 90 lbs. ; common, filled with 7 lb. 2 oz. B. C. 64 lbs. : shrapnel filled with 234 balls (14 per. lb.) and 9 oz. B. C. : case shot filled with 50 8 oz. balls, 49 lbs. 14½ oz.

Charges, 12 and 10 lbs. : M. V. with 12 lbs. and 90 lbs. shell, 1285′ ; with 10 lb. charge and 65 or 66 lb. shell, 1383′ ; with the 12 lbs. charge and 90 lbs. shell its range is 4000 yards at an elevation of 10° ; with the 10 lbs. charge and the lighter projectile its range is the same with an elevation of 9° 35′, and is 5400 yds. at 14° 57′. Wt. of carriage empty, with wheels, drag-chain, &c., about 33 cwt.

40 *pr. R. M. L. gun ;* total L. 120" : L. of bore 104·5" : cal. 4·75 : average wt. 34·5 cwt. : grooves 3. Ammunition, common shell filled with 2·5 oz. B. C. 39 lbs. 10 oz. : shrapnell filled with 180 balls (18 per lb.) and 4·5 oz. B. C. 43 lbs. : case shot filled with 405 balls at 16½ per lb., 38 lbs. 6 oz. : carriage the same as for 64 pr. Range 4500 yds. at 10° 46′.

25 *pr. R. M. L. gun* ; total L. 98″ : L. of bore 88″ : cal. 4″ : grooves 3 average wt. 18 cwt. Ammunition, common shell filled with 1·75 lbs. B. C. 25 lbs. : shrapnel filled with 158 balls and 3 oz. B. C. 25 lbs. : case shot filled with 245 balls (16½ per lb.) 24·25 lbs. : charge 4 lb. R. L. G. powder. M. V. 1320′. Range at 10° 9′ 3600 yds. and 4500 yds. at 14° 40′. Wt. of carriage empty with wheels, drag shoe, &c., 15 cwt. : of limber empty with boxes, shafts, and wheels, 11 cwt. 1 qr.

All these 3 guns are for siege purposes fired over an overbank parapet.

8 *in. R. M. L. Howitzer ;* total L. 64″ : L. of bore 48″ : cal. 8″ : mean wt. 45 cwt. 3 qrs. : grooves 4. Ammunition, common shell filled with 14·5 lb. B. C. 185 lbs. 13·75 oz. : case shot filled with 75·8 oz. balls, 74 lbs. Charges from 10 to 2·5 lbs. : with a 10 lb. charge the range is 1600 yds. at 10° 5′, and 3800 yds. at 38° 15′. The carriage is similar to that of the 40-pr., and the limber is the same as the 64-pr. limber with a store box.

6·3 *in. R. M. L. Howitzer ;* total L. 56″ : L. of bore 45″ : mean wt. 17 cwt. 76 lbs., cal. 6·3″ : grooves 20 : ammunition, common shell filled with 7 lb. B. C. 69 lbs. 5·25 oz. : case shot filled with 50 8-oz. balls, 49 lbs. 14·75 oz. Charges from 4 to 1 lb. : with a 4-lb. charge the range is 1800 yds. at 10° 5′, 3800 yds. at 29° 45′ and 4000 yds. at 35° elevation. Carriage is that for the 40-pr. ; the limber that for the 64-pr.

The guns used in the field are as follows :—

Nature of Gun.	Weight of Gun.	Calibre.	Weight of Gun and Carriage (packed.)	Number of Rounds in Limber and on Gun.	Weight of Limber Loaded.	Total Weight behind Team (Gunners Dismounted).	Number of Rounds in Waggon.	Weight of Waggon Loaded.	Range at Elevation of 9°.
	lbs.	in.	lbs.		lbs.	lbs.		lbs.	yds.
B.L.R. 20 p^{dr} A.	1792	3·75	3581	18	..	5425	48	4256	3500
Do. 12 do.	896	3·00	2240	34	1904	4144	90	4844	3400
Do. 9 do.	672	3·00	2128	34	1600	3750	90	4540	3000
M.L.R. 16 p^{dr} (wrought iron) .	1355	3·60	2700	28	1916	1916	72	4732	3400
Do. 13 do. do. .	896	3·00	2240	36	1888	4228	106	5032	4000
B.L.R. 13 do. do. .	952	3·00	..	..		..	..	..	..
M.L.R. 9 do. do. .	896	3·00	2240	40	1701	3941	108	4506	3040
Do. 7 p^{dr} (steel) for mountain service .	150	3·00	345	..	..	..	..	..	1400
Do. do. do. .	200	3·00	417	..	..	..	..	..	1900

The greatest number of rds. fired by a German batty. in 1870 was 230 rds. per gun fired at Mars le Tour, but the average per gun fired in that battle by all the artillery engaged was only 94, which was greatly in excess of the amount fired at any other of the great battles.

Batteries of position.—The establishments vary little from those of Fd. Batteries already given. The guns used are the 40-pr. and 25-pr. R. M. L., and the 40-pr. and 20-pr. B. L. Armstrong. Four guns constitute a Battery, except with the 25-pr., of which there are 6. With both the Armstrong gun Batts. there are 30 riding horses and 112 draught horses for the 40-pr., and 88 for the 20-pr. Batts. : 4 ammn. : 3 ammn. and store, and 1 platform waggons with 40-pr., and the same, with the exception of the platform waggon, with the 20-pr. : the number of rds. carried is 38 per 40-pr. and 66 per 20-pr.

With the R. M. L. 40-pr. and 25-pr. the same number of riding horses, and 134 and 124 draught horses per Batty. respectively. Both carry 1 spare gun carriage, 1 forge, 1 store, and 1 ammunition and store waggon, and the former 8, the latter 6 gun ammunition waggons.

Gatling guns.—There are two sizes used by us, the 0·65″ and the 0·45″ bore : both have 10 barrels : the former is sighted up to 2000 yds. and weighs, with drum empty, about 7·25 cwt. : the limit of effective range with the latter is said to be about 1200 yds.

DETAIL OF DIVISIONAL AND ARMY-CORPS RESERVES, THE LATTER IN 3 SECTIONS.

Officers and Men.	Divisional.	Army-Corps, One Section.
Major	1	..
Captain	..	1
Lieutenants	2	2
Quarter Master	1	1
Surgeon	1	1
Veterinary Surgeon	1	1
N. C. Os. and Men.		
Sergeant Major	1	1
Quarter Master Sergeant	1	1
Sergeants	6	6
Corporals	6	6
Bombardiers	6	6
Gunners	50	50
Drivers	123	80
Trumpeters	2	2
Sergeant Farrier	1	1
Shoeing Smiths	6	6
Collar-makers	3	3
Wheelers	3	3
Total	214	171

Horses.	Divisional.	Army-Corps, One Section.
Officers: Private	*2	*2
Officers: Public	5	5
Staff Sergeants	2	2
Non-commissioned Officers	9	9
Farriers	1	1
Trumpeters	2	2
Spare, Riding	2	2
Total	23	23
Carriages, gun, spare: 16-pr.	4	4
Carriages, gun, spare: 9-pr. with limber	4	4
Carts S.A. ammunition	44	4
Waggons: For gun limber 16-pr.	36	..
Waggons: For gun limber 9-pr.	36	..
Waggons: Ammunition A. and S.	60	104
Waggons: A. & S. for stores and baggage	12	8
Waggons: Ditto, for rockets	6	..
Waggons: Ditto, spare	6	..
Waggons: Forge, limber up	6	4
Waggons: Spare, draught	20	20
Total horses	257	171

Equipment.	Divisional.	Army-Corps, One Section.
Carriages, gun, spare: 16-pr.	1	1
Carriages, gun, spare: 9-pr.	1	1
Carts, small-arm	22	2
Waggons: For Ammunition gun limber 16-pr.	6	..
Waggons: For Ammunition gun limber 9-pr.	6	..
Waggons: For Ammunition A. & S. S.A.A.	..	9‡
Waggons: For Ammunition A. & S. 16-pr.	8‡	12‡‡
Waggons: For Ammunition A. & S. 9-pr.	2‡	5‡
Waggons: A. & S. for stores, &c.	2	2
Waggons: Ditto, for rockets	1	..
Waggons: Ditto, spare	1	..
Waggons: Forge, limber up	1	1
Total carriages §	51	33
Number of rounds carried† per gun 16-pr.	90	90
Number of rounds carried† per gun 9-pr.	76	76
Number of rounds carried† per rifle	30	30
Per carbine cavalry	..	20
Per pistol‖ Infantry	36	..
Per pistol‖ Cavalry	..	36

* 2 private property, Veterinary Surgeon.
† Each Section Army-Corps Reserve has a full reserve for ⅓rd of the Army-Corps.
‡ Each A. & S. waggon carries 126 rds. for 16-pr. in 21 boxes of 6 projectiles each, and the cartridges in 4 metal-lined cases: or 208 rds. for 9-pr. in 26 boxes of 8 projectiles each, and cartridges as for 16-pr. ; or 25,200 rds. M. H. in 42 boxes.
§ One day's rations and forage to be carried distributed in the waggons.
‖ With supply for Officers as in Regimental Reserve.
N.B.—When tents and horse blankets are carried, no extra carriage is required, as they can be placed on the waggons.

Regimental Staff.	Officers.	3rd Class Clerks.	Bâtmen.	Riding Horses. Private.
Colonel Commanding Corps Artillery	1	1	2	3
Adjutant	1	..	2	2
Lieut.-Col. Commanding Corps Horse Artillery ..	1	1	2	3
Adjutant, R.H.A.	1	..	2	3
Lieut.-Col. Commanding Corps Field Batteries, and Corps Reserves	1	1	2	3
Adjutant, R.A.	1	..	2	2
	6	3	12	16

N.B.—In my humble opinion this is an inordinately large staff for 3 H. A. Batts, and 2 Batts. 16-prs.

Engineers.—At present there are 3 troops of R.E. train (one being a telegraph troop) and 40 companies (2 being telegraph companies). The men are equipped like infantry, except that they are armed with a breech-loading Lancaster carbine (8 lbs. $3\frac{1}{2}$ oz.) and sword bayonet (1 lb. $8\frac{1}{4}$ oz.).

See page 49 for particulars about pontoons.

The personal equipment of the R.E. is similar to that laid down for cavalry and infantry, according as the men are mounted or not.

DETAIL OF ONE FIELD COMPANY AND FIELD PARK, R.E.

Officers, N.-C. Officers, and Men.	Each of Four Field Companies.		Field Park.		Four Field Co.'s, and Field Park.		Total.
	Mounted Men.	Dismounted Men.	Mounted Men.	Dismounted Men.	Mounted Men.	Dismounted Men.	
Officers.							
Majors	1	..	..	..	4	..	4
Captains	1	..	..	..	4	..	4
Lieutenants	3	..	1	..	13	..	13
Surgeons	1	..	..	..	4	..	4
Total Officers ..	6	..	1	..	25	..	25
N.-C. Officers and Men.							
Sergeants	2*	6‡	1	..	9	24	33
Corporals	1	6	1	..	5	24	29
2nd Corporals	1	6	1	..	5	24	29
Farrier Sergeant ..	..	..	1	..	1	..	1
Shoeing-smiths	1	..	1	..	5	..	5
Corporal Collar-makers	..	..	..	1	..	1	1
Corporal Wheelers ..	..	..	..	1	..	1	1
Sappers, various trades	..	134	..	..	..	536	536
Drivers	26	..	24	..	128	..	128
Trumpeters	1	..	..	..	4	..	4
Buglers	..	1	..	..	..	4	4
Bâtmen*	..	12	..	2	..	50	50
Total Officers, N.-C. Officers and Men	38	165	30	4	182	664	846
	203		34		846		

Horses, Saddlery, Harness, and Carriages.	Each of Four Field Co.'s.	Field Park.	Four Field Co.'s, and Field Park.
Horses.			
Riding — Officers	11	2	46†
Riding — N.-C. Officers	3	3	15
Riding — Trumpeters	1	..	4
Riding — Spare	..	2	2
Total	15	7	67
Draught for — Store Waggons ..	24	28	124
Draught for — Printing	..	4	4
Draught for — Lithographic or Photographic ..	..	4	4
Pack Equipment	3	..	12
Spare	4	6	22
Total Horses	46	49	233
Carriages.			
Waggons — Store	6	7	31
Waggons — Printing	..	1	1
Waggons — Lithographic or Photographic	..	1	1
Total	6	9	33

* Each Officer is allowed two Bâtmen. They will be provided from the Reserves, and will be unarmed.

† Each Officer, R.E., below the rank of major attached to Fd. Comps., is allowed 2 public horses; the Surgeon has one troop horse.

‡ 1 Sergt. in each Comp. is a Comp. Sergt. Major.

DETAIL OF A GARRISON COMPANY.*

Officers and Men.	No.	
Major	1	Conveyance for the Baggage, Camp Equipage, and Stores of these Garrison Companies will be provided, according to circumstances, from the General Transport.
Captain	1	
Lieutenants	2	
Total Officers	4	The R. E. are now armed with the same rifle as the Infantry, and every man has in possession 50 rds. of ammunition, which is maintained by drawing on the Infantry Divisional reserves. In the Telegraph and Pontoon troops a considerable proportion of the men are armed with cavalry swords, which is an absurd arrangement; those not armed with a rifle should have a revolver and an Elcho sword-bayonet.
N.-C. Officers and Men.		
Sergeants	6	
Corporals	6	
2nd Corporals	6	
Sappers	100	
Buglers	2	
Bâtmen†	8	
Total	132	

* This includes Siege, Telegraph, and Torpedo Companies.

† Each Officer is allowed two Bâtmen. They will be provided from the Reserves, and will be unarmed.

DETAIL OF ONE PONTOON TROOP.

Officers.	No.
Major	1
Captain	1
Lieutenants	4
Quarter-Master	1
Surgeon	1
*Vetery. Surgeon	1
Total	9
N. C. Os. & Men.	
Troop Sergt.-Major	1
Troop Q.M.-Sergeant	1
Sergeants	10
Corporals	12
2nd Corporals	12
Pontooniers	100
Drivers	148
Trumpeters	3
†Bâtmen	18
Artificers.	
Farrier and Carriage Smith	1
Sergeant Artificer	1
Corporal Artificers	3
Shoeing and Carriage Smiths	8
Collar-makers	4
Wheelers	4
Carpenters	4
Total	339

*Horses.**	No.
(Riding.)	
Officers	17
Staff Sergeants	2
N.C. Officers	13
Farrier	1
Shoeing Smiths	2
Trumpeters	2
Total	37
(Draught.)	
For waggons: Pontoon	120
For waggons: Trestle	24
For waggons: Store	34
For waggons: Forge	6
Spare	22
Total Horses	243

Carriages.	No.
Waggons: Forge	1
Waggons: Pontoon, for	20
Waggons: Trestle, for	4
Waggons: Store	6
Total‡	31
Artificers' Tools.	
Carpenters' ... sets	2
Collar-makers' ... ,,	4
Painters' ... ,,	3
Smiths' G. A. S., with 36-lb. vice ... ,,	1
Tinmans' ... ,,	1
Tools, shoeing, in leather case ... ,,	4
Wheelers' and Saddletree makers ... ,,	1
Whitworth's Stocks and Dies 1¼-in. to ¼-in., with Tray ... ,,	1

* Each Officer of R.E. below the rank of Major, attached to the Pontoon Troop, is allowed 2 public horses; the Surgeon has 1 public horse; the Veterinary Surgeon provides his own horses and saddlery.

† Each Officer is allowed two Bâtmen, to be provided from the Reserve; they will be unarmed.

‡ One of these, a four-horsed waggon, carries one day's supply of rations and forage.

Each pontoon and trestle waggon carries 5 yds. of bridge complete, so the troops can lay 120 yds. of bridge in all.

DETAIL OF ONE TELEGRAPH TROOP, R.E.

Officers and Men.	Right Half Troop.	Left Half Troop.	Total for One Troop.
Officers.			
Major	1	..	1
Captain	..	1	1
Lieutenants	3	3	6
Quarter-Master	1	..	1
Surgeon	1	..	1
Veterinary Surgeon	1	..	1
Total	7	4	11
N.-C. Officers and Men.			
Troop Sergeant-Major	1	..	1
Troop Q.-M. Sergeant	1	..	1
Sergeants	5	5	10
Corporals	5	4	9
2nd Corporals	5	4	9
Sappers	50	40	90
Drivers	66	56	122
Trumpeters	2	2	4
†Bâtmen	14	8	22
Artificers.			
Farrier and Carriage Smith	1	..	1
Sergeant Artificer	..	1	1
Sergeant Telegrapher	1	..	1
Corporal Artificer	2	..	2
Corporal Telegrapher	2	2	4
Shoeing and Carriage Smiths	3	3	6
Collarmakers	1	2	3
Wheelers	2	1	3
Carpenters	1	2	3
Telegraphers	10	2	12
Total	179	136	315

Horses, Saddlery, and Harness.	Right Half Troop.	Left Half Troop.	Total for One Troop.
Horses.			
Riding.			
Officers	*13	*8	*21
Staff Sergeants	2	..	2
Non-Commissioned Officers	7		16
Signallers	11	11	22
Farrier	1	..	1
Shoeing Smiths	..	1	1
Trumpeters	1	1	2
Total	35	30	65
Draught.			
For waggons—			
Wire	36	24	60
Office	8	8	16
Store	8	8	16
Air Line	12	12	24
Forge	4	4	8
Spare	6	6	12
Total horses	109	92	201

Equipment.	Right Half Troop.	Left Half Troop.	Total for One Troop.
Carriages.			
Waggons—			
Wire	6	4	10
Office	2	2	4
Store	2	2	4
Air Line	2	2	4
Forge	1	1	2
Total	13	11	24
Artificers' Tools.			
Carpenters .. sets	1	1	2
Collarmakers .. ,,	2	2	4
Farriers .. .. ,,	1	1	2
Painters .. .. ,,	1	1	2
Smiths' G.A.S., with 36 lb. vice .. .. sets	1	1	2
Telegraphers .. ,,	9	8	17
Wheelers and Saddle-tree makers .. sets	1	1	2
Whitworth's stocks and dies .. .. sets	1	1	2
Tools, shoeing, in leather case .. ,,	2	2	4

* Each Officer is allowed one troop horse, and forage for one private horse.

† Each Officer is allowed two Bâtmen, to be provided from the Reserve; they will be unarmed. One day's supply of rations and forage is carried distributed among the waggons.

A Half Troop is attached to an Army Corps: the establishment shown above for Right Half Troops is that which is considered requisite in the event of only ½ Troop forming part of an expeditionary force.

The 10 wire waggons carry 30 miles of cable (3 miles each waggon). The 4 office waggons carry instruments, &c., for 16 stations. The 4 air-line waggons carry 30 miles of overhead wire with necessary number of poles, &c.; 60 miles of telegraph can thus be constructed and worked by the Telegraph Troop. It is proposed to reorganise this Telegraph Troop and the 2 Telegraph Companies into a "Field Telegraph Corps," divided into 8 sections, each section carrying 20 miles either of cable or overhead telegraph material, or 160 miles in all. Each section at war strength will consist of 1 subtn. officer and 50 N.-C.Os. and men. See Article on "Electric Telegraph" (*post*).

The establishment of a Battalion of Native Sappers and Miners in Bengal consists of 10 Comps., 9 combatant and 1 M. Os., 63 British N.-C. Os., 140 Native N.-C. Os., 20 Buglers, and 1000 privates. Its subt. Medl. estabt. consists of 19, and its artificers and followers are 111. Its conservancy estabt. of 3. For pontoon companies there are 28 native artificers in addition.

The number of companies in the Madras Regt. of Sappers and Miners is the same (10). There is one M. O. and 13 combatant offrs., 63 British N.-C. Os., 141 Native N.-C. Os., 20 Buglers, 48 Recruit and Pension Boys, and 1050 privates. There are 74 Nat. artificers and followers, 1 apothecary, and 5 medical subordinates. In Bombay the Effective Establishment of the Corps of Sappers and Miners consists of 5 Companies with 1 Commandant, 5 Officers Commanding Companies, 1 Adjutant, 1 Quarter Master and Interpreter, 2 Doing Duty Officers, Surgeon, 1 Conductor, 1 Sergeant Major, 1 Quarter Master Sergeant, 4 Sergeants, 4 First Corporals, 4 Second Corporals, 5 Subedars, 5 Jemedars, 20 Havildars, 10 Buglers, 40 Naiques, 400 Privates, and 12 boys. The Subt. Medl. Estabt. consists of 14, conservancy estabt. 3, and there are besides 46 public native followers.

COMPANY OF THE COMMISSARIAT AND TRANSPORT CORPS.

The Company is calculated and organized on a footing that will, by the addition of certain details on taking the field (enumerated below), permit of its being used in Sections detached.

The War Establishment of Men and Horses will vary with the portion of an Army-Corps to which the Sections are attached, as shown in the detailed Tables for an Army-Corps.

Four Companies form the Cadres of the Sections of Commissariat and Transport necessary for the 1st Line, and two Companies the Cadres of Sections for the 2nd Line of an Army-Corps.

Two Companies form the Cadres of the Sections, detailed for the Line of Communications and Base.

OFFICERS AND MEN. In this Table R. stands for Riding, and D. for Draught horses.	War Establishment.												
	Mounted.									Dismounted.	Grand Total.		
	Hd. Qrs. & 1st Section.			2nd Section.			3rd Section.						
	No.—All Ranks.	Horses.		No.—All Ranks.	Horses.		No.—All Ranks.	Horses.		No.—All Ranks.	All Ranks.	Horses, &c.	
		R.	D.		R.	D		R.	D.			R.	D.
OFFICERS.*													
D. A. C. G.	1	1	..	..	..	..	..	..	..	..	1	1	..
Q. M.	..	..	..	1	1	..	1	1	..	..	1	1	..
											1	1	..
Total Officers	1	1	..	1	1	..	1	1	..	..	2	2	..
											1	1	..
*Warrant Officers.**													
Conductors of Supplies	1	1	..	..	..	..	1	1	..	..	1	1	..
											1	1	..
1st Class Staff-Sergts.	..	..	..	..	..	..	..	..	..	1	1	..	..
Non-Commissioned Officers and Men.													
2nd Class Staff-Sergts. as Company Sergt.-Majrs.	1	1	..	..	..	..	..	..	..	..	1	1	..
2nd Class Staff-Sergts.	..	..	..	..	..	..	..	..	..	1	1	..	..
3rd Class Staff-Sergts. as Company Q. M. Sergts.	1	1	..	..	..	..	..	..	..	..	1	1	..
3rd Class Staff-Sergts.	..	..	..	..	..	..	..	..	..	2	2	..	..
Sergeants	2†	2	..	1†	1	..	2†	2	..	3	5	5	..
	1	1	..	1	1	..	..	..	..	..	2	2	..

Corporals	1	..	..	2	..	..	2	..	..	2	7	..	..
	1	..	..	1	..	..	1	..	..	..	3	..	..
2nd Corporals	1	..	..	1	..	..	1	..	..	3	5	..	..
	1	..	..	..	..	..	..	..	..	..	2	..	..
3rd Class Staff-Sergts. as Wheeler-Sergts.	1	..	..	..	..	..	..	..	..	..	1	..	..
3rd Class Staff-Sergts. as Collar-maker-Sergts.	1	..	..	..	..	..	..	..	..	..	1	..	..
3rd Class Staff-Sergts. as Farrier-Sergts.	1	1	..	..	..	..	..	..	..	..	1	1	..
Corporals as Wheelers	1	..	..	1	..	..	1	..	..	..	1 / 2	..	..
Corporals as Collar-Makers	1	..	..	1	..	..	1	..	..	..	1 / 2	..	..
Corporals as Farrier and Carriage Smiths	1	..	..	1	..	..	1	..	..	..	1 / 2	..	..
Privates, as Shoeing and Carriage Smiths	1	..	..	1	..	..	1	..	..	..	2	..	..
	1	..	..	..	..	..	..	..	..	..	2	..	..
Buglers	1	1	..	1	1	..	1	1	..	..	1	1	..
											2	2	..
Privates	..	..	..	..	..	..	..	..	..	24‡	24	..	..
,, Drivers	21‡	..	18‡	21‡	..	16‡	21‡	..	18‡	..	63	..	52‡
Total N. C. Officers and Men	32	5	18	27	1	16	27	2	18	36	122	8	52
	7	2	..	5	2	..	5	1	..	..	17	5	..
Total existing Establishment	33	6	18	28	2	16	28	3	18	36	125	11	52‡
To be added	8	3	..	5	2	..	6	2	..	..	19	7	..
Grand Total	41	9	18	33	4	16	34	5	18	36	144	18	52‡
												70	

NOTE.—The Artificers, Drivers, and Draught Horses will be augmented to whatever number may be necessary from Reserves or local means. The numbers are shown in the Commissariat and "Transport Tables of an Army-Corps," p. 32.

* By the Commissariat and Transport Tables of an Army Corps, each Brigade and Division has a further establishment of Officers and Warrant Officers who would be available for transport purposes on an emergency.

† Promote 1 Sergeant as Sergeant-Major, except No. 2 Section when with Bearer Company.

‡ Draught horses, Drivers, and Privates to be added to meet the requirements of the part of the Army-Corps to which the Company is attached.

Each Officer is allowed one public service horse and one bâtman, who will be taken from the Reserve. He will be unarmed.

The details of Commissariat and Transport Staff, and Sections Commissariat and Transport Corps, Administrative and Executive, have recently been revised, and will be found in the "Corps Tables" temporally issued on July 28, 1882.

Land Transport.—A most difficult question for all generals. Happy is he who can reduce the amount of impedimenta to be carried. In our next war it is hoped that the men of the Transport Companies will be dressed and equipped roughly, but in a workmanlike manner, for the hard work they have to do. In my opinion the result of all our war experience for the last thirty years goes to prove, that it is a fatal mistake to place the transport of an army under the Commissariat Department. Transport to be efficient must have a perfect military organization, and that it cannot receive when under the charge and command of a Civil Department of the army. At the same time it is essential that whilst organized upon military principles, the officers and men employed should remember they are employed upon non-combatant duties. Our old Military Train was a failure because it was armed, equipped and dressed in Dragoon fashion ; the officers were "above their work," and all ranks seemed to be too "fine gentlemen" to condescend to the arduous duties connected with the business for which they were invented. Our present Transport Companies are well organized, but in the field they should be worked under a Director of Transport, who should be an officer holding combatant rank in the army, and not under the Commissary-General, who is himself the largest employer of transport during war. The transport should be organized as a separate department under the direct orders of the G. of C. Calls upon the Line for whole battalions of soldiers to do the transport work should not be permitted. Before undertaking any military operation, no matter what may be its probable or possible magnitude, I would impress upon the commander to provide beforehand for the conveyance of his stores, baggage, &c., by a well-organized transport service under military officers, every small detail being well thought out and provided for. On the manner in which this is done will depend in the largest measure the success of the undertaking.

In the British army there is a prejudice in favour of pack animals, which has come down to us from the Peninsular war. Nearly all our regulations regarding baggage to be carried in the field used to be based upon the calculation of what bat animals can carry. The worst transport, and the most difficult to manage, is that by pack animals. As a rule, there will always be field artillery with an army, and wherever it can go wheeled transport can follow. Pack animals are continually being laid up with sore backs. A train of baggage is on the road, say ten hours ; during that time the pack animals have no rest, as they cannot be unloaded during temporary halts. It is difficult and tedious to load them well, and loads frequently fall off, occasioning delay and confusion. Two pack mules will carry a load, exclusive of pack-saddle, of about 300 or 350 lbs. The same two animals will draw a load of about 800 or 1000 lbs. (in a light cart), according to the nature of the roads.

The question of driving *versus* riding is now being considered upon its

true merits, and it is to be hoped that a large proportion of our conveyances will be driven in future. A horse loses one-half his power of sustained draught by having a driver on his back. During the late war in America every species of transport was tried; animals, whether mules or horses, carrying loads on their backs, were given up at an early period of the war, and latterly the whole transport of both armies, except the conveyance of the sick, was performed by long waggons drawn by 6 mules or horses, and driven by the man, who rode the near-wheeler. Animals of the transport service require but little grooming during war, so that 1 man is ample for the care of 4. The men should be armed solely with a good central fire revolver, and be clothed in easily-fitting blouses made like Norfolk jackets. All iron-work about the carts and harness should be lacquered. The men should be better paid than the other branches of the service, and only steady men allowed to enter it.

Draught for transport purposes should be calculated at from 10 to 12 cwt. per horse, for all stores in flat countries with ordinarily fair roads, the length of the march being about 20, but never over 25 miles except under peculiar and emergent circumstances. For the conveyance of the entrenching tools and reserve of S.A.A. of regiments, the gross draught per horse should not exceed 7 or at most 8 cwt. A horse moving at a walk can for ten hours exert a force twice as great as one can when moving at a trot for half that time.

Harness. Double set of wheel, complete with numnah and sheepskin for R.A. and R.E. weighs 102¾ lbs.; for A.S.C. and Regimental Transport 144$\frac{11}{16}$ lbs. The double set of lead harness complete weighs 146$\frac{3}{16}$ lbs. and 118$\frac{3}{16}$ lbs. for these two patterns respectively. A pair of short traces to unite lead with wheel weighs 6½ lbs. N.B.—Harness and saddlery increase in weight by use, owing to the quantity of grease or soap they absorb.

It is most desirable that for all transport, half the horses in every team should have collars, and half be provided with breast straps. If this were made the rule we should seldom have horses rendered unfit for draught during a campaign; for a horse becoming collar-galled could have the breast strap from another horse placed on him, and *vice versa;* by the time he became galled from the breast strap, the old gall would generally be well again, and he could then work with a collar once more, so that really we should lose the services of but very few horses with sore shoulders.

Grease. The allowance carried in each wagon in South Africa was at the rate of 2 lbs. per wheel.

Military conveyances. The wagons and carts, &c., for military transport should be light but strong, which ends can only be secured when they are made of sound well-seasoned wood. Our wagons, &c., planned and made at

DESCRIPTION OF WAGONS AND CARTS NOW IN USE.

	NAMES OF WAGONS, CARTS, ETC. * To hold 8 wounded men=about 14 cwt.	Number of Horses.	Weight complete with Pole or Shafts, Drag-chain, &c. &c.	Weight of load.	Internal dimensions of Body (partitions removed). L.		W.		D.		Track (outside measurement) in Feet and Inches.		Tonnage for Shipment.	
			cwt.	cwt.	ft.	in	ft.	in.	ft.	in.	ft.	in.	tns.	
1	Flanders wagon . .	4	16½	30	10	1½	3	6¼	1	7	5	2	5·00	No. 3 is the only waggon with equirotal wheels: No. 6 has wheels of 3′ 4″ and 4′ 8″ in diameter; 121 and 162 lbs. weight respectively. The wheel of S. A. A. cart is 5′ diameter, and weighs 172 lbs. The tire of our new carts and waggons is 2¼″: that of ambulance carriages generally is only 2″.
2	Canadian do. . .	2	13	20	9	8½	3	2	1	3	4	8	5·49	
3	G. S. do. (mark I.)	4	17¼	30	8	9	4	0	2	0	5	10	3·5	
4	Do. (do. II.)	4	17⅝	30	9	7	4	1½	2	0	5	8	4·36	
5	Do. (do. III.)	4	17⅝	30	9	8	4	1½	1	6	5	8	4·304	
6	Do. (do. IV.)	4	17⅞	30	9	8	3	8	1	8	5	2	4·041	
7	Spring do.	4	23¼	40	10	1	4	3	2	0	5	2	4·177	
8	Bread and meat do.	4	29⅜	40	10	4	3	11	2	9½	5	2	8·604	
9	Bakery do.	4	27	40	10	4	3	11	2	9½	5	2	8·604	
10	Steam oven . . .	4	42⅜	..	..		..		..		5	9	10·71	
11	Pontoon (mark III.)		16¼	..	..		..		..		5	10	7·502	
12	Trestle (mark III.)		16¼	..	..		..		..		5	2	7·502	
13	Cart, spring . . .	2	12	20	5	5½	4	1	1	11	5	2	2·443	
14	Cart, tip (mark I.) .	2	11½	20	6		4	1	1	11	5	2	2·112	
15	Do. (mark II.) .	2	8¼	15	5	6	3	4½	1	9	5	2	2·979	
16	Cart, G. S. . . .	2	6⅜	15	6		4	1	1	8	5	2	2·079	
17	Do. Maltese. . .	1	5½	6	..		..		..		5	2	1·75	
18	Cart, S. A. A. . .	2	8½	12	..		..		..		5	2	2·468	
19	Waggon, Ambulance	2	16½	* *	..		..		..		5	2	5·5	
20	Do. (mark III.) .	2	18	*	..		..		..		5	2	3·625	
21	Waggon, Medical .	2	17⅝	..	..		..		..		5	2	8·292	

N.B.—In this table, L. stands for length; W. for width; and D. for depth.

No. 6 is now the transport wagon for the army; no more of other patterns will be constructed. Except when the roads are very good and level, and the horses large, powerful, and in very good condition, all our transport wagons are so heavy, that when fully loaded, they will require 6 horses each; the ambulance wagon, when loaded with 8 wounded men, would weigh over 32 cwt.: with 2 horses it would be immovable, except on the hardest and most level roads.

Woolwich, are about the heaviest used in any army ; they are apparently constructed not only to support the ordinary strains of a campaign, but to be also proof against all possible accidents or contingency that could befall them in any and every part of the globe. This is, in my opinion, an absurd precaution ; it would be amply sufficient if they were made proof against the ordinary and probable accidents that may be expected in an ordinary campaign. The result of our present system is, that the number of horses allotted to some of the most cumbersome conveyances, can, in some instances, scarcely draw them when loaded according to regulations. It is better to have light carts and wagons, and undergo the inconvenience of an occasional break-down and loss of a wagon, than that every cart and wagon should be so heavy that no break-down is ever possible. The loss of a wagon now and then is nothing, but the waste of strength in draught occasioned by heavy material is a serious matter.

The wagons in use in South Africa were—

CART OR WAGON.	No. of bullocks.	No. of mules.	Weight complete.	Weight of load.	Height of draught.	Track.	Wheels.				
							Weight lbs.		Dish inches.		Width of tire.
							Fore.	Hind.	Fore.	Hind.	
			cwt.	lbs.							in.
Colonial ox wagon with tent	16 to 20	..	29	4000	2′ 3″	5′ 3″	140	168	2	3½	3
Do. with half tent	Do.	..	24 to 28	Do.	Do.	5′ 2″	196	244	1½	2⅜	Do.
Colonial mule wagon	..	8 to 10	16	2000	2′ 6″	Do.	203	272	½	½	2½
American buck wagon	14 to 18	10 to 12	22	2000 to 3000	Do.	Do.	192	224	¾	1	2¾
Do. Do.	..	10	20	2000	Do.	Do.	98	164	Do.	¾	2½
American box wagon	..	8 to 12	13	2000	2′ 8″	Do.	136	168	⅞	1¼	2¼
Scotch cart	..	6	6	1000	2′ 9″	5′	144	..	2½	..	2½
		4	5	800	2′ 6″	5′ 4″	148				3
Colonial 'bus	..	6	14½	..	2′	5′ 2″	90	112	⅝	2	2

The wagons used during the Red River expedition weighed, complete with pole and drag-chain, 11 cwt. 1 qr.: they were drawn by 2 horses each; their ordinary load over the very bad road used was from 1600 to 1900 lbs. The road was very rough, and they stood the work well. Similar wagons are commonly used all over Western Canada. A number of two-wheeled carts were tried over the same road at first starting, but after a couple of days' trial they were given up, the road being too hilly for them.

The 2-wheeled carts used by the Russians in 1877 in Armenia broke down also from the same causes.

The Maltese cart was used to great advantage in the Crimea; with one mule, on a good road its load should be about 650 lbs. This cart weighs from about 5½ cwt. to 6 cwt.

All wagons and carts should be fitted with breaks; the break used in South Africa is very good and is very simple in construction. They should also be supplied with a tarpaulin to keep their loads dry in wet weather.

The 18 ft. buck wagon when fitted as an ambulance to hold 3 men lying and 16 men sitting, weighed 42 cwt.

Traction engines have never yet been effectively tried for transport purposes during war. Although they are useless except on fairly level roads, they could, it is thought, be used to advantage in some countries. Their use was attempted during the Ashanti campaign, but the steepness of the inclines on the road forced us to abandon their use. The traction engine most suited for military purposes is the "Steam Sapper;" weight when empty 102 cwt. 1 qr.; add for coals 3 cwt., water 10 cwt., and driver 168 lbs., and the total weight when running will be 5 tons 16 cwt. 3 qrs. The weight on driving wheels 85 cwt. 3 qrs., on leading wheels 31 cwt., its total greatest width 6 ft. 1 in. Its consumption of coal is 50 lbs. an hour when used as a stationary engine, on a road 49 lbs., and as a locomotive on rails 37 lbs. per hour. Under those three conditions, its consumption of water per hour is from 30 to 40 gallons, from 35 to 48, and from 30 to 40 gallons. The tank of engine contains 70 gallons, that of tender, 50. Water is required every sixth mile. In a day of 10 hours' work as a stationary engine it requires 1½ lb. of tallow and 1½ lb. of lard oil; if used on road or rails it requires ¼ lb. more of lard oil, and under all circumstances ½ lb. of cotton waste per diem. The "Steam Sapper" on a good road will draw a load equal to its own weight up an incline of $\frac{1}{10}$, and twice its weight up to $\frac{1}{20}$, and three times its own weight over the level or up slopes not exceeding $\frac{1}{30}$. Its maximum effective load is 10 tons on roads with slopes not exceeding 1 in 11, with pressure not above 75 lbs. per sq. in. Its average speed on fair roads 2½ to 3 miles per hour; weight of truck 2 tons; the nett load therefore with one carriage would be 8 tons, with two, 6, and with three, 4 tons. These traction engines are worked to the best advantage in pairs, each drawing 2 or 3 carriages; they can then help one another when in difficulties.

Transport with us is divided into 3 classes :—Regimental, Departmental, and General.

1*st. Regimental*, which is divided into 2 Lines, the 1st Line being an integral part of the Battalln., &c., the men being soldiers of the Regt., Battaln., &c., the animals, wagons, &c., being supplied by the Commisst. Dept. when the army is mobilised ; the 2nd Line (carrying the tents) will consist of Transport Comp. of the A.S.C., but whilst attached to Regts. will be administered as the 1st Line. For purposes of supply, both Lines of the Regt. transport will work between the Divnl. Depots and their own Regts. When the army is halted, all Regimental transport (including all waggons, &c., of the R.A. and R.E.) will be made use of for general transport duties as the G.O.C. may consider desirable ; he alone must be the judge, and he should turn a deaf ear to all remonstrances on the subject. The rule must be, that no transport be at any time allowed to stand idle, except for necessary rest. If this plan is carried out judiciously, no injury whatever will accrue to the corps concerned, whilst great relief will be afforded to the general transport working along the L. of C.

2*nd Departmental transport* consisting of the Comps. of the A.S.C. acting under the orders of the Director of Transport, and of the special transport belonging to the R.A. and R.E. It will work between the Advanced Magazines and the Divnl. Depots.

3*rd. General*, which will usually be levied wagons, or it may be railway, canal, or river transport. It will be worked by the Director of Transport under the orders of the G. of C. According to existing regulations it is the duty of the C. G. to provide and maintain the animals, harness, wagons, &c., for the 1st Line of the Regtl. Transport, its *personnel* being found by the Regts. The C. G. will provide and maintain the wagons, animals, and drivers for the Deptl. transport ; for the 2nd Line of Regl. transport he will provide the animals, drivers, offrs., N.C.Os., and artificers required ; for the transport purposes of the Medcl. Dept., the same also, together with the wagons for the transport required by the O.S. Dept. (about 30 tons per Army Corps). He will also have to furnish the animals, wagons, and transport establishments for the conveyance of 2 days' rations for the whole Force employed, and he will also find the offrs., N.C.Os., and artificers for the working of the General Transport.

The Regtl. and Deptl. Transport will on the march be distributed into 2 Lines as follows :—

1*st Line*, Regtl. For the conveyance of all camp equipments (tents excepted), offrs'. baggage, the current day's nett ration, regtl. reserve of S.A.A. and intrenching tools.

RECAPITULATION OF TRANSPORT COMPANIES.

	Company.	Section.	* The numbers in this column include Bâtmen.	Officers and Men.				Horses.				Carriages.
				Offrs.	N.C.O. & Men.	Drivers.	Total.	Ridg.	Drt.	Spare.	Total.	
1st Line.	I.	1st	Divisl. details of I. Divn.	2	13*	46	61	6	82	10	98	21
		2nd	Bearer Company	1	9	43	53	4	80	6	90	40
		3rd	1st Brigade	1	11	22	34	4	40	4	48	11
		4th	2nd Brigade	1	11	22	34	4	40	4	48	11
			Total No. I. Compy.	5	44	133	182	18	242	24	284	83
	II.	1st	Divisl. details of II. Divn.	2	13	46	61	6	82	10	98	21
		2nd	Bearer Company	1	9	43	53	4	80	6	90	40
		3rd	1st Brigade	1	11	22	34	4	40	4	48	11
		4th	2nd Brigade	1	11	22	34	4	40	4	48	11
			Total No. II. Compy.	5	44	133	182.	18	242	24	284	83
	III.	1st	Divisl. details of III. Divn.	2	13	46	61	6	82	10	98	21
		2nd	Bearer Company	1	9	43	53	4	80	6	90	40
		3rd	1st Brigade	1	11	22	34	4	40	4	48	11
		4th	2nd Brigade	1	11	22	34	4	40	4	48	11
			Total No. III. Compy.	5	44	133	182	18	242	24	284	83
	IV.	1st	Hd. Qrs. of Army-Corps	2	13	36	51	6	64	8	78	27
		†2nd		1	11	30	42	4	20	..	24	3
		3rd		1	11	47	59	4	84	10	98	21
		4th	Cavalry Brigade	1	11	62	74	4	110	14	128	38
			Total No. IV. Compy.	5	46	175	226	18	278	32	328	89

2nd Line.	V.	1st	2 Fd. Hospitals . .	I. Divn	2	13	46	61	6	88	4	98	24
		2nd	2nd day's Provisions and Commissariat Det.	I. Divn	1	11	67	79	4	128	6	138	32
		3rd	2 Fd. Hospitals . .	II. Divn.	1	11	46	58	4	88	4	96	24
		4th	2nd day's Provisions and Commissariat Det.	II. Divn.	1	11	67	79	4	128	6	138	32
			Total No. V. Compy. .		5	46	226	277	18	432	20	470	112
	VI.	1st	2 Fd. Hospitals . .	III. Divn.	2	13	46	61	6	88	4	98	24
		2nd	2nd day's Provisions and Commissariat Det.	III. Divn.	1	11	67	79	4	128	6	138	32
		3rd	2nd do. do. Cavy. Bde.		1	11	31	43	4	60	2	66	15
		4th	2nd do. do. Corps Details		1	11	46	58	4	88	4	96	22
			Total No. VI. Compy. .		5	46	190	241	18	364	16	398	93
	VII.	1st	‡3 Fd. Hospitals (of the 6 with Hd. Qrs.)		3	24	73	100	10	138	8	156	74
		2nd											
		3rd	Bakery Train (Hd.-Qrs.) . .		1	11	43	55	4	82	4	90	23
		4th	Ordnance Store (Hd.-Qrs.) . .		1	11	63	75	4	120	6	130	30
			Total No. VII. Compy. .		5	46	179	230	18	340	18	376	127
	VIII.	1st	*Reserve Company to Army-Corps, and available for carriage of about ¾ of the tentage for the whole force at one time.*		2	13	56	71	6	108	4	118	28
		2nd			1	11	56	68	4	108	4	116	28
		3rd			1	11	56	68	4	108	4	116	28
		4th			1	11	56	68	4	108	4	116	28
			Total No. VIII. Compy.		5	46	224	275	18	432	16	466	112
			Total 1st Line . .		20	178	574	772	72	1,004	104	1,180	338
			Total 2nd Line . .		20	184	819	1,023	72	1,568	70	1,710	444
			GRAND TOTAL .		40	362	1,393	1,795	144	2,572	174	2,890	782

† Cadre Section as Reserve to 1st Line. ‡ Carriages for 6, but Transport for 3 only estimated.

Note.—92 drivers of the 1st Line, and 48 drivers of the 2nd Line, may be "hired" in place of "military" drivers.

1st Line, Departl. For the conveyance of 1 day's provisions and oats, Butchery implements, Bearer Company's equipment, &c., and of the tents if so ordered.

2nd Line, Departl., attached to Regts. for the conveyance of tents and horse blankets.

" Departl. not attached to Regts., for the conveyance of 1 day's provision and oats for the whole Force, of the Fd. Hospl. equipmt., of the Bakery Train, and of the Ordnance Advance Reserve Stores.

To carry out these duties which, according to present regulations, devolve upon the Commissariat, 4 Transport Comps. are allotted to each Army Corps for the deptl. duties of the 1st Line of Transport (not including Regtl. Transport), which allows of one section of a company as a Reserve; 4 other Transport Comps. take the duties of the 2nd Line of Transport of an Army Corps, including the 2 Fd. Hospls. with each Divn. and 3 of the 6 Fd. Hospl. with the Corps Reserves, and the O.S.D. Stores, Bakery Train, &c. The following would be the distribution of these 8 Transport Comps.: Nos. 1, 2, and 3 Comps. to the 1st Line of the 3 Divisions of the Army Corps; No. 4 Compy. to the 1st Line of Corps Details and the Cavalry Brigade; Nos. 5 and 6 Comps. to the 2nd Line of the 3 Divisions and of the Corps Details; half No. 7 Company for the 3 Fd. Hospls. in reserve, and the other half for Bakery Train, and No. 8 Compy. for O.S.D. Stores and for 2nd Line attached to Regtl. Transport.

A Division acting independently would require 2 Transport Comps. for both lines of transport, &c., &c.

Each of the 3 Transport Compys. attached to Divns. is thus distributed: No. 1 Section with the Compy's. Hd. Qrs. will supply the Deptl. Transport of the 1st Line of Divnl. Details; the 2nd Sectn. is attached to the Bearer Compy.; and the 3rd and 4th Sectns. each to one of the two Brigades composing the Division. The 4th Compy. is thus distributed: its Hd. Qrs. and 1st and 3rd Sectns. will supply the Deptl. Transport for 1st Line of Corps Details, including the ½ Bearer Compy. attached to them, and its 2nd Sectn. will be in Reserve; its 4th Sectn. is attached to the Cavy. Brigade with its attendant ½ Bearer Comp., see page 52 giving details of establishment of a Transport Company.

The preceding table gives a recapitulation of this distribution in a tabular orm.

For the General Transport the number of carriages, animals, &c., required will depend so much upon the nature of the operations to be undertaken, and upon the country to be operated in, that no guide to them can be attempted. It should be worked under the orders of the Director of Trans-

port. Its organisation, under most circumstances, should follow that adopted in the Peninsula, where a park of 800 carts was thus divided :—

1 Brigade = 25 carts, 54 bullocks (4 of them spare), 1 conductor, 1 smith, 9 men, and 14 boys.
2 Brigades = 1 Division under an officer - - = 50 carts, &c.
8 Divisions = 1 Grand Division - - - - - = 400 ,,
2 Grand Divisions = 1 Park - - - - - - = 800 ,,

To work such a park there would be required, 1 officer as commandant, 2 officers as assistants, and 20 inferior officers, with 40 N.-C. Os. and 40 artificers.

If the fidelity of the drivers of this levied transport can be trusted, they should be employed upon the part of the L. of C. passing through the districts to which they belong, as casualties in men and animals can then be more easily replaced ; but if their fidelity is suspected, the farther they are employed from their own homes the better, as they are then more dependent upon you, and deserters are more easily apprehended ; this was proved in 1860 in the north of China, where the 3000 men of the Coolie Corps brought from the south remained faithful to us throughout the war, whilst the transport locally obtained never could be depended upon, and in one instance deserted *en masse*.

Transport Coolies. In many of our small wars transport coolies have played an important part, notably in the Ashanti campaign, for as no animals could live on the Gold Coast, the whole transport consisted of coolies, men, women, and even children being employed. They carried the loads on their heads, the common load being 50 lbs. for a man, but many carried 60 lbs. and some even 70 lbs., and the women about 40lbs. each. Similar weights were carried in China by the Coolie Corps, the load being either carried in two equal portions, one at each end of a split bamboo, or two loads were carried between two men, in one parcel slung to the centre of a pole. In the Loochai and Duffla expeditions, the weight of the load was only 40 lbs., as each carrier had to carry his own kit besides, which weighed over 21 lbs. In China the Coolie Corps was organised in comps. of about 300 coolies each (it was intended they should have been 400 men each), under the command of an English officer. To each comp., in addition to the English officer, there was 1 company sergt., 4 other sergts., 28 British soldiers, 4 Chinese headmen, and 4 Chinese assistants. The staff of the corps consisted of 1 commandt., 1 2nd in command, 2 subalterns, and 1 sergt. In the Duffla expedition the Coolie Corps consisted of 4 Divns., under 1 commandt. Each Divn. consisted of 1 British offr., 3 British N.-C. offrs., 12 sirdars or mates, and 300 carriers ; each Divn. was divided into 3 comps. of 100 carriers each, under a N.-C. O. with a sirdar or mate for each of its 4 sections.

In the organization of a carrier corps, the customs, habits, and prejudices

of the natives to be employed must be studied, for upon them the details of the organization must very much depend. In most cases savages work best under their own chiefs or headmen ; the element of white men is required to ensure punctuality, possibly honesty and obedience to orders ; in many cases it is only possible to ensure to the individual carrier the payment of his just wages by having the payments made direct to the carrier by an English officer.

The native carrier transport in Ashantee was thus allotted per battalion of English troops. For 650 soldiers at 1 carrier for every 3 soldiers, 217 carriers ; 30 officers' baggage, at one carrier per officer, 30 ; cooking pots for 30 officers, at 1 to every 3 officers, 10 ; regimental reserve of S. A. A. (Snider), 50 rounds for 580 men (70 boxes), 70 carriers ; 82 camp kettles (Flanders pattern), 10 by 1 carrier, 9 carriers ; regimental orderly room and Q. M.'s office, 2 ; for 40 cots (for sick carriage), at 6 carriers each, 240 ; native orderlies for 2 medical officers, 6 ; headmen, 1 per 25 carriers and 3 spare, 28 ; making a total of 616 natives, and adding 38 (6 per cent.) as spare, the total number of natives for each battn. was 654.

Ox transport can be used in the rear of an army along its lines of communication with very great advantage in a country like South Africa, that abounds with grass ; there the ox will not work or even live many months upon any other food. In India, Turkey, and throughout the East, the ox, however, thrives well on chopped straw. The great advantage of ox transport in South Africa is that the oxen require to have no forage carried for them, the country supplying all they require. During the summer months of July, August and September, when the old grass has been burnt, and the young grass has not yet come up, to move with only ox transport is difficult. Ox transport in South Africa can travel from 12 to 14 miles a day, but no more than about 60 miles a week can be expected from it. The average rate of march for a single waggon is $2\frac{1}{2}$ miles an hour, which comes down to 2 miles an hour for a large convoy. Ox transport should be divided in South Africa into sections of 10 waggons each, with a white man as conductor for each section, there being an officer to about every 50 waggons. The best and surest work is obtained from ox transport when its movements do not in any way depend upon the movement of troops or of convoys drawn by mules or horses. Oxen should be worked by night as much as possible, and never during the greatest heat of the day, nor in wet weather nor in larger numbers than 50 waggons together ; if that number be exceeded, there will be delays and difficulties about grazing. The ox takes several hours to feed ; they should be well guarded by mounted escorts in an enemy's country. It is very necessary they should be accustomed to the language or tone of voice of those who drive them. The following spare gear was issued in South Africa with every section of 10 wagons : 1 jack-lifter, 1 trek touw, 10 yokes, 40 riems, and 20 yoke-stays.

ANIMALS USED FOR TRANSPORT PURPOSES.

THE HORSE may be said to be in the prime of life from 5 to 10 years old; he weighs from 1000 to 1200 lbs., according to his height; the former is for the saddle, the latter for the draught horse. For cavalry and artillery purposes his minimum height should be 15 hand 2 inches. The average walk of a horse is a mile in 16 minutes, 3·75 miles an hour, making 120 strides (110 yards) each minute, the stride being 0·916 yard; the regulation rate of walk for our cavalry is "not to exceed 4 miles an hour." The average trot is a mile in 8 minutes (7·5 miles an hour), making 180 steps (220 yards) each minute, the stride being 1·22 yard.* This is a slow trot; when going at a good pace, a horse trots easily 8½ miles an hour. Our regulation trot of manœuvre is 8 miles an hour, at which pace 235 yards are passed over in one minute. The gallop is about 100 strides (352 yards) each minute, that is, at the rate of 12 miles an hour, the stride being about 10 ft. The gallop of manœuvre in our cavalry is at the rate of 12 miles an hour. A "horse's length" is 8 ft. A horse occupies in ranks 3 ft. × 10 ft., and when picketed, from 3 to 6 ft × 9 ft.; he should have in stables not less than 1200 cubic feet; stalls should be not less than 4 ft. 5 in. × 9 ft. When horses are used as pack-animals, their load should be 200 lbs., including pack-saddle. It has now been settled that all horses are to be picketed to ropes stretched between picket posts or waggons.

The diet of horses should be carefully attended to, and occasional change is most beneficial; half a bushel of carrots a day per horse has an excellent effect. Green food can be given in small quantities occasionally with great advantage, especially to young horses when they are not doing hard work, but great care must be taken, when in the field, that horses do not eat as much as they like; whole squadrons of horses have died in a night from doing so. Sick horses will often eat green forage when they will not touch other food. The daily ration of forage, whatever it may be, should be divided into three equal feeds, given one in the morning, one at mid-day, the other in the evening. Horses should not be disturbed when eating their corn by any attempt to clean them. Those which miss a feed by being absent at feeding time, should not be given two feeds at the next feeding hour if there is time to give the two feeds separately, with an interval between them before making them comfortable for the night. They should also be watered early in the morning; always give river or lake water in preference to that from springs or wells. On the march very little should be given before starting; let them drink a little frequently during the march, but when halting for the night they should not be watered for at least an hour after feeding. When halted for a day, let them have as much as they like,

* A good trotter will do from 7 to 8 ft. at a stride.

taking care that they are cool at the time. Horses will eat leaves when grass is not to be had ; those of the elm are the best. Horses and ponies, and especially mules thrive well and can do hard work on bamboo leaves. Chopped straw is a good substitute for hay ; horses have done work for some considerable time on the thatch taken off houses. In rainy weather grass should be piled in heaps, and the driest parts given first. When it can be done it is a good plan to crush all corn, beans, and peas ; when this cannot be done to the two last, they should be soaked in water for a few hours. Give sparingly all food that the horse is not accustomed to. (See article on rations.) Grooming in moderation is all that horses on service should have. That continual grind at "stables" wears out men's spirit, and it is far from certain whether (carried to the extent it is in our service) it does not render horses very susceptible to cold when picketed in the open in bad weather, by opening the pores of the skin too much. In this, as in most other things about our army, we try to carry into the field the habits of life in barracks in England, and "go in" too much for appearance.

In grooming, begin cleaning at the off hind-quarter, and go to the head ; first wisp and rub the dirt and dust out, and then brush until quite clean. All brushing is to be done against as well as with the grain, preserving as much as possible a straight arm. No circular motions are to be allowed. The hand not immediately in use must be kept upon the horse, to prevent his closing too much on the groom. The curry-comb is also to be kept on the back of the hand, and never to be used on the horse.

Immediately after each day's march the feet are to be picked and carefully examined, heads and legs thoroughly wisped, and feet washed, the backs carefully examined to see that they have not been galled or hurt in any way. The shoes should be looked to and loose ones refastened. All mounted officers should see to this themselves, as grooms are careless. Wounds occasioned by kicks and sprains should be continually fomented with hot water at first, to reduce the pain and inflammation ; cold water and bandages to be applied afterwards. If you can rest the horse for a couple of days, give a mild dose of physic. For bullet wounds, applications of cold water, as with men, is the only cure. All gashes, or sword cuts, must be sewn up as quickly as possible. Officers going on detached duty away from any vet., ought to take a small supply of horse medicine with them, such as balls, and discutient and astringent powders. Hoof ointment, for brittle feet or sand cracks, is made of tar and train oil in equal parts. One part of this ointment with two of train oil is good for mange.

Shoeing.—It is much to be regretted that all officers in passing out of the Staff College, should not be obliged to learn how to shoe a horse. I strongly advise all who have an opportunity of learning, to avail them-

selves of it. A set of spare shoes, with nails, should be carried on service with every horse: these shoes should be especially made to fit each horse; and when a shoe is cast, not a moment should be lost in having it replaced. If obliged to do so yourself, use the least number of nails that will keep it on for the time, and in driving them in, incline them well outwards, feeling for the end along the crust of the hoof with the fingers of the left hand; if, after the first few taps of the hammer, you do not feel the point coming out, draw the nail, and try it at another hole. A great part of the art is, in pointing the nail, to give it a slight bend outwards.

The shoe to be beveled off, so as to leave a space, and prevent pressure on the sole.

It is not to be grooved, or fullered, but simply punched, and the nails countersunk.

Calkin is only to be applied to the hind shoe, and is to be confined to the outside heel. The inside heel to be thickened in proportion.

The weight of the shoe to be from 12 to 15 ounces, according to the size of the horse.

As a general principle, horses are to be shod with not less than 6 nails in the fore and 7 in the hind shoe; and the shoe is not to be attached with less than 3 nails on either side.

In preparing the foot for the shoe, as little as possible should be pared out, and the operation should be confined to the removal of the exfoliating parts of the sole.

Both fore and hind shoes to be made with a single clip at the toes.

The same shoe, unless very little worn, is not to be removed and reapplied in consequence of a horse having been sick. No hot shoe, under any circumstance, to be tried on a horse's foot.

Every horse to be newly shod once in a month.

THE MULE comes next. He is far less liable to disease, and requires less grooming and attention than the horse, and is about twice as longlived: he almost rivals the horse in usefulness for general military purposes. The mule should not be worked under 4 or 5 years old, but they last well until 20 or 25 years of age: the female is the most docile and the entire is often vicious and seldom carries well. In height they range from 13 to 16 hands. Their common load is 160 lbs.. or including weight of pack-saddle, 200 lbs.; very fine mules if well fed will, however, carry as much as 300 lbs.; height varies from 13 to 16 hands. They will eat almost anything, but are very particular and whimsical about their drinking water. The mule from the male ass and the mare is the best; their voices take after the sire. The real value of the mule is felt most strongly in mountainous countries, where, as a rule, he is more useful even than the elephant, which requires good food to keep him in working order; a mule will live, be fat and do useful work under circumstances that would kill the elephant. He can travel easily 3 to 3¼ miles an hour when loaded, and is very sure-

footed over rough, stony and precipitous or hilly roads. The mule is a good swimmer, and may be trusted to cross rivers in safety. He suffers much, however, from leeches and other jungle pests. His skin is tougher than that of the horse, and he is less liable to a sore back.

In Abyssinia the load was reduced to 100 lbs. (exclusive of the pack-saddle) owing to the steepness of the roads. In Bengal a mule carries 2 boxes (1200 rds.) of M. H. ammunition. See article on "Ammunition" for information as to the conveyance of S. A. A. on mules in Europe. The Cyprus mule is an excellent beast of burden, and according to size will carry a load of from 150 to 220 lbs. for a march of 20 to 24 miles in about 6 or 7 hours, according to the nature of the road or path.

PONIES.—The common pony of India is inferior as a transport animal to both the mule and donkey. The good Kabulee pony will carry a load of 160 lbs., but the ordinary pony can only carry about half as much. The pony of Cyprus carries a load of from 130 lbs. to 200 lbs., and will do about 20 to 24 miles a day.

THE BULLOCK is admirable for slow draught, especially over rough roads, or through forests, or other places where there are no roads at all. They stand fire better than any other animals, and used to be employed extensively in India for draught in field batteries. They must not be hurried; their ordinary pace is from 2 to 2½ miles an hour; if used over hard roads they require shoeing. They want but little care, and thrive well on poor food. They attain their prime at 6 years; age to be known by annular swellings on horns, allowing 3 years for the 1st ring, and 1 for each of the others. They are used in many parts of India as pack-animals, when they carry a load of about 160 to 200 lbs., including the weight of their equipment. In the plains of India the waggon or cart with 2 bullocks carries a load of 800 lbs., and with 4 bullocks 1600 lbs. In the recent operations in Afghanistan, the regulation load for the 2 bullock cart was fixed at 8 maunds, say 655 lbs. In Bombay these figures are 700 and 1300 lbs. respectively. In India the space allowed in shed stables is 10 ft. by 4 ft. per bullock. The 2 bullock cart of Cyprus will carry 1000 lbs., and do from 20 to 24 miles in about 6 or 7 hours.

CAMELS are used in the East from 3 to 16 years of age; they are in their prime from 4 to 12 years old; about 7 ft. high (to top of hump), about 8 ft. long from nose to tail. The Bactrian camel has two humps, whilst the Arabian animal used in India has only one. Pace about 2 or 2½ miles an hour, kept up steadily for the longest marches; the pace of the camel of Sind is said to be exactly one pace of a yard in length per second, which would be at the rate of 2 miles 80 yards an hour. The swift riding camel of India does about 7½ or 8 miles an hour for many hours over a level country;

its stride is from 6½ to 7½ ft. In India generally, the load should, as a rule, be from 300 to 480 lbs. (not counting saddle, &c.) according to the size of the camel. In Afghanistan the regulation load was 4 maunds, say 330 lbs. The carrying power of the camel is in India calculated to be equal to 2 mules or pack bullocks. Sir C. Napier fixed the camel load in Sind at from 250 to 300 lbs. exclusive of saddle. They thrive well upon leaves of trees, and can go without water longer than any other animal. During temporary halts the laden camel can kneel down and rest. They are admirably adapted for carrying long articles, such as scaling ladders, infantry pontoons, &c. The camel is at home in the desert, and works well in the plains of India; it is unsuited for hilly countries. After rain in clay soil, or over rocks and stony places, they split up and are consequently useless there. They are good for fording rivers that are deep but not rapid, and where (as is so common in India) the bottom of the ford is shifting sand, the passage of a number of camels over it renders it hard and firm. They are extremely delicate in constitution, and liable to diseases little understood. When suffering from over-work they do not recover with rest like the horse or mule: they pine and die away. They require a long time to feed, at least 6 hours; owing to their great height they suffer severely from ill-balanced loads. The camel used in India is a vicious brute. Average weight about 1,170 lbs. In Bengal when calculating for the conveyance of baggage, 1 camel is allowed to each S. Sergt.'s tent, 1 to every 2 pal tents, 2 for every 3 E. P. tents, 1 for the bedding, &c., of every 8 British soldiers, 1 per troop or company for cooking utensils, 1 for every 2 arm chests, 4 per troop or company for stores, 1 for the scales and weights of a British Regt., half a camel for the baggage of each regimental Sergt. Major, Q. M. Sergt., and schoolmaster. In the plains, a good camel can easily carry 6 boxes of M. H. ammunition, or 4 in a hilly district.

THE ELEPHANT is the king of beasts of burden, becoming fit for work at 20 years of age, and lasting well to 50 and even 80 years of age. The female is to be preferred to the male, as much more tractable. The load for steady work should not exceed 1200 lbs. for the large-sized, and about 800 lbs. for the small-sized animals: in Abyssinia the weights carried by the artillery elephants averaged from 1324 to 1844 lbs, including weight of pad (500 lbs.): the 12 pr. Armstrong guns (weighing 924 lbs.) were carried on elephants. In the plains of India the ordinary-sized animal can carry 16 boxes of M. H. ammunition in 8 suletahs, 4 on each side in 2 tiers exclusive of the pad, pace from 3 to 3½ miles an hour in cold weather; when laden can keep up well with infantry in their daily marches. The back of an elephant is much higher—say on an average 6 in.—than the shoulder; not 1 in 50 females exceed 8 ft. at shoulder; the largest tame elephants in India measure under 10 ft. at the shoulder; those of the commissariat

average about 7½ ft. It is most tractable in disposition, is invaluable during marches in countries flooded by rain for extricating carts, guns and wagons that have stuck in the mud. They are now used in India for the draught of guns in siege trains; before such guns are taken under fire it is necessary to have the elephants taken out and replaced by bullocks, as the former cannot be made to stand fire. The average weight of an elephant in India is from about 5600 to 6600 lbs. They are often used in hilly countries to carry guns on their backs. (See article on bridges for further dimensions.) A trench 7 ft. wide is impassable to the elephant, although the stride of a large animal is 6½ ft. He suffers much from great heat, and does not like working in the sun; the skin is easily chafed by harness in wet weather; in good health is always in motion. When listless, with the trunk gathered up, the animal is unwell. In moving them by rail, they require protection from the sun, and during the day water should be frequently thrown over them. Care must also be taken to screen their eyes to prevent them seeing and endeavouring to seize passing objects with their trunks. They should not travel by rail at night. In loading them with baggage, they should not be kept long standing or kneeling. One elephant is calculated as equalling 3 or 4 two-bullock carts, or 3 camels. In Bengal 3 S. S.'s tents are allowed as a load to each elephant, or 1⅓-elephant to every 2 E. P. tent. They only sleep for about 4 or 5 hours in the 24, so when possible they should be left undisturbed from 9 A.M. until 3 P.M. daily.

The equipment gear of transport animals is as follows:—

Pack saddles.—There are 3 patterns used by us at home; the larger weighs 32½ lbs., the second 28, and that for cacolets and litters 33 lbs.; these weights include the pannels and girth straps, which are screwed on to the saddle trees; the weight of the harness is 23, 21 and 23 lbs. for those three patterns respectively; the cover used to protect the loads weighs 4½-lbs., and the baggage straps 5¼ lbs.

Mule equipment.—In India the mule and pony saddle complete with suletah and loading rope weighs 48 lbs. In India the following stores are issued with each mule or pony:—1 head stall with chain or rope, 1 heel rope or chain with shackle, 1 jhool and surcingle, 1 thobra or nose bag, 2 pegs (iron pegs were used in Afghan war), 1 wooden mallet to every 50 animals, 1 currycomb and 1 hand rubber to every 3 animals, 1 pack saddle complete, 1 bridle, 1 loading rope, 1 suletah or koorja; when iron pegs are used 1 iron hammer should be issued for every 3 animals. Picketing chains of light, galvanized iron are better than those made of rope for Indian work.

Pack Bullock equipment consists of pad, suletah and loading ropes, and weighs about 50 or 60 lbs.

Camel equipment.—1 leading rope, 1 cotton belly band or jaraki (13½ ft. long and 1½ in. wide), 1 nakel or nose-peg, or a web halter instead, 1 gorband or breastplate, 1 doomchi or crupper, 1 daman or tethering rope, 1 mubar or nose rope, or when a halter is used instead of the nose-peg, a plain leading rope is sufficient—1 pillan or saddle (wt. 42 lbs.), 1 suletah (for 10 per ct. of the animals it weighs 16 lbs.), 1 suffra or feeding bag, 1 loading rope, and 1 jhool (wt. 16 lbs.), weighing altogether about 114 lbs.

Elephant Equipment consists of gaddees, guddala, peyte, suletah bags, buntha ropes, and ropes for loading, weighing in all about 314 lbs.

In taking over transport of all kinds, an officer should be careful to note on the receipt he gives for it, the general condition of the animals, carriages, equipments, &c., &c. All deficiencies of equipment to be recorded, as well as the number of sore backs or badly galled animals, &c., &c. All these remarks to be entered in the register book in which he keeps a list of all the animals, stores, equipment, &c. which he receives and issues. He must also keep a book with a nominal roll of all those serving under him, together with their rates of pay, and all other useful particulars regarding them.

Loading of Pack Animals.—1st. Attach the end of the loading rope at the lower fore-ring of the saddle, pass it loosely through the lower hind ring, and then through the upper hind ring or hook.

2nd. The load (which should always be as compact as possible) is then laid against the lower part of the saddle, and the end of the rope passed through the slack which hangs between the two lower rings; it is then passed through the upper fore ring or hook, and secured.

Great judgment is required in loading pack animals, and care should be taken that the animals are not overweighted, that the load is well put on, that it is neither pitched too high upon the saddle, thereby causing it to roll upon the back, nor too low, which adds to the weight and encumbers the animal, but that the lower line of the load should be even with the shoulders. When the load is allowed to hang below the saddle on either side, the animal, especially the camel, is very much distressed by its striking against its legs at every step. Before starting it is essential that the officer in charge of the transport should go round and see that his orders have been effectively carried out regarding the loading of the animals, as some little time spent in adjusting the loads before starting generally saves confusion and subsequent loss of time when on the march.

Ladders will be found of great service in loading pack animals.

Previous to loading pack animals, the loads should be distributed in lines with intervals of 2 paces between each load: the animals to receive the loads should then be placed opposite them, and if possible picketed there: this is very desirable, for if loaded animals are permitted to wander amongst those being loaded, great confusion will ensue, and many loads be rubbed or

kicked off in the *mêlée.* It is for the officer in charge of each Transport section to see that the saddles, harness, or other pack equipment fits the animals, and that when these have been properly adjusted, they should always be used for the same animal as long as it remains effective. When animals fall-off in condition from hard work, sore backs, bad galls, &c. can only be prevented by frequent readjustment of harness and pack equipment. Never load your animals a moment before it is necessary to do so.

Transport animals on the march should not be pressed beyond their ordinary walking pace. When an animal is unable to keep up with the others, its load must be reduced by placing part of it on one of the spare mules, camels, &c., &c., which should invariably accompany each section of transport to the extent of at least 10 per cent of the loaded animals. At very difficult points of the road in hilly countries, the animals should be disconnected one from the other as they are likely to be thrown down in surmounting obstacles if fastened together in a string. Extra men, should, if possible, be posted at such places, to remain there until all have passed, for the purpose of assisting the pack animals, temporarily supporting their loads, &c., &c. Trains of wagons on the march should halt for five or ten minutes every two hours, when drivers dismount, down props, ease girths, lift saddles and pads, and examine shoulders. When the halt is a long one, animals should be fed, watered, nostrils, eyes, and dock sponged out. If the halt is not long enough to feed, drivers should endeavour to give their animals even a mouthful of grass or hay and enough water to rinse out their mouths; to do so, refreshes the animal greatly.

Happily for the army we have now finally accepted the system of Regimental Transport. On the nature of the operation immediately in hand will depend the order of march for the baggage; sometimes it may be by battalions, brigades, or divisions. If a cart breaks down, or the load tumbles off a pack animal, all the transport of the battalion or regt. concerned must draw off, or at least to one side of the road, allowing the baggage of other regts. to pass on until the breakage, &c., has been rectified, when it will resume its march behind the baggage of the regt. then passing it. This is a very necessary rule to make, for it is essential to keep each unit of baggage together, so that in the event of a break-down the drivers and all the transport establishment of the regt. concerned may be at hand to assist. Except in the case of illness, no one to be allowed to travel in any wagon or to ride any of the transport animals, and all armed men must carry their arms themselves. Transport officers cannot be too strict in carrying out this rule. All transport officers to be held responsible that every animal under their charge carries one day's corn with it.

Organisation of Transport.—With us, we have so few clearly-defined regulations for war, that it is generally necessary to specially organise a

transport for each particular expedition. The following proportion of officers and men to wagons and pack animals is based upon recent experience in Afghanistan and South Africa. For the command of, care of, and general management of the transport of each Battalion of Infantry or Regt. of Cavalry, an officer should be carefully selected. He will be responsible to the O. C. his Regt. for the efficiency of the transport committed to his charge. He will not receive any extra pay, but if not belonging to a mounted branch of the service, he will have a horse, saddle, &c., issued to him by the Transport Department. He will be allowed a sergeant as an assistant, who will be mounted in like manner, and who should, I think, be allowed 1s. per diem as extra pay. When pack animals are used, two privates per troop or company, with extra pay at 6d. each per diem, should be allowed; these men should be carefully instructed in the loading of pack animals, or whatever may be the description of conveyance made use of. The sergeant and these men should carry their arms at all times. In India, two N.-C. O.'s or privates are allowed as assistants, but no English soldiers per troop or company, their place being supplied by Sepoy superintendents. The baggage of a battery of R. A. should be in charge of a N.-C. O. with extra pay at the rate of 1s. per diem. In native regts. the transport should be under the Qr. Master aided by a native officer, and also by two privates per troop or company.

The scale of subordinates allowed when pack animals are used in India, is as follows. 1 Sepoy superintendent to every 300 mules; 1 muleteer to every 3 mules or for every 6 donkeys: 1 camel driver to every 4 camels, 1 Duffadar to every 25 camels; 1 Jemadar to every 100 camels; 1 Naib Chowdry to every 500 camels; 1 Munshi to each Naib Chowdry; 1 native shoeing-smith and 1 native saddler per Regt. Battery, or Company of supplies. For bullock-carts the establishment was, 1 driver for every pair; 1 first-class and 2 second-class inspectors, 2 head muccudums, 4 second-class muccudums, and 1 native doctor for every 500 bullocks.

In South Africa the heavy cumbrous wagons, drawn by from 14 to 18 bullocks, were worked generally in sections of 10 wagons each under a N.-C. O. or a civilian conductor. A transport officer was in charge of every 3 or 4 sections. The following gear and spare stores were carried by each section:—1 jack-lifter, 1 trek-touw, 10 yokes, 40 riems, and 20 yoke-stays.

Care of Transport animals.—Transport officers to take care that all the animals under his care receive their full allowance of food, and have as much water as they can drink. The best time for watering is in the middle of the day. Nothing is more refreshing to an animal after a hard day's work than grooming, and every endeavour should be made to effect it. In South Africa to remove the saddles or harness from mules or horses for even a quarter of an hour during a march, so that the animal may roll and stale,

has a most reviving effect. The prejudice against removing the saddle when the horse is warm is not believed in by South African colonists. It is very necessary to keep animals warm at night ; if any description of bedding can be obtained, it adds greatly to their comfort and health. When transport is being worked by fixed stages along any line of road, lines for the animals in well-sheltered positions should be made. Every care should be taken to keep these lines clean and well drained. If possible the dung should be dried and burnt in fine weather. When it can be done, some sort of rough shelter should be erected to protect harness and pack saddles from wet, as wet gear is very likely to cause sore backs. The lines for mules, ponies, and bullocks should be divided into blocks to hold about 50, 60, or 80 animals each (according to the numbers in which they are organized in sections, divisions, &c). The animals of each unit should be ranged in two rows facing inwards, with a clear space of 8 ft. between the picket ropes to which their heads are fastened. Each animal to be allowed a width of 6 ft. in the rows. For ponies and mules, heel-ropes should be provided if possible, the pegs for the heel-ropes being 11 ft. in rear of the head picket pegs. Similar arrangements should be made for camel lines, each animal requiring only 3 ft. in width and 8 ft. in depth ; the space between the two rows of heads to be the same as for mules, viz., 8 ft. When camels are thus in column as it were in their lines, the lines marked out for the heads of the animals will be 8 ft. and 22 ft. apart alternately ; a passage of 6 ft. clear between the tails of the rows of camels is thus provided for. The native system is to make the camels lie down in circles, and when the weather is very cold, or the position exposed this is best, as the animals afford one another protection from cold winds. A space of about 22 yds. square will be required for a circle formed of 50 camels.

SUPPLIES OF FOOD FOR HORSES AND ALL TRANSPORT ANIMALS. —*Horses.* The daily ration for all horses in the field is 12 lbs. of oats and 12 lbs. of hay. (See articles on *Hay* and Oats.) Horses employed on heavy draught work are allowed 2 lbs. of oats and 2 lbs. of hay extra. The ration in the Crimea for the former was 12 lbs. of oats or barley, and 16 lbs. of hay or chopped straw. Latterly, 1 lb. of bran was issued in addition for all horses, and 1 lb. of bran was always substituted for a similar amount of grain when required. The allowance of oats for the artillery was afterwards increased to 14 lbs. When not doing very hard work the ration of oats can be reduced to 10 lbs. In Turkey, where green forage was issued, 28 lbs. were given in lieu of 10 lbs. of hay or chopped straw. When no grain is to be had, the ration of hay should be 32 lbs., or 20 lbs. of unthreshed corn forms a good ration, 14 lbs. of bran = 9 lbs. of oats. When horses are stabled, 8 lbs. of straw should be issued per horse as bedding. Horses require from 6 to 8 gallons of water daily, according to the work they do and the climate they do it in.

In India, Arabs and small horses have 8 lbs., and colonial horses 10 lbs. of gram daily. The grass provided by the grass-cutter is about 30 lbs. per horse daily. When none is to be had, 12 or 15 lbs. of hay should be given instead. Whenever gram or any sort of beans is given to animals, it should be split, and, if possible, bruised as well as soaked before eaten. In South Africa the forage ration for horses ranged from 10 to 12 lbs. of oats or Indian corn, and as much grass as they could pick up when turned out knee-haltered to graze; sometimes it was 8 lbs. of grain, and 10 lbs. of oat hay, and ¼ oz. of rock-salt per horse was sometimes added. Horses, when not worked hard, will thrive well on 6 gallons of water a day, but require from 8 to 12 when at hard work, according to the climate. A couple of gallons extra should be allowed, when possible, for washing them.

Mules and Ponies in the Crimea were given 10 lbs. barley and 12 lbs. of chopped straw. In America, where mules were very extensively used during the Secession war, the ration was 8 lbs. hay and 11 lbs. grain daily. In South Africa the mule ration was 10 lbs. of grain (mealies) or 20 lbs. of oat hay, or half of each together, and ½ oz. of rock salt. They were at the same time turned out knee-haltered to grass almost daily. When regularly grazed they thrived well on 8 lbs. of grain. In Cyprus the mule ration (where they are not allowed to graze) is 8 lbs. of barley and 24 lbs. of chopped straw; that laid down by our regulations was 10 lbs. of hay, 8 lbs. of barley, and 1 lb. of bran; 12 lbs. of barley extra was allowed in winter when they were worked hard. In India, under similar conditions, it is 10 lbs. barley or 5 lbs. gram, and 12 lbs. chopped straw or hay. Mules, ponies and asses require 6 gallons of good water daily. Mules are more particular about the water they drink than most other animals.

Rations for Bullocks that are used in India for draught in the siege train and artillery batteries are 4 to 6 lbs. of gram, and 12 or 14 lbs. of chopped straw.

Oxen in the Crimea received 6 lbs. of oil cake and 12 lbs. of chopped straw; or, in the absence of oil cake, 6 lbs. of barley; they require from about 6 to 8 gallons of water daily. On board ship their ration is 2 lbs. gram, 12 lbs. of hay or kirbee, and 6 galls. of water. In Cyprus the ration was 5½ lbs. cotton seed, 5½ lbs. bran, and 8 lbs. of chopped straw. They require from about 6 to 8 galls. of water daily.

Buffaloes in the Crimea received 20 lbs. hay or straw, 15 lbs. oats, or 12 lbs. bran, increased to 30 lbs. when no hay or straw was issued.

For Camels in the Crimea the ration was 9 lbs. of barley meal and 12 lbs. chopped straw. When the latter could not be had, 9 lbs. of barley was issued instead. They ought to have green food if possible. In India they

are fed entirely upon the leaves of trees; those of the peepul are the best. When rationed in India they receive generally 9 lbs. of barley or 5 or 6 lbs. of gram, together with 20 lbs. of mixed bhoosa. They should have 15 gallons of water daily, although a large Arabian camel, taking 5 or 6 gallons of water into its stomach, can exist, it is said, for 5 or 6 days without drinking.

On board ship the ration is 3 lbs. gram, 20 lbs. hay or kirbee, and 8 galls. of water. In Cyprus the ration is 8 lbs. chopped straw and 15 lbs. of cotton seed.

Elephants in India are given from 15 to 30 lbs. of wheat flour, according to the size of the animal and the work he is doing. Mixed with it is 1 lb. of coarse sugar or molasses. This is given to him in large thick cakes, in addition to about 400 lbs. of green food, such as sugar cane, branches of the peepul and other trees, green corn, &c.; or, if green food is not to be had, to about 240 or 250 lbs. of rice or other straw. Tree-food is heating, and, if possible, should only be given in the rains; when plantain leaves are given they should be cut into lengths of about 12 inches. On active service the ration is often reduced to 25 lbs. of flour, 2 oz. of salt, 100 lbs. of green food, or 175 lbs. of hay. In Bengal it is found that a full-sized animal will eat 750 lbs. of sugar cane, which is more nourishing than 800 lbs. of any other green fodder. As much as an elephant can bring in on his back may be considered as his daily ration of green fodder. Unless supplied with plenty of green food, they soon fall off in condition; their food should be clean and wholesome; they require from 25 to 30 galls. of water daily. In India 15 lbs. of firewood is allowed daily to cook the cakes for each animal. On board ship the ration is Atta (flour) or rice, 18 to 20 lbs. 170 lbs. dry, or 320 lbs. green fodder, 2½ oz. salt, and 40 to 50 galls. water.

Hay.—If possible, obtain that of last year's saving; hay cut in the summer is not good until about October 1. It should smell sweet, be free from weeds and dirt. A load is 36 trusses of 56 lbs. of old, or 60 lbs. of new, each. It is shipped for use during voyages, and sent to armies wanting forage in compressed trusses bound with iron hoops, weighing from 140 to 160 lbs., and measuring 135 cub. ft. per ton. It is considered new for 3 months. A cubic yard of old weighs 126 lbs., of new 84 lbs.; if well pressed, old hay weighs as much as 225 lbs. to the cubic yard. In inspecting hay, thrust the arm into it, and its age may be tolerably estimated by the ease or difficulty in doing so, for the newer it is, the easier is the arm thrust into it.

Straw should be sweet, clean, and unbroken—the longer it is the better; that which has been threshed by machinery is never nearly so good as that

threshed by hand. A load is 36 trusses of 36 lbs. each: a cubic yard well pressed, weighs about 145 lbs.

Oats, barley, and other grains should be free from dirt, well dried, without any approach to mouldiness: they should have a sweet smell, and be heavy in the grain, and free from insects. All grain kept in store in large quantities should be turned over at least twice a week, to prevent fermentation. A bushel of oats weighs from 24 to 42 lbs. (according to contract in England, 38 lbs. to the bushel): of barley, 47 to 54 lbs.; of wheat, 60 lbs.; of rye, 54 lbs.; of maize (Indian corn), 56 to 66 lbs.; buckwheat, 46 to 52 lbs.; beans, 60 to 64 lbs.; peas, 66 lbs.; potatoes, 60 lbs.; onions, 57 lbs.; 32 lbs. of oats, and 48 lbs. of wheat go to the cubic foot. Grain should be about a year old.

Crops.—The following is a fair average of the number of bushels that go to an acre at home; oats, 40 to 50; barley, 35 to 40; wheat, rye, and beans, 25 to 30; maize and buckwheat, 30; peas, 25; potatoes, 8 tons; turnips (white), 30 to 40 tons; (yellow), 30 to 32; (swedes), 28 to 34 tons; cabbage, 35 to 40 tons; carrots, 10 to 20 tons. The weight of straw per acre of the following crops is: wheat 3000 to 3600 lbs.; barley, 1500 to 2100 lbs.; oats, 27000 to 3500 lbs.; rye, 4000 to 4800 lbs.; bean-straw, 2700 to 3200 lbs.; pea-straw, 2700 lbs. An acre of meadow-land, according to its quality, gives from 1 to 3 tons of hay.

The Bushel measure is difficult to obtain abroad; it may therefore be necessary to make it at times; to do so, see an article on "Weights and Measures."

COMPRESSED FORAGE.—In our next wars we are certain to use compressed forage to a large extent, as we have now tested its value for service in the field. That used in Natal in 1879 and 1881 consisted of oats, hay and bran, led to much waste from several causes; but experience has taught us that the following mixture is preferable, viz., oats, 7·25 lbs., crushed linseed 0·25 lb., crushed beans 1 lb., and chopped hay 0·5 lbs., making up in all a ration of 9 lbs., which is considered as fully equivalent to 12 lbs. of oats. This new ration is called the *Forage cake*, and is compressed into rectangular blocks of 18 lbs. nett each; 4 cakes are packed together into one bale enclosed in stout canvas, and bound with 2 iron bands, the net and gross weight being marked on each bale. One ton of these bales measures from 38 to 40 cub. ft.

The Bran cake for use at sea and for sick horses on land is of the same form and weight as the Forage cake, one ton of it measuring only about 40 cub. ft.

The Hay cake is also of the same form and weight: it is made of hay-chaff, and it is said that 9 lbs. of it may be safely substituted for the ordinary 12 lbs. ration of hay. One ton of this cake measures only about 45 cub. ft.

On service this hay cake can be advantageously mixed with the forage cake, but to obviate the excessive waste from feeding from the ground in the manner usual in the field, especially in windy weather, when quantities of the common hay ration are blown away from the picket-lines, it will be necessary to use a large, roomy nose-bag of a new pattern instead of the old pattern corn nose-bag. With this compressed forage cake it will be possible for cavalry to be sent away on detached duties, each horse carrying 36 lbs. of it in the corn bag, which, supplemented by whatever straw or hay or grass is to be found in the country itself, will enable the detached party to be independent of all commissariat supplies of forage for 4 days.

SUPPLIES OF FOOD FOR MEN.—*The two great necessities in the food line are bread and meat.* Biscuit may be used in lieu of bread, and preserved meat in lieu of fresh meat, when, comparatively speaking, only a small supply of fuel will be necessary; but, as a general rule, we may say that a liberal supply of fuel is also a necessity for an army in the field. It was the want of fuel more than of any other supply from which we suffered most in the Crimea during the winter of 1854–55.

Our existing regulations direct that on service each man shall always carry about him "the iron ration" for one day's consumption, and when on the march should also carry one day's ordinary rations, meat excepted, which is to be carried regimentally in carts provided for that purpose, and that each horse and transport animal should carry one day's forage complete. (See details of regimental establishments.) The Commissary attached to each Brigade, and Divisional and Army Corps Details, is to have with him in his waggons one day's supply for every man, for whose feeding he is responsible, of biscuit, preserved meat, &c., together with oats for every horse and transport animal belonging to his brigade, &c. The C. G. of each division will, in addition, have in a like manner complete supplies of provisions and oats for another day for every man or horse under his charge. That is, in addition to the iron ration carried by the men, 3 days' provision for the men, 1 day's hay and 3 days' oats for all horses and baggage animals, will accompany the troops on the march. These supplies are only to be used upon emergent occasions, the daily requirements of men and animals being daily provided for by the C. G., independent of these reserves. When it is necessary to draw upon them, the amount expended must be replaced as soon as possible from the advanced magazine, in which there should always be 4 days' complete supply for all the men and horses in the front.

For daily consumption the meat should be killed as soon as possible after

the march for the following day's consumption, and drawn by the Regtl. Q. Ms., together with all the other articles of the daily ration. As a rule, this meat will be kept in charge by the Q. Ms. in the carts or waggons told off for the purpose until the end of the following day's march, and then issued to the companies. The bread or biscuit, together with all the other articles in the ration, will be issued to the companies the evening they are drawn by the Q. Ms. from the Commissaries, and will be carried during the following day's march by the men for that day's consumption. It may occasionally be necessary to issue the meat to the companies also, so that it may be cooked at once and carried by the men the following day for that day's consumption.

Packages in which preserved meat or other food is made up should, for convenience in handling and distribution, never exceed 1 cwt. gross ; but it is far better that their weight should only be 56 lbs. gross ; the net weight should be 100 or 50 lbs., or a decimal part of those weights. The duties of an issuer are very onerous, and every effort should be made beforehand by attention to these little matters, with a view to reducing his difficulties as much as possible.

Armies taking the field now will carry with them steam or field ovens (according to the nature of the service) for baking. The steam oven (on a carriage) is easily drawn along roads by a pair of horses, and can be taken across country, wherever guns can pass, by four horses. It requires coke for heating, a fuel easily carried, with the extra advantage that a little goes a long way. These ovens will bake in each batch on an average 109 loaves of 3 lbs., or 2 field rations each. It may be estimated that 4 *batches* of bread will be turned out of one of them by fair tradesmen under ten hours. The weight of this oven is about 2 tons. A smaller size weighs 1 ton 2 cwt., and will bake a little over half the quantity that the larger one can. The field ovens (Aldershot pattern) are made of sheet iron : each weighs about 320 to 342 lbs. (according to the pattern), complete with their equipment of tins, &c., and can bake 100 rations (150 lbs.) at a time. On the Red River Expedition one of these ovens, worked by two men, turned out 470 loaves (of one ration, 1½ lb. each) in 12 hours ; oven being in good working order and the weather fair.

Travelling Bakery Wagons are also now approved for the use of the A. S. C. The wagons are covered, and in them the bakers can knead and prepare the bread for the ovens ; they are constructed to carry the necessary dough-troughs and baking implements.

Supplies of meat must be obtained as much as possible in the country. They will generally be driven to the front from the depots where they are collected. At every stage proper arrangements should be made for their protection and food : unless this is done, the loss of animals will be very

great before any drove reaches the army. On the march with a force, meat should be killed every evening as soon as the march is over, so that, as the animals are driven, no transport should be required for it.

Previous to a general action every exertion should be made to collect supplies for several days at some point within one day's easy march in rear of the army. Two days' rations should always be issued the evening before a battle; these arrangements will set free a large amount of transport for the removal of the wounded immediately the action is over.

Meat.—An ox should not weigh less than 600 lbs.;* 800 lbs. may be taken as an average, but a very good one will weigh twice as much: a cow may be a few pounds lighter. A deduction of 50 per cent. to be allowed for skin, offal, head, &c., &c. To find the weight of animals the formula is $(G \times \cdot 08)\ L \times 42 =$ weight in lbs.; G being the girth in ft., taken close behind the shoulder, L the length in ft., measured from the fore part of the shoulder-blade to the bone of the tail. A good sheep weighs from 60 to 100 lbs.; 70 lbs. may be assumed as an average: 45 per cent. to be allowed for offal. A full-grown pig weighs from 100 to 250 lbs.; 25 per cent. only being allowed for offal.

'Animals should be inspected by a V. S. 24 hours before being killed.' When possible, the meat should be killed from 24 to 48 hours in temperate climates, and 10 or 12 hours in the tropics, previous to being cooked. All animals for food should be in good health; if no V. C. is at hand, disease may easily be detected by a heavy sluggish look about the eyes, a hot dry feeling about the nose, and by a hanging tongue. The coat is also rough and staring; with cows the teats are hot. All runnings from the nostrils are suspicious. If there is any suspicion of the rot being in sheep, throw the animal on its back, and push open the eyelids; if it be free from this disease, the eyeball will be finely streaked with veins of a good healthy and bright red; if they are pale, the sheep is diseased.

Meat, especially in hot countries, should always be inspected immediately before it is cooked. The lean and the fat should be in proportion—the latter should be firm, and not too yellow; the meat should not be bloody anywhere. When any doubt exists as to its condition, a doctor should examine it at once.

Salt Meat.—To inspect it have several casks opened; if not full of brine the meat is to be suspected, as any portion of meat not continually covered by it is sure to become bad. Examine portions from both ends and centre of cask; they should be of good colour, well provided with fat. Decomposition can be detected by the smell, by a greenish colour, and by an unnatural softness. When time permits, no salt meat should be accepted

* *These weights do not apply to oxen, sheep, etc., that have been fattened for the butcher.*

in large quantities as good without boiling and tasting pieces at hazard out of several barrels. This is more particularly the case in inspecting salt meat for a voyage.

Care should be taken to keep the casks always full of brine. Fresh brine is made by dissolving salt in water. Brine is considering sufficiently strong when a potato will float in it. Salt ceases to dissolve in the liquid when the latter is completely saturated.

Bread.—'There should be a due proportion, not less than 30 per cent., of crust; the exterior surface should be well baked, not burnt; the crumb should be permeated with small regular cavities, no parts should be heavy and without these little cells; the colour should be white, or brownish from a mixture of bran; the taste not acid, even when held in the mouth.' It will keep good for 4 or 5 days in warm, and for 7 or 8 days in cold weather. 30 per cent. is gained in weight in baking. In making bread the following proportions are a good guide: 20 lbs. of flour, 8 to 12 lbs. of water, 4 oz. of yeast, and 1½ to 2 oz. of salt, to which a little potato should if possible be added. 780 lbs. (1 sack) of flour will give from 90 to 105 4 lb. loaves: 6½ lbs. of dough yields 6 lbs. of bread. When taken from the oven bread begins to lose weight. The 4 lb. loaf loses in the first 24 hours 1¼ oz.; in 48 hours, 5 oz.; in 60 hours, 7 oz.; in 70 hours, 8¾ oz. Bread when stale can be rebaked once, and will taste quite fresh for 24 hours; after that time it will then rapidly deteriorate. In baking the heat of the oven should not exceed 212 .

Flour should be white, with only a small amount of bran in it; there should be no lumps, or if any, they should break easily on slight pressure: it must not be acid in taste, and there should be no smell of fermentation or mouldiness.* Barrels of flour when stored in houses should occasionally be rolled out into the open air. It was found on the Red River Expedition that flour kept in barrels is not injured in any large quantity when exposed to wet, as a caking of paste forms round it, immediately inside the wood of the barrel, which preserves the flour within it. The Hudson Bay Company keep flour during their great inland journeys in sacks which they soak in water previous to filling with flour, and a caking of paste is thus formed which keeps the flour sweet within it. Wheat when ground yields 80 per cent. of flour, 16 of bran, and there is 4 per cent. of loss.

'*Biscuit* should be well baked, but not burnt; of a light yellow colour, and should float in water. When struck, it should give a ringing sound; a piece put in the mouth should thoroughly soften down. It should be free from weevils.'

* For further information on these subjects, consult Dr. Parkes' 'Practical Hygiene.'

Food is generally sent to an army in the field in the following packages:

Nature of Ration.	How packed.	Size of Package in Feet and Inches.	Cubic Measurement for Freight in Cubic Ft.	Average Weight in lbs.	
				Gross.	Net.
Biscuit	*Bags*		5	102	100
,,	*Barrels*	2′ 6″ × 1′ 8·36″	7·214	106	84
Salt beef	Tierces	2′ 8″ × 2′ 2″	12·5185	530	300
,,	*Barrels*	2′ 4″ × 1′ 11″	8·5138	360	200
,,	Small casks	1′ 7″ × 2′ 0″	6·336	202	100
Salt pork	(Same as Salt Beef)				
,,	*and in barrels*	2′ 5·5″ × 1′ 9·3″	7·745	325	200
,,	Half	1′ 11″ × 1′ 6″	4·3	190	100
Flour	*Barrels*	2′ 6″ × 1′ 8·36″	7·214	219	196
,,	Half	2′ 0″ × 1′ 4·545″	3·8	113	98
Sugar	*Barrels*	2′ 8″ × 2′ 2″	12·5185	460	390
,,	Half	2′ 4″ × 1′ 11″	8·5138	339	280
,,	Kilderkins	2′ 3″ × 1′ 8″	6·25	228	180
,,	Small casks	2′ 0″ × 1′ 7″	5	140	110
,,	Barrels,	2′ 1″ × 1′ 6·45″	4·93	127	102
,,	,,	1′ 11″ × 1′ 4·227″	3·49	94	79
Raw coffee	,,	2′ 8″ × 2′ 2″	12·5184	334	280
Ground,,	*In cases made up of 20 lbs. packages.*	3′ 1″ × 1′ 4″ × 0′ 11″	3·7685	133	100
,, ,,	Small cases	2′ 2·5″ × 1′ 4″ × 0′ 8·5″	2	73	50
Rice	*Barrels*	2′ 8″ × 2′ 2″	12·5185	411	340
,,	Half hogsheads	2′ 4″ × 1′ 11″	8·5138	309	250
,,	Kilderkins	2′ 3″ × 1′ 8″	6·25	218	170
,,	Small casks	2′ 0″ × 1′ 7″	5	130	100
,,	,,	1′ 7″ × 1′ 3″	2·473	67	50
Rum	9½ *gallon cask*	2′ 3″ × 1′ 3″	3·515	119	89
Tea	*Chests*	1′ 11″ × 1′ 9″ × 1′ 6″	5	112 to 136	90 to 110
,,	Half chests	1′ 10″ × 1′ 5″ × 1′ 2″	3	66	45 to 50
,,	Catties	1′ 3″ × 1′ 0″ × 0′ 11″	1·145	28	21
Pepper	*Cases holding 20 lb. canisters*	3′ 1″ × 1′ 4″ × 0′ 11″	3·7685	133	100
,,	Small cases	1′ 7″ × 1′ 3″ × 1′ 0″	2	73	50
Salt	*Bags*		3·3	202	200
,,	*Kegs*	1′ 6″ × 1′ 4·227″	2·7	115	110
Preserved potatoes	*Cases*	1′ 9″ × 1′ 4″ × 0′ 11″	2·1388	79	56
Lime juice	Cases, 20 pints	1′ 7″ × 1′ 3″ × 1′ 0″	1·979	69	..

Tea and *Coffee* can only be judged of by tasting them when prepared for use in soft water. Tea should not be bitter; it should have an aromatic smell. Coffee should always be served out roasted and ground (not too fine). It should be sent from England soldered up in 10 lb. tins.

Sugar should be tolerably 'white,' crystalline, not evidently moist to the touch, and should dissolve entirely in water, or leave merely small fragments, which, on examination with the microscope, will be found to be bits of cane.

Lime Juice.—'The taste should be pleasant, acid, but not bitter.' When fresh fruit or fresh vegetables are not to be had in sufficient quantities, 1 oz. should be given in water per man daily. When possible it is a good plan to mix it with half its weight of sugar to make it palatable. 20 oz. of lime juice go to one pint: it is usually sent abroad in bottles holding 3 or 4 pints each; in each there is a little olive oil, which excludes the air from the lime juice. Good lime juice will keep for at least 3 years.

Salt should be white, crystalline, and dry; it should dissolve completely in water.

TABLE FOR CALCULATING THE NUMBER OF BARRELS OR OTHER CASES IN WHICH ANY GIVEN NUMBER OF RATIONS ARE CONTAINED, WITH THE BULK, GROSS WEIGHT, &c.

NATURE OF RATION.	Daily Allowance.	1000 Rations Net Weight in lbs.	No of Barrels &c., &c., containing 1000 Rations.	Gross Weight in lbs. of 1000 Rations.	Cubic Measurement in Feet of 1000 Rations (gross).
Biscuits in bags. . .	1 lb.	1000	10	1020	50
,, barrels . .	1 ,,	1000	11·90476	1261·9	85·88
Salt beef in barrels. .	1 ,,	1000	5	1800	42·569
Salt Pork.	1 ,,	1000	5	1625	38·725
Flour	1 ,,	1000	5·102	1117·347	36·8
Sugar	2 oz.	125	0·3205	179·487	4·0
Raw coffee	½ ,,	20·833	0·03439	24·8468	0·93142
Ground coffee in cases.	½ ,,	20·833	0·20833	27·70789	0·78509
Rice in barrels . . .	1 ,,	62·5	0·19264	75·5514	0·767
Rum ,, . . .	½ gill.	146·44	1·64473	195·74	5·78
Tea in chests . . .	$\frac{1}{16}$ oz.	10·4162	0·111	12·74	0·637
Pepper in cases. . .	$\frac{1}{256}$,,	1·736	0·0185	2·3	0·06542
Salt in bags	½ ,,	31·25	0·15625	31·5625	0·515625
,, kegs. . . .	½ ,,	31·25	0·284	32·67	0·7663
Preserved potatoes. .	4 ,,	250	4·4564	352·678	9·5482
Lime juice	1 ,,	62·5	2·5	172·5	4·947

When calculating the gross weight of provisions that are made up in bales or other packages, the gross weight may be roughly calculated by adding 15 per cent. to the gross weight.

The packages upon which this calculation is based are those printed in italics in previous Table. 1000 field rations will therefore weigh 3074 lbs. gross, and occupy 99¼ cubic feet, salt beef being issued and the biscuit and salt being in bags. If the ration be of salt pork in barrels, the biscuit and salt also in barrels, and a ration of potatoes, lime juice, and rum be added, the gross weight of 1000 rations would be 3863 lbs. with a gross measurement of 151·65 cub. ft.

Water.—In calculating the quantity of water required per man for drinking and cooking, it may be put down at 6 pints in temperate, and 8 pints in tropical climates. A similar amount will just allow men to wash their bodies. In stationary camps, however, the minimum daily allowance per man should be 5 gallons for all purposes, washing clothes included.

In selecting positions, particularly those that are likely to be of a permanent character, a careful analysis of the water should be made by a medical man. A fair opinion can be formed as to whether it is wholesome or not, by the appearance of the inhabitants, and by tasting the water oneself. 'It should be transparent, colourless, without odour, and tasteless; well aerated, cool, and pleasant to drink; it must have no deposit; vegetables should be easily cooked in it.' It should be moderately soft, so that a lather with soap can be easily made with it. Shallow well-water is always to be examined with suspicion. The water of some rivers at certain seasons is thick and muddy; in some, it is always so. To examine it without the aid of chemical tests, fill a long tumbler or other glass vessel with it. If the water has been drawn in a bucket or other vessel, shake it up and stir it well before pouring it into the tumbler or glass cylinder; let it stand for a day, or as many hours as possible; draw off the water without disturbing the sediment, which should then be carefully examined through the microscope of your telescope. Vegetable decompositions and iron are the chief substances that give colour to water. When water is very bad it should be boiled before drinking; after boiling it should be placed in shallow vessels, and poured from a height from one into another.

The dirtiest water I ever saw in common use was that of the Pei-Ho, which was of a deep yellowish-brown when drawn from the river, owing to the large amount of clay it held in suspension. It was cleaned, and made most palatable by immersing the hand containing a lump of alum in it, and moving it about for a few seconds. All the colouring matter sank to the bottom. The longer the time that elapses between the operation and drinking, the better. I do not think it has been proved that growing vegetable substances are always injurious, although dead vegetable matter is so without doubt.

RATIONS.—*Provisions.*—All officers and other soldiers when in the field draw the following rations daily: 1½ lb. of bread or 1 lb. of biscuit, fresh or salt or preserved meat 1 lb., coffee ⅓ oz., tea ⅛ oz., sugar 2 oz., salt ½ oz., pepper 1/36 oz. When troops are marching or doing hard work, ½ lb. more should be added to the meat ration. It is usual to add 1/64 gall. (½ gill) of rum, and instead of issuing the double ration of both tea and coffee, to omit the latter and double the former. As a rule 2 oz. of compressed vegetables, or 4 oz. preserved potatoes, are added to the foregoing ration. In estimating for the transport of rations allow 3½ lbs. gross weight for each man per diem.

The ration issued during the Autumn Manœuvres has been 1¼ lb. bread, or 1 lb. biscuit, 1 lb. fresh meat or salt pork, ⅓ oz. of tea, 2 oz. sugar, ½ oz. of salt, and 1/36 oz. of pepper: ¼ lb. of cheese was occasionally added. This grocery ration is a great improvement upon the old plan of issuing a proportion of both tea and coffee upon the same day, as tea does not taste well when prepared in a pot in which coffee has been made a few hours before.

The ration issued latterly in the Crimea included, in addition to the above, ½ lb. vegetables, 1 oz. of rice. and 1 oz. of lime juice; ½ a gill of rum was also issued daily to every man, and extra issues of it were made upon the slightest excuses, so that at the end of the war every man who survived was a confirmed dram-drinker.

The rations issued in Abyssinia when transport had become most difficult were for Europeans, 1 lb. of biscuit or flour, 2 oz. of vegetables, 1½ oz. of sugar, ½ oz. of tea, and 1 dram of rum. For Indian soldiers, they were 1 lb. of flour, 2 oz. of ghee, if purchased locally; ½ oz. of salt, and 2 oz. of vegetables once a week.

The daily ration for our men in Bengal consists of 1 lb. of bread, 1 lb. of beef or mutton, 1 lb. of potatoes or other equivalent vegetables, 4 oz. of rice, ⅔ oz. of salt, 5/7 oz. of tea, 1⅜ oz. of coffee, and 2½ oz. of sugar.

The rations issued during the Red River Expedition were, 1 lb. of salt pork, or 1½ lb. of fresh meat, 1 lb. of biscuit, or 1½ lb. of fresh bread, ½ pint of white beans, or ¼ lb. of preserved potatoes, 1 oz. of tea, 2 oz. of sugar, ½ oz. of salt when fresh meat was issued, and 1/36 oz. of pepper. Upon this ration the men did the hardest work I have ever known troops called upon to perform, and no force in the field could have been healthier.

The ration issued during the Ashantee War to white troops was, bread, 1½ lb. fresh, or 1¼ lb. biscuit, or 1 lb. of flour; meat, 1½ lb. fresh or salt, or 1 lb. preserved; vegetables, 2 oz., rice or peas, or 4 oz. of preserved potatoes, or 1 lb. of fresh; tea, ¾ oz.; sugar, 3 oz.; salt, ½ oz., pepper 1/36 oz. On days when long marches were made, or when an engagement was anticipated, 4 oz. of sausage.

The native levies not being Fantees, received 1¼ lb. of rice, or 1 lb. of

biscuit; ½ lb. of salt meat, or 6 oz. of preserved potatoes. The native carriers received 1¼ lb. of rice. The native allies (Fantees) received 1 pint of rice and ¼ lb. of salt meat. This ration for white troops was the largest ever given; the exhausting nature of the climate rendered it necessary to give the men as much as they could possibly eat and digest.

The scale of daily rations for the Chinese Coolie Corps in 1860, was, for 3 days in the week, ½ lb. of salt pork or salt beef; ½ lb. of calavances; 1½ lb. of rice; ½ oz. of lime juice and ¼ oz. of sugar: and for the other 4 days in the week, 2 lbs. of rice and ½ lb. of salt fish.

During peace, whenever it is practicable to do so, rations should be occasionally issued direct to the soldier in quantities to last two or three days. It teaches him to economise his food, so that when it becomes necessary, as it frequently does in war, to give him several days' supply at a time, it may not be a new thing for him to exercise discretion and care in using them properly.

C.Os. in our army do the reverse invariably. When giving several days' rations for their men they keep it in bulk, if possible, and issue it in small quantities, telling you that if they gave it out to their men at once, they would eat it all in one day, or throw away what they could not eat after their first meal. This is the old story of treating our men as foolish children. Let us in future endeavour to teach them to reflect, and act as they would in civil life regarding their food.

Indian Troops.—The scale of rations for native troops and followers from India adopted in Abyssinia may be taken as a standard: it was as follows: rice or atta (flour), 2 lbs., dhall, 4 oz., ghee, 2 oz., salt, ⅔ oz., turmeric, ⅛ oz., pepper, ⅛ oz., sugar, 3 oz. (or in lieu if preferred 1½ oz. of tobacco) and mutton or goat twice a week when procurable. At first the native followers were allowed ½ lb. of flour less than the soldier, but the full ration was subsequently issued to all. It is very desirable to issue curry powder made up, in lieu of the turmeric, &c., as is done when natives are on board ship. It should be powdered and mixed and made up in 10 lb. tin canisters: the ration on shore should be ½ oz. daily a man. It can be made of the following ingredients: turmeric, ¼ oz., chilies, ¼ oz., black pepper, ⅛ oz., coriander seed, 1 dram, cummin seed, ½ dram, and cloves, ½ dram.

In South Africa the ration for native levies was, 1 lb. of mealies or 1 lb. meal or 1 lb. Kafre corn, or 1 lb. of flour or biscuit; 1½ lb. fresh meat, or 1 lb. of salt or preserved meat, and, except when salt rations were issued, ½ oz. of salt.

Fuel, per man per day, is 3 lbs. of firewood or coal. When the latter is issued, 1 lb. of kindling wood is allowed to every 36 lbs. of coal. In South Africa, where the fuel had to be carried on the march, 2 lbs. of Natal coal was issued in lieu of all wood. In the Crimea the allowance of fuel was

increased latterly to 4½ lbs. of wood. This is only intended for cooking. The nature of the climate, and the nature of the huts or temporary barracks, must determine the amount required for heating purposes. As a rule, whilst an army is campaigning in a country where wood is plentiful, no issues of fuel for cooking will be made by the Commissariat; the troops will provide themselves with wood every day when they halt, parties, each under an officer, being sent to cut it. In fixing the ration of coal in rooms, the home daily allowance may serve as a guide: it is: for No. 1 grate with an opening of 1¾ ft., 320 lbs.; No. 2 grate, with 17 in. opening, 260 lbs.; No. 3 grate, 15 in. opening, 240 lbs.; 6 lbs. of wood being allowed for all 3 grates besides. The grates are of Galtons pattern, the first size being for a room of from 7800 to 12,000 cub. ft., the 2nd for those of from 3600 to 7800 cub. ft. and the 3rd for all under that size. The present scale which has been substituted for the above is, for every 12 men or a fraction of that in any room 37 rations of coal and 1 of wood, the ration being 1 lb. of coal, and $\frac{9}{7}$ b. of wood. For staff and departments the ration of fuel is: rank and file and civil servants have 1 ration each, all sergeants 1½, lieutenants 4, captains 6, majors 12, lt.-colonels 15, colonels 20, brig.-generals 40, maj.-generals 50, lt.-generals 60, and generals 80 rations. For regts. the rations are issued as follows: to a F.O. Commanding 8, all other F.Os. 4, for the officers of each company irrespective of the number of officers, 8; for each other officer 2 rations, and for sergts. and rank and file, &c., the same as for the staff.

Straw for bedding will be issued when troops are halted for any length of time, at the rate of 72 lbs. per 5 men, or 216 lbs. per bell tent, to be refreshed with half the quantity at the end of succeeding 8 days, until the 24th day, when an entirely fresh issue is to be made. In wet weather it must be changed more frequently; see "*Internal Arrangements of Camps.*"

Light.—Where rations of light are issued the ration is ⅔ gill of oil for each lantern, with 1 drachm of wick for every 8 gills of oil issued.

All demands for stores, clothing or personal equipment * are to contain full and exact details as to the number and particular description of every article required, according to the authorized nomenclature or vocabulary of stores, and to be made on the prescribed forms. In the case of stores to be issued upon the authority of a G.O. according to the strength of the regiment, or in certain proportions (for instance, a second blanket per man, the further issue of a pair of boots, &c.) the requisition will be transmitted direct to the

* *Under the term 'personal equipment' will be included all small arms, accoutrements, small arm ammunition, harness, saddlery, and other appointments supplied for men and horses, as well as tools and materials for their repair and preservation.*

O.S.O. of the Divn. of Brigade, no other authority being necessary beyond the G.O., the number and date of which must be quoted on the requisition.

Os. C. corps when in the field will cause inspections to be made of all equipment after an action, as well as daily when halted after a march, in order that their condition may be constantly known and reported upon when necessary to the G.O.C. They will immediately make requisitions, in duplicate, direct to the O.S.O. of the Divn. of Brigade, for the replacement of any articles which may have been lost, or have become unserviceable either from fair wear or through the neglect of individuals. When arms, equipment or stores of any kind are lost, destroyed, or injured, and it is a matter of consideration on whom the expense of repairing or replacing should fall, the G.O.C. will assemble a court of inquiry, composed of offrs. not belonging to the corps interested if practicable, to investigate the matter.

O. S. Os., under the authority of the G.O.C., will arrange as to the mode and time of supply, acting in direct communication with the offrs. to whom the issues are to be made.

Camp Equipment includes all articles that are not personal equipment required by troops for themselves and horses in the field except food. It is distributed by companies or troops, and captains are responsible for it. All requisitions for it are made direct to the O.S. Dept. by the C.Os. of corps, and must be accompanied by a statement of the strength of the corps or detachment for which it is required giving the information as follows :—

Mounted Corps.	Number.	Dismounted Corps.	Number.
Batteries		Batteries	
Troops		Companies	
Officers: Field		Officers: Field	
Officers: Other ranks		Officers: Other ranks	
Staff-sergeants		Staff-sergeants	
N.-C. Os. and men		N.-C. Os. and men	
Horses: Officers' chargers		Officers' chargers	
Horses: Troop (ridden as chargers by officers)		Public bât animals	
Horses: Troop		Private bât animals	
Public bât animals			
Private bât animals			

The quantity of each article demanded that may be in possession is also to be stated, specifying how many are serviceable and unserviceable, and the reasons for demanding them.

Any articles lost otherwise than by unavoidable accident, or damaged beyond what may be considered as fair wear and tear, will be charged against the troops.

All articles may be purchased by officers when in the field, provided the state of the store admits of the sale.

It is the writer's conviction that tents cannot possibly be carried by an army when engaged in temperate climates in active operations before an enemy. The Prussians during their late wars had none, neither had our army in the Peninsula. As the lines of operation will generally be along railways, tents can easily be brought up for use when the army is stationary for any length of time as at a siege. At other times the men must bivouac and be billeted in villages.

The authorized quantities of camp equipment for cavalry and infantry have been already detailed in the organisation of those arms. The artillery and engineer train have theirs always in possession.

The Circular Tent is the one used in our army (except in India, where it is only used in hill expeditions). It is issued at the rate of 1 to every 15 men ;* it is 10 ft. high, diam. at base is 12 · 5 ft., the ropes extend about 18 in. all round ; its apex forms an angle of 70° : it weighs 74 lbs. complete with pole when dry ; it is made of canvas. (All canvas tents increase in weight by from 30 to 40 per cent. when completely wet.) It consists of 1 valise, 1 pole (in 2 pieces), and a bag containing 42 pins and 2 mallets.

The Tent d'Abri consists of 2 sheets, 2 poles, and 7 pins, and weighs about 11 lbs. when dry ; it is issued at the rate of 1 to every 3 men, when supplied.

The Hospital Marquee complete weighs, when dry, 512 lbs., and consists of 1 valise, 1 bundle of poles, 1 bag containing 4 large and 180 small pins, and 2 mallets, and 1 bottom. It is intended for the accommodation of 18 sick, and contains 3 · 336 cubic feet of air. The tent for hospl. use in the field, is *the double circular*, without lining, weighing 100 lbs., and accommodating 4 patients.

In Bengal tents are issued to European troops as follows : 1 S. Sergt. tent to each of the following—regimental Sergt.-major, Q.M. sergeant, musketry sergeant, paymaster sergeant, orderly-room clerk, band-master, armourer-sergeant. Privates' tents, 1 to every 16 men ; 1 for rear and 1 for quarter-guard, and for hospl. purposes 1 for every 200 men, and 1 for apothe-

* *In Abyssinia, when transport became very difficult, these tents were issued at the rate of* 1 *to every* 20 *men,* 1 *to each brigadier and his staff, and* 1 *to every* 12 *other officers.*

cary's and purveyor's stores. The officers provide their own tents. A S. Sergt. tent weighs 400 lbs. when dry. A privates' double-poled tent, when dry, weighs from 600 to 631 lbs. ; it is 22 by 16. A Lascar pâl weighs 248 lbs. In Bombay the privates' tent holds 22 men ; in Madras, 25 men.

NOTE.—*A hand hatchet weighs* 1 *lb.* 14 *oz.; a felling axe* (*Canada pattern*), 4 *lb.* 8 *oz., with handle; a pick-axe,* 5 *lbs., with handle; a shovel,* 4 *lbs.* 12 *oz.; a spade,* 6 *lbs.; a bell tent, dry,* 74 *lbs., and when wet about* 90 *lbs.; a blanket, old pattern,* 3 *lbs.* 12 *oz.; new pattern,* 4 *lbs.* 10 *oz.* (7½ *ft.* × 5 *ft. in size*). *The Flanders camp kettle* 3½ *lbs.* (*holds* 12 *quarts,* 12 *in. in breadth at top, and* 11 *in. at bottom, depth* 12 *in., and cooks for* 8 *men*) : *the Torren's kettle weighs* 3½ *lbs.* (*holds* 6 *quarts, and cooks for* 5 *men*). *Reaping hook,* 10 *oz.; sickle,* 14 *oz.; horse blankets* 6¼ *lbs.; billhook,* 1 *lb.* 12 *oz.; lifting jack,* 19 *lbs.; carpenters' tools, plain set of,* 77 *lbs.; box, tin, grease, half-round,* 18 *oz.; linchpin,* 4 *oz.; washer, drag,* 19 *oz.; lashing rope used in transport,* 20 *oz.; waterproof sheet,* 3 *lbs.* (*when used* 1 *is allowed for every* 2 *men*) ; *buckets, leather,* 2 *lbs., canvas,* 1 *lb.; rope, picket, white,* 25 *yards long,* 23 *lbs.; corn sack, cavalry,* 1¼ *lb.; crowbars,* 5 *ft.* 6 *in., and* 4 *ft.* 6 *in.*

The equipment and public carriage provided in the Bengal Presidency for Regts. on Fd. Service is as follows :—

Establishments.				Troops.	Tents.		
Native Offrs.	Medical Subordts.	S. Sergts.	Rk. and F.		S. Sergts.	English Privates.	Pâls.
..	1	4	154	Battery R. H. A. Field Artillery	5	14	5
..	1	2	88	,, ,, Heavy ,, .	4	8	14
..	1	1	86	,, ,, Garrison ,, .	3	8	2
..	2	3	91	,, Mountain { in Hills . / ,, Plains .	..	..	24
					5	8	11
..	4	11	444	Regt. Engs. Cavalry	14	36	2
..	4	10	876	,, ,, Infantry	13	67	2
13	2	..	444	,, ,, Native Cavalry. .	..	..	2‡
16	2	..	696	,, ,, ,, Infantry .	..	..	40§
..	3	..	4*	Head Quarters Sappers . . .	9	2	..
2	..	..	120†	Company of ,, . . .	1	1	10

* These 4 are British N.-C. Os. † Of these 6 are British N.-C. Os.
‡ For Hospitals.
§ 32 of these are for 8 companies (4 per company), 2 for Qr. Guard, 2 for rear Guard, and 4 for Hospital. 1 Lascar is provided for each tent with British troops.

2 Copper water vessels (5 gals. each) are allowed for each E.P. tent, & 1 for each S. Ss. tent; 1 lantern is allowed for each tent with British troops. For the carriage of tents, 1 camel is allowed for 1 S. Ss. tent, or 2 elephants for 5 S. Ss. tents; 2 camels for a E. P. tent (new pattern,) or 1 camel & 1 elephant, or 1⅓ elephant for 2 E. Ps. tents (new pattern). If of old pattern 3 camels or 1 elephant to 2 tents: 1 camel for 2 pâls, or 1 elephant for 6 pâls.

For carriage of baggage, S. Sergts. class A (Sergt.-Majr.; Q.-Mr.-Sergt.; Band Sergt.: Sergt. Instructors of Musketry & Fencing) ½ camel each; other British N.-C.Os. and men of all arms, 8 to a camel: Nat. offrs. and Hospl. Assistants have conveyance provided for 30 seers of baggage each; Nat. N.-C.Os. for 15 seers, and Native Rk. and File for 7½ seers. Brit. N.-C.Os. belonging to Sappers and Miners are allowed ½ camel each for the conveyance of baggage; for carriage of cooking pots, 2 camels to each Battery of H.A, or Fd. Artilly. and 1 camel for those of other Batteries and for each troop or company of British troops. For arms of sick, 9 camels for Regt. of Brit. Cavalry, and 12 for Infantry Battn.; 4 camels for Nat. Infy. Battn. and ½ camel per compy. of Nat. Sappers and Miners. For Paulins or Troop stores, 4 camels for Batty. R.H.A.; 3 for Fd. Artilly.; 2 for Heavy Batty.; 24 for Regt. of Brit. Cavy. For Vety. stores 1 for R.H.A. and Fd. Batty.; 2 per Regt. of Brit. Cavy. For scales and weights 1 per H.A.; Fd.; and Heavy Batty., and 2 per Regt. of Brit. Cavy. For Bullock gear, 1 camel for gear of every 20 bullocks. For Hospital and Medical equipment according to nature of service. For S.A.A. according to nature of service (each camel to carry 6 boxes). For carriage of grain for horses and mules, 15 camels for Batty. R.H.A., 10 Fd. Artilly., and 33 per Regt. of Cavy. For grain for bullocks, 1 per Batty. R.H.A. and Fd. Batty. and 13 per Heavy Batty.

Grain for horses 5 seers a day for 3 days		H.A.	200	horses.
		Fd. Batty.	130	,,
		Brit. Cavy. Regt.	436	,,
do.	mules 3	do.	Batty. Mountn. Artilly. 178	mules.
do.	bullocks 3	do.	H.A. 59	bullocks.
			Fd. Batty. 73	,,
			Heavy Batty. 290	,,

Dooly bearers are supplied in following proportions:—1 dooly for every 10 British soldiers, & 1 per Troop or Compy. of Native troops; 6 bearers to each dooly, for every 4 doolies, 1 mate extra, and for every 16 doolies 1 sirdar extra.

Bangy Burdars, 1 per Batty., 2 per Brit. Regt. Cavy. & Infy.; 1 per Nat. Regt. or detachment of Sappers and Miners to carry Medicine Petarrahs. For troops North of Jhelum, dandies are provided at the following rates:—

Batty. R.A.	2	common	1 Bareilly.
Regt. Brit. Cavy.	4	,,	2 ,,
,, Infy.	6	,,	3 ,,

This is exclusive of service establishment of doolies, and will be taken with troops on hill service with as many doolies in addition as the estabt. of Kahars. can carry.

All Brit. Offrs. provide their own tents, and the camels for their conveyance, also for the conveyance of their baggage.

THE ORDNANCE STORE DEPARTMENT will provide, receive, hold, issue and account for munitions of war required for the service of all branches of the army and the navy, and all military stores except clothing and necessaries for the army. Clothing and necessaries will, however, be consigned to the O.S.D. at the B. of O.

Our regulations do not allot any O.S. officers to Divns. or Brigades ; the O.S. establishment for an Army Corps is as follows :—

* Includes 2 Armourers, 10 Collar Makers, 8 Wheelers and Saddletree Makers, 8 Carriage Smiths, 2 Shoeing Smiths, and 8 Tent Makers.	D. C. G.	A. C. G.	Commisy.	Depty. Commissy.	Asst. Commissy.	Clerks.	N.-C. Os. and Men.	Bâtmen.	Riding Horses.
Head-Quarters of Army-Corps	1	1	1	..	2	6	..	7	8
For general duty, as may be ordered	3	5	3	4	9	25	200*	32	35
Total . . .	4	6	4	4	11	31	200*	39	43

NOTE.—The actual rank of these Officers is subject to variation. The Officers and men will be posted where the G. O. C. thinks they are most requisite for the wants of the Service.

The senior O.S.O. will as a rule be with the Hd. Qrs. of the army, and the next senior offr. will be with the G. of C., as the post of next importance, and this latter offr. will have under his orders all O.S.Os. on the L.

of C. By this arrangement the duties of the Department will be divided into 2 sections—viz., (*a.*) those in connection with the supply of ordnance stores from the Advanced Depot to the troops in front, and (*b.*) those in connection with the landing of stores at the base, their custody in the various magazines and storehouses formed along the L. of C. and especially in keeping the Advanced Depot fully supplied with all such stores, ammunition, &c.. that the army may require from day to day. All correspondence on purely O.S. subjects, will be conducted by the officers of the O.S.D. under the authority either of the G.O.C. the army conveyed through his C. of the S. or of the G. of C. according as the O.S.O. concerned be either with the troops in the field, or employed on the L. of C. All general instructions on O.S. subjects, intended for the information or guidance of the troops must be conveyed through the only recognised channel of doing so, viz., through G.Os.

AMMUNITION.—The A.G. of an army in the field is responsible to the G.O.C. for the supply of ammunition for that army.

To enable him to perform this duty efficiently, he will be furnished as often as he may deem necessary, by the O.C. the R.A., with returns of the reserves in R.A. and O.S. charge respectively.

G.Os.C. Divisions are responsible for maintaining their reserves of ammunition, and they will be furnished as often as may be required with the necessary reports from the O.C. the R.A. of the division. Any deficiency in the regulated amount of ammunition is to be immediately made known to the A.G. of the army.

As a general rule, subject to such modifications as the nature of the service may require, the proportion of gun ammunition is calculated at 500 rounds per gun, and of S.A.A. at 480 rounds per man. These proportions will usually be distributed in the following manner, subject to the approval of the G.O.C.

	Rounds of Ammunition.		
	Per Gun.		Small Arm for each Rifle.
	9-pr.	16-pr.	
In possession of the troops, on gun and limber	40	28	70
Regimental Reserve, in waggons with Battery	108 } 148	72 } 100	30 } 100
Field Reserves with Divisional	76	90	30 } 60
the Artillery Army Corps, in 3 sections	76	90	30
	300	280	160
Grand Depot and Intermediate Reserves with the O.S.D.	200	300	320
	500	480	480

The *Regimental Reserve* of 30 rounds for each rifle (in addition to the 70 rounds in possession of the troops) will accompany each battalion in the field in charge of the O.C., to move with the battalion, and be kept supplied by demands on the Divisional Reserve.

The Transport of the Regimental Reserve for a battalion of 1000 men will require:—

——	Men.*	Animals.	Weight of Ammunition and Boxes.
3 small arm ammunition carts, each carrying 9,600 rds. of M.H. ammunition.	3	6	3804 lbs.
1 Non-commissioned Officer	1	..	..

Making a total of 3 carts, 4 men and 6 animals. Pack animals, however, will be exclusively employed, where, from the nature of the country, carts would not be available.

The load for a pack animal will be:—

2 boxes, weight, 79 lbs. 4 oz. each	158½ lbs.	Total weight, 206 lbs. exclusive of forage.
Pack saddle	34 ,,	
Cover	6 ,,	
Strappings and other articles	10 ,,	

As the killed and wounded in an action have fired little or no ammunition, and as large proportion of men in great battles never fire a shot, nothing is more fallacious than to determine the quantity of S.A.A. should be carried by the soldier, and for lines in Regtl. and other reserves by a calculation based upon the number of rounds fired by battalions in any well-known battle. It is only on very rare occasions, and under exceptional circumstances, that the infantry soldier fires over 100 rds, in any one day, although we know that at Königgrätz one Regt. fired on the average 72 rds., and two companies 80 rds., and at Plevna it is said that some Battalions fired 150 per man. In fitting out expeditions into wild countries or to places at great distances from the B. of O., special calculations must be made in each instance to meet the peculiar circumstances of the case. In Abyssinia the Regts. beyond Senafe had in their own charge 200 rds. per man (including what was carried by the men): the 2nd reserve was 250 rds. per rifle, and at Zula there was a 3rd reserve. In the Red River expedition there was a large reserve of ammunition at the B. of O., and each man carried 60 rds. besides which the only reserve was at the rate of 100 rds. per rifle. Of the troops who crossed the Prah for the final advance on Coomassie, each man was provided with 70 rds. in pouch, and 50 rds. per man were carried

regimentally as the 1st reserve: the 2nd reserve (which was in charge of the R.A.) consisted at first of only 50 rds. per man, but was subsequently raised to 70 rds. a man, and large field reserves were collected at Prahsue, to be pushed on to the fortified posts in advance as required: at each of these posts the garrisons were supplied with 200 rounds a man. The returns giving the expenditure of ammunition in battles before breechloaders were in use, are no guide now on this subject. In fixing the quantity of ammunition, both for Artillery and Infantry, to be taken with an army, it is essential to provide the troops in front most liberally, so that they may be prepared for any extraordinary expenditure, calculating the quantity to be at the advanced depot, and in charge of the O.S.D. on the average expenditure which we know has taken place in the battles of recent wars. As regards Artillery ammunition, it has been generally considered that 150 rds. per gun are ample for one battle, and this may still be regarded as a fair allowance, although 3 French Batts. at Gravelotte are said to have fired 212 rds. per gun, and an Austrian Batty. at Königgrätz 218 rds. a gun.

For brigades and divisions, the G. O. C. will distribute his reserve ammunition, transport, or mass it as he may think best; while for smaller bodies of troops, pack animals could accompany and supply one or more detached companies over any ground or on outpost duty.

The divisional and army corps or general reserves will be in charge of the R. A., and will be conveyed and replenished as hereinafter directed. These reserves will form part of the field equipments of the R. A., and will not be in charge of the O.S.D. The remaining reserves will be in charge of the O.S.D. and will be placed in depots.

The first reserve of ammunition for the guns (108 rounds per gun for 9-pr., and 72 per gun for 16-pr.) is contained in the divisional reserve. The divisional reserve for small arms (about 40 rounds per rifle) will be conveyed in ammunition carts attached to each divisional reserve. Should the state of the country in which the army is acting render it necessary to adopt any other method of transporting this reserve, the means will be determined by the C.-in-C., and carried out by the R.A.

The divisional reserve is, under all circumstances, to be at hand, and in the event of its being found necessary to separate the carts from the divisional reserve to which they are attached, the Divisional C.O. of R.A. must make arrangements for their being placed under proper charge, in some safe spot, easily accessible to the troops, in order that no unnecessary delay may occur when occasion shall arise for making issues to corps whose supplies are exhausted.

The army corps or general reserve is always to be kept up with the army, and as far as practicable out of fire.

The officers of R.A., commanding the reserves, will be responsible to the G.Os.C. Divisions or Army Corps respectively, that the ammunition of each divisional reserve is from time to time completed, so far as circumstances will permit, from the army corps or general reserve.

The latter reserve will be completed from the reserves in charge of the O.S.D.,

upon requisitions of the O.C. the R.A., supported by the receipts for the issues made to the troops. On emergency, however, the O.S.Os. will make issues on requisitions of the officers immediately commanding the several R.A. reserves, but such issues will be reported by the Commissary in charge of the Depot to the C.G. at Hd. Qrs. for covering approval.

Should the B. of O., where the grand depot of reserve is placed, be further distant than an ordinary two days' march from the advanced depots last mentioned, intermediate depots will be required; upon the organisation and disposition of which the A.G. of the army in the field and the C.G. of O. should take the orders of the G.O.C. who will determine what course should be followed to insure a regular and sufficient supply of ammunition from the grand depot of reserve, for the use of the army.

Os. C. corps in the field will obtain their supplies of ammunition on requisitions direct from the Os. C. the R. A.

In fortresses or garrisons, the G.O.C. holds the C.G. of O. responsible that the reserve of S.A.A. is equal to the authorized proportion, and available at all times for issue. In fortresses abroad, the number of rds. for S.B. guns will be according to a scale fixed for each, and for rifled guns as follows: 250 rds. for each 12·5″, 12″, 11″, and 10″ R.M.L. gun: 300 rds. for each 9″ and 7″ R.M.L. and for each 20-pr. R.B.L. gun: and 200 rds for each 64-pr. and 80-pr. R.M.L., and for each 7″ R.B.L. and each 40-pr. R.B.L. gun.

Gunpowder is packed in barrels, half-barrels and quarter-barrels; the first contain 100 lbs., or 125 lbs. of P. powder, owing to its greater density, and weigh 30 lbs. each; their height is 21·5 in., their circumference at bung 55·75 in., taking up 2·5 cub. ft. of magazine space; the half-barrels contains 50 lbs. and weigh 18 lbs. each; their height is 17 in., their circumference at bung 42·5 in., and they take up 1·4 cub. ft. of magazine space. Powder is always sent abroad in lots of 100 barrels at a time. A cubic foot of powder weighs about 56 lbs.

In damp or temporary magazines it is packed in metal-lined rectangular cases of 3 sizes, viz. 17″×20½″ (holding about 120 lbs. of powder in bags), 13½″×16½″ and 10½×14.″ The powder used by Fd. Arty. is known as "Rifled Large Grain" marked R. L. G.). The grains are about the size of barley. Pebble powder (marked P.) is used for large ordnance, and is made in cubically-shaped grains about ½″ long. That used for M. H. rifle is known as R. F. G^2; its density is somewhat greater than that used for other rifled small arms, which is known as R. F. G. (Rifle Fine Grain).

Ammunition for Fd. Guns.—The projectiles fired from the R.M.L. Fd. guns are common and shrapnel shell and case-shot. The light 7-pr. has in addition a double shell and a star-shell. About two-thirds of all projectiles in our equipment are shrapnel. The *common shell* when filled weighs almost exactly according to the denomination of the gun; thus the 16-pr. shell weighs about 16 lbs., the 13-pr. shell 12 lbs. 10 oz., the 9-pr. shell 9 lbs., and the 7-pr. (single shell) 7 lbs. 4½ oz.; the

double shell 12 lbs. 3¾ oz. The *shrapnel shell* of latest pattern for those guns (when filled) weighs about 17 lbs. 14¼ oz., 12 lbs. 9¾ oz., 9 lbs. 12¾ oz., and 7 lbs. 11 oz., and contain 128, 116, 63, and 42 balls each respectively. To distinguish them the heads of shrapnel are painted red. *Case shot* is essentially a close quarter projectile: for the above mentioned Field guns the weight of the case shot for each is about 15 lbs. 3 oz., 13 lbs. 7¼ oz., 9 lbs. 10¼ oz., and 6 lbs. 4 oz.: the number of balls in each is 176, 340, 108, and 70 respectively, the weight of the ball being 16½ or 16 per lb. except for the 13-pr. which is 34 per lb. *Cartridges*, the weight of charge in lbs. for these guns is 3, 3½, 1¾, and 1½, for the 400 lbs., and 12 oz. for the 200 lbs. 7-pr.

Gun ammunition is carried on service in the following manner and proportion per gun by our Fd. Artillery:—

		16-pr.	13-pr.	9-pr.	7-pr.
Gun carriage	Limber	24 rds.	— rds.	36 rds.	—
	Axletree (case)	4 ,,	— ,,	4 ,,	—
Waggon	Limber	24 ,,	— ,,	36 ,,	—
	Body	48 ,,	— ,,	72 ,,	—
	Totals	100 rds.	— rds.	148 rds.	rds.
	Case-shot	4	—	4	12
	Common shell	24	—	32	48
	Double ,,	—	—	—	10
	Shrapnel	72	—	112	32
	Star shell	—	—	—	4
		100	—	148	106

S. A. A. Box. The new pattern measures externally 22″ L., 7″ D., and 8·5″ W.; when tin-lined it weighs 12·25 lbs.; without tin, 7 lbs. 10 oz. When filled with 600 rds. of M. H. it weighs 79·25 lbs. and 76 lbs. 7 oz., with and without tin lining; with 630 rds. of M. H. carbine, 4 lbs. less; with 560 Sneider, 9 lbs. less; with 2136 rds. for Adams' Revolver, 103·5 lbs.; with 200 rds. of 65″ Gatling, 81·25 lbs.; or with 680 rds. of ·45″, 89 lbs. 13 oz., with tin-lining for all these three last-named cartridges. This box takes up ·757 cub. ft. of magazine space.

The S. A. A. Cart carries 16 of these boxes, and in addition can carry in its under box, 1200 rds. of revolver ammunition. It weighs 8·5 cwt. when empty, and about 20 cwt. when full.

S. A. A. on pack animals. 2 boxes form a load: a camel can carry 6 boxes in the plains and 4 in the hills in India.

Ammunition for the regulation revolver is made up in bundles of 12 cartridges, weighing 8 3/16 oz. each bundle. It is packed in boxes 11·75″ L., 8″ D, and 4·25″ W., weighing empty 4 lbs. 7 oz., and when filled with 600 rds., 30 lbs. 1 oz.; or in smaller

boxes 8·5″ L., 5·5″ D., and 4·25 W., weighing empty 2·25 lbs.,and when filled with 240 rds. 12 lbs. 9 oz.

Gatling ammunition is made up in bundles of 10 rds. each, the ·65″ weighs 3 lbs. $7\frac{3}{16}$ oz.; the ·45″, 18·25 oz.: the bullet of the ·65″ is 1422 grs., the powder 270 grs.; in the ·45″ those amounts are 480 grs. and 85 grs. respectively.

The Medical Department.—The P.M.O. with an army in the field will be a Surgeon-Genrl. with a staff of 1 Surgeon-Mjr. as Secretary, 2 others as orderly M. Os., 1 officer & 2 Clr.-Sergts. (as clerks) of the A.H.C. The P.M.O. is allowed 3 chargers, each of the other officers 1 each; 1 batman of A.H.C. is allowed for each charger. There will also be a Sanitary officer attached to the Hd. Qr. Staff or the army who will advise the C. of the S. or Q.M.G. as the case may be, or one of their deputies, upon all sanitary subjects, such as the selection of sites for camps, &c., &c. All arrangements for care, treatment, and conveyance of sick and wounded, are made by the P.M.O., through the C. of the S. or Q.M.G. as the case may be. He will direct the disposition and movements of the bearer Cos. and the movable Fd. Hospls. He will bring to the notice of the G.O.C. all circumstances affecting the health of the men, and recommend any changes he may consider necessary in their rations. It is advisable that the earliest information regarding intended movement may be given to the P.M.O., so that due arrangements may be made for the establishment of the necessary hospitals, &c., &c.

The medical staff for each Division will be 1 Deputy S.G. with 2 chargers and 1 Sergt. A.H.C. as clerk, 1 Surgn.-Majr. in charge of Divl. Staff and to act as Divl. Sanitary offr. with 1 Corpl. A.H.C. as clerk, and 1 offr. of orderlies to act as Q.-Mr. under the Divl. P.M.O. with 1 Corpl. A.H.C. as clerk. Each of these officers have one charger; 1 batman A.H.C. is allowed for each charger. The total numbers for the 3 Divisions of an Army Corps will be, 8 M. Os., 4 offrs. of orderlies, 4 Sergt. clerks, 8 Corpl. clerks, 16 batmen & 16 chargers. All officers of the department below the relative rank of Majr. are supplied with public service horses. One Bearer Compy. and 2 Fd. Hospls. are attached to each division.

The medical staff for each Army Corps will consist of, 1 Surgn.-Genrl. as P.M.O. with 1 sergt. & 1 private A.H.C. as clerks; 2 Depty. S.Gs., 1 as Field Inspector, & 1 as Sanitary offr.; 2 Surgn.-Majrs., 1 as Secretary to P.M.O. and 1 in medical charge of Hd.-Qr. Staff; and 1 Captn. of Orderlies to act as Q.-Mr. under P.M.O. with 1 corpl. A.H.C. as clerk, making a total of 5 M.Os.; 1 offr.; 1 sergt.: 1 corpl., 1 privt., and 9 batmen A.H.C., with 10 riding horses; the P.M.O. being allowed 3 chargers but only 2 batmen. One Bearer Compy, and 6 Fd. Hospls. are attached to the Army Corps Details, including Cavalry Brigade. Transport is only provided for 3 of these Fd. Hospls. as all would not as a rule have to move at the same time.

The Army Hospital Corps is organized for duties in connection with the Hospital service of the army, and is an integral part of the A.M.D., the P.M.O. subject to the G.O.C. having supreme authority over it in matters of discipline. The officers are of two grades, Captains and Lieutenants of orderlies, who under the M.Os. have authority to command not only the men of their own corps, but also the patients in Military Hospitals, and such N.-C.Os. and men as may be attached thereto without their own officers for hospital duty. The corps is chiefly recruited from the ranks of the army. In the field it is divided into two branches—I can scarcely term them units,—viz., the Bearer Company and the Field Hospital.

The Bearer Company will be provided with either mule or waggon transport according to the nature of the country operated in. The detail of a Bearer Compy. with mountain equipment is as follows :

Officers and Men.	Nos.	A.S.C. for Transport Purposes.
OFFICERS.		
Surgeon-Major (in charge)	1	..
Surgeons-Major	3	..
Surgeons	4	..
Captain of Orderlies	1	..
Lieutenant of Orderlies	2	..
Transport Officer	0	1
Total Officers	11	1
N.-C. OS. AND MEN.		
Sergeant-Major	1	..
Sergeants	10	2
Corporals	10	2
Corporal, Saddler	..	1
,, Wheeler	..	1
,, Farrier	..	1
Private Shoeing-smith	..	1
Privates	110	..
Muleteers	..	50
Batmen, &c.	11	1
Total N.-C. Os. and Men	153	60
Grand Total	213	

Horses, Mules, &c.		Nos.	If the mules are untrained, double the number of muleteers will be required.
Riding Horses.	Officers { Private	4	
	Officers { Public	8	
	N.-C. Os.	3	
	Total	15	
Pack animals and pack saddles.	for patients	76	
	,, equipment	11	
	,, operating tents	2	
	,, surgery stores	2	
	,, water bags	4	
	,, spare	5	
	Total	100	
Grand Total (horses, &c.)		115	
Cacolets, pairs		50	
Litters ,,		26	
Tents, Operating		2	
Field Panniers		2 prs.	
Water Bags or Barrels		1	
Blankets		195	
Kettles, Flanders		25	

If tents are carried for the officers and men, there will be required in addition to the above, 6 muleteers, 12 pack animals, 12 pack saddles and 23 single tents.

When ambulance waggons are used in lieu of pack animals, instead of having 50 muleteers, there will be 43 drivers, and instead of 100 pack animals with pack saddles, 86 draught horses (80 for carriages and 6 spare), and instead of the 76 prs. of cacolets and litters, and 33 ambulance waggons (2 horsed), 2 surgery waggons and 2 two horsed waggons, with 2 water carts and 1 supply cart (40 carriages in all) will be required. When tents for officers and men are carried, 2 G.S. waggons, 4 horsed, must be added, which will raise the total establishment to 42 carriages, 94 draught horses and 47 drivers. This Bearer Company is divisible into 2 half comps.; when so divided the section of the Transport Company with the force to which the ½ Bearer Compy. is attached, finds 1 of the carts for supplies, and the repairs &c. are performed by its artificers.

The transport required by one Bearer Company with ambulance waggons will be as below. It is divided into 1st and 2nd Lines, the first being in fact its regular establishment, the 2nd being added when possible, the 23 waggons required for it being obtained from local sources. All the transport used by the medical department is supplied by the A.S.C. or obtained locally from the country; it is to be maintained and kept in repair by the commissariat.

1st Line.

2 Operating Tents (double circular) without lining, 100 lbs. each	2 Two-horsed Surgery Waggons (2 Drivers and 4 horses).
Equipment for dressing stations, 1400 lbs.	
26 Axes, 56 lbs.	2-horsed Waggons for Equipment (2 Drivers and 4 horses).
195 Blankets (780 lbs.) and 16 straps to secure them	
17 Buckets (canvas), 12 lbs.	
25 Kettles (Flanders), 212 lbs.	
7 Ropes (25 yards) 175 lbs.	
Picketing things { 42 posts, 231 lbs. / 3 mauls, 24 „	
12 Officers' baggage, 720 lbs.	
4 „ cooking pots, 80 lbs.	
Carriage for 60 patients	2 Water Carts, 10 two-horsed Ambulance Waggons, with 12 Drivers and 24 horses.
For Supply (current day's rations)	1 Supply Cart, 1 Driver and 2 horses.
Add for Spare	3 Drivers and 6 horses.
Total, 2 Waggons for Equipment; 2 Surgery Waggons; 10 Ambulance Waggons (17 carriages), with 20 Drivers and 40 horses.	2 Water Crts., 1 Supply Crt.; 2 Surgery Waggons; 10 Ambulance Waggons (17 carriages), with 20 Drivers and 40 horses.

2nd Line.	Carriages for 138 Patients . . .	23 Ambulance Waggons, 23 Drivers, and 46 horses.

Total 1st and 2nd Line, 33 Ambulance Waggons and 7 other carriages (40 carriages in all),* with 43 Drivers and 86 horses. Or when 23 tents for officers and men are carried, requiring 2 G. S. Waggons for their conveyance, the total will be 42 Carriages, 47 Drivers, 94 draught and 15 riding horses.

All our regulations for the provision of ambulances are based upon the assumption that 10 pr. cent. of the 32,000 men of an Army Corps that would possibly be under fire, would be wounded.

The duties of a bearer column will be to render first assistance to the wounded, and remove them from the field to dressing stations aud Fd. Hospls. A bearer column will consist of 4 companies, 1 for each Divn. and 1 for the Corps troops, including the cavy. brigade. The bearer compy. will be under the direct command of the M.O. in charge, who will be responsible through the O.C. the troops to the P.M.O. of Divn. for its efficiency at all times. The Lieuts. of the A.H.C. will be employed during an action in conducting the ambulances to and from dressing stations, and will perform such other duties as the senior M.O. present may consider necessary for the welfare of the sk. and wdd. The Transport Offr. of the A. S. C. will command the detachment of his own corps attached to the bearer compy., but he will carry out all instructions received from the M.O. in charge as to the disposition and movements of the waggons and horses.

Before an action commences the P.M.O. of the Divn. will advise with the G.O.C. in regard to the positions where dressing stations will be established. In the absence of the G.O.C. or other C.O., the P.M.O. of Divn. will issue the necessary instructions to the bearer compy. When no orders have been received from the G.O.C. or from the P.M.O. of Divn. the M.O. in charge of the Compy. will on his own responsibility organize the dressing station or stations, and take such measures as may be necessary for the relief and transport of the sk. and wdd. Dressing stations will be established, if possible, at points not exposed to fire. If there be suitable buildings near the scene of action they will be utilized, otherwise an operating tent will be pitched under cover, and the M.O. in charge of the bearer compy. will issue such directions as he may consider necessary for the organization of the dressing stations, and apportion to each M.O. his duties.

At the dressing stations the waggons and carts will be placed in position

* *If suitable spring carriages can be obtained locally, 23 of these need not be ambulance waggons, and a corresponding reduction can then be made in the number of drivers* (43) *and draught horses* (86) *detailed as necessary.*

under the orders of the M.O. in charge. The dressing station will be distinguished during daytime by 2 Geneva flags, and during the night by 2 red lanterns. During the action wounded straggling from the field will be attended to at the dressing station, and transferred to the rear with all possible speed. At the close of an action two M.Os. with the sick bearers, followed by a Lieut. of the A.H.C. conducting the 1st lines of ambulances, will advance by the shortest available route, and halt as near as possible to the scene of action. The bearers will then take the stretchers from the waggons in the proportion of 1 stretcher for every 4 men ; 2 to carrying the wounded man and 2 to act as reliefs or fatigue-men, assisting in placing him on the stretcher and carrying the wounded man's rifle and valise, and, in the absence of the M.O., applying a first dressing if necessary. The sick bearers will be divided into 2 half-companies—each half compy. being under the direction of a M.O. ; the wings will be further divided into sections of 16 men, each section being under the direction of a N.-C.O. The bearers thus detailed will patrol the battlefield and its vicinity, examine the fallen, and separate the living from the dead, removing the wounded to the ambulances for conveyance to the dressing station, and returning again immediately with the stretchers to the field. When the waggons have been loaded they will proceed to the dressing station, each waggon being followed by an attendant—if possible, a N.-C.O.—who will assist in the removal of the wounded from the waggons. Whenever practicable, the wounded will be carried to the dressing station, or even to one of the Fd. Hospls. in the vicinity, without removal from the stretchers. When all the wounded have been removed from the open, the woods and ditches in the neighbourhood will be methodically searched, so that there may be no possibility of any wounded remaining uncared for. Lanterns for searching in the dark form part of the equipment of a surgery waggon. The arms and valises of wounded men will be carried with them in the ambulances to the dressing stations and Fd. Hospls., and will be handed over to a sergeant of the A.H.C.

Officers and N.-C.Os. of a bearer compy. will be responsible that the private property of the dead and wounded is not appropriated. A severe punishment will follow any such act of appropriation. The 2nd line of ambulances will be under the charge of an offr. of the A.H.C. and under ordinary circumstances about half a day's march in rear of the compy. When the wounded begin to arrive at the dressing station, the M.O. in charge will send an offr. of Orderlies with orders for the 2nd line of ambulances, or as many of them as may be considered necessary, to advance to the dressing station to remove them to the nearest Fd. Hospl. In case of the troops retiring, the P.M.O. of Divn., or, in his absence, the M.O. in charge of the bearer compy. will determine what portion of the medical establt. will be left behind.

The establishment of a Field Hospital is as follows ; it is divisible into two half hospitals.

OFFICERS.	No.
Surgeon-Major (in charge)	1
Surgeons-Major	2
Surgeons	4
Captain of Orderlies	1
Total Officers	8
N.-C. OS. AND MEN.	
Sergeant-Major (Steward)	1
Clr.-Sergt. (Assistt. Steward)	1
,, (Wardmasters)	2
,, (Compr. in charge)	1
Sergt. (Compdr.)	1
,, (Storekeepers)	2
,, (P.M.O's. Clerk)	1
,, (Cooks)	2
2nd Corporals	4
Privates (4 Assistt. Cooks)	22
Drivers	22*
Batmen, &c.	8
Total N.-C.Os. and Men	67
Grand Total	75

EQUIPMENT.		
Hand Axes	10	Weight 6150 lbs. carried in 4 G. S. Waggons (4 horsed).
Blankets	75	
Canvas Buckets	6	
Kettles	9	
Offrs, Baggage	8	
,, Cooking Pots	3	
Opertg. Tents	2	
Hospl. ,,	50	

Hospl. Equiptmt. for 200 sick, carried in 4 G.S. Wags., and 2 Pharmacy Wags. : 2 Water Carts.

Total No. of carriages	12
,, ,, Horses, Drft.	44
,, ,, ,, Riding	8
Grand Total Horses	52

* These men belong to the A.S.C., but no Offrs. or N.-C.Os. or spare horses, &c., are included, although a due proportion would of course accompany the Transp. Detachmt. allotted to each Fd. Hospl.

All artificers' work is done by Hd. Qrs. of the Section supplying the Transport, and the supply cart will be furnished by such Section.

If tents are carried for all ranks no extra carriage will be required, but each hospl. will want 10 bell tents in addition. Each Fd. Hospl. at the base of operations will require 11 marquees or 50 hospl. circular tents (100 lbs. each), if tents are used for patients, but in other respects the equipment for them is the same as above ; no transport will of course be provided as part of their establishment. The 2 Fd. Hospls. with a Divn. will be supplied with transport by the 2nd Line of Divnl. Departl. Transport.

Movable Fd. Hospls. will form the 2nd line of medical assistance in the field ; they will be an integral portion of the army corps, and will receive the sk. and wdd. from dressing stations and corps. There will be 12 movable Fd. Hospls. for an army corps ; 2 will be attached to each Divn., 6 remaining for general disposal. Each Fd. Hospl. will accommodate 200 sick, and will

be divisible into two, each half Fd. Hospl. being complete in personnel and *materiel* for 100 sick. When a Fd. Hospl. is divided, the surgeon next in rank to the M.O. in charge will take command of the detached portion. Each hospl. tent in a movable Fd. Hospl. will accommodate 4 patients; but the number may be increased or decreased in accordance with the requirements of the sk. and wdd. Only transport for 3 Fd. Hospls. of those that are not attached to Divns. will be kept up; when necessary, transport for the remaining hospls. will be supplied on requisition by the Commisst. Department. The P.M.O. of a Divn. will be responsible that a sufficient number of Fd. Hospls. are opened. When more than 2 are required for the Divn. he will apply to the S.G. through the G.O.C. the Divn. for such of the unattached Fd. Hospls. as may be required. When a Fd. Hospl. of a Divn. cannot be moved on account of the number of sk. and wdd., want of transport, or other circumstances, the hospl. will cease to belong to the Divn., and its place will be taken by a reserve Fd. Hospl. detailed for the purpose by the S.G. of the army corps. The P.M.O. of a Divn. will advise the G.O.C. as to the number and position of Fd. Hospls. that may be considered necessary while in camp. When no instructions have been received from the Hd. Qrs. of a Divn., the M.O. in charge of a movable Fd. Hospl. will use his discretion in opening it, reporting his reasons for so doing to the G.O.C. the Divn., who will refer the matter to the P.M.O.

He will send all sk. and wdd. to the hospls. along the L. of C. and the base as soon as practicable, only retaining under treatment cases that are likely to be fit for duty within a short period, or those which might suffer by removal. Before an action the movable Fd. Hospls. will be cleared of any sk. or wdd. that can be removed to the rear. In selecting a site for a Fd. Hospl. before an action, due precautions will be taken that the position is as close as possible to the 1st line of assistance, and that there is a practicable road for the ambulances from the front, and a sufficient water supply in the vicinity. Advantage will be taken of any available and suitable buildings in towns and villages for the establishment of these Fd. Hospls. When there are no buildings available the hospl. tents will be pitched, and the carriages drawn up under the direction of the M.O. in charge.

Stationary Fd. Hospls.—The 3rd line of medl. assistance in the field will consist of stationary Fd. Hospls. along the L. or Ls. of C. and at the B. of O. In choosing sites for stationary hospls., due attention will be paid to the character and elevation of the country, the nature of the soil, the proximity and purity of the water supply, the practicability of drainage, the shelter afforded by wood or high land from cold winds, and that the position is easy of access and at a convenient distance from the main road, and, as far as circumstances will admit. If possible these hospls. will be established in buildings or wooden huts at the port of embarkation, and in towns,

villages, or farm-houses along the Ls. of C. Hospl. marquees will be stored at the B. of O. and issued for stationary hospls. when other shelter is not available. In forming stationary Fd. Hosps. along the Ls. of C., existing lines of rail. and roads will be utilized. The hospls. and provision stations will be placed at regular and convenient intervals so as to suit the position of the forces, and the circumstances of the wounded. The sk. and wdd. from the army in front will be transported by the ambulance of the movable hospls. as far as the advanced depot, where other conveyance provided by the Commissariat on the requisition of the S.G. of the L. of C., or the D.S.G. with the Road Comdt. will meet and convey them to their destination. On no account is the ambulance of the movable hospls. to convey sk. and wdd. beyond the advanced depot. Before the removal of sk. and wdd., care will be taken in the first instance to ascertain through the Road Comdt. when the road will be open and available for their transport; due notice will in all cases be given by the D. Ss. G. of Divns. of the removal of sk. and wdd. from the movable hospls. to the S.G. of army corps and to the S.G. and I.G. of the Ls. of C., and the latter will be responsible that intelligence is communicated throughout the whole line and to the P.M.O. at B. of O.

The custody of the arms of men in hospital.—The M.O. in charge of the hospl. is responsible for the arms, accoutrements, and such of the soldier's clothing or private property as may be handed over to his charge. For each patient upon arrival a kit inventory should be made out on which all articles received must be entered, with the soldier's name, regt., number, &c., together with the number marked on his rifle, arms and accoutrements. If the man returns for duty with his regt., all these articles must be returned to him, a list of them being furnished to his C.O. If he dies or is "invalided" out of the country, his arms and accoutrements will be handed over to the nearest O.S.O. with full details and a receipt obtained, by whom the circumstance will be reported to the regt. concerned.

Medical staff on line of communications & at base of operations.—There will be one S.G. for the L. of C. and B. of O. He will carry on the duties of the Dept. under the orders of the G. of C., and will be responsible to the P.M.O. of the army for medl. arrangements along the L. of C. and at the B. of O. He will be responsible for the medl. administration of all stationary hospls., both at the B. of O. and on the Ls. of C.; also that sufficient supplies of medl. and surgl. equipment, to meet the requirements of the whole army, are in store both at the base and at the advanced depot, and will report all wants and deficiencies to the P.M.O. informing the G.O.C. thereof. He will be responsible for the forwarding of medical and surgical appliances and stores for the hospls. of the whole army. He will be responsible, under the G. of C., for the removal of all sk. and wdd. from the

advanced depot to the stationary hospls. on the Ls. of C. or at the base, and also for the embarkation, under the instructions of the Comdt. at the B. of O., of sk. and wdd. to England, or to any convalescent station. The hospl. ships, so far as their medl. equipment and readiness for reception of sk. and wdd., will also be under his supervision and control. Two classes of patients will be transferred from base hospls. to hospl. ships: (*a*) Those who are invalided. and awaiting transport home, or to a sanitarium; and (*b*) sick sent on board for change of air, or to obviate overcrowding at B. of O.

Field Inspector of Lines of Communication.—One D.S.G. will be appointed for each L. of C., and will carry on his duties under the Road Comdt.; he will be responsible to the S.G. of the Ls. of C. for all medl. arrangements; will frequently visit the stationary hospls. on the Ls. of C., and will, in consultation with the M.Os. in charge, decide regarding the patients that may return to duty, and those who are to be invalided, furnishing a report thereof to the S.G.

Base of operations.—There will be 3 D.Ss.G. at the B. of O., the senior of whom, acting under the S.G. of the L. of C. will perform the duties of P.M.O. under the O.C. at the base. He will also act as Sanitary Offr., and will be consulted as to the selection of buildings to be used as barracks or hospls., of sites for camps and hospls. at the base, for the medl. supervision of the same, and for the equipment and supplies of such hospls. The second will be responsible for the arrangements connected with the reception of sk. and wdd. from the stationary Fd. Hospl. along L. of C. and from the army in front. He will also superintend the embarkation of sk. and wdd., and will preside over all medical invaliding boards. He will intimate to the G.O.C., when it is necessary for invaliding boards to assemble, and will take due precautions that there is no delay in bringing forward offrs. and men for invaliding, when they are not likely to become effective within a reasonable time. The third will be responsible that there is a sufficiency of medl. and surgl. stores, and will arrange with the Commissariat Dept. for the forwarding of the same to the hospls. on the L. of C., and the advanced depots, for the use of the hospls. and bearer comps. with army corps.

Advanced Depots.—One S.G. will be stationed at the advanced depot, and, acting under the S.G. of the L. of C., will have charge of medl. and surgl. supplies and appliances as it may be considered necessary to keep there. He will procure, by requisition from the D.S.G. at the B. of O. these stores, and will be responsible that a sufficient supply is kept at the advanced depot to meet the urgent requirements of the movable hospls. and bearer comps. in front, and will arrange with the Commissariat for the forwarding of these to the hospls. and bearer comps.

Hospital Ships, for the transport of sick and wounded from the theatre of war to England, should be fitted up immediately that war is determined upon ; those prepared for the Ashantee war in 1873 can be followed as models. Standing bedplaces should be provided for the sick, who should have about 300 cubic feet each. We have numbers of old screw line-of-battle ships suited above all other ships for this purpose. If the voyages are short, and the weather sufficiently settled to permit of vessels being towed by steamers, good roomy sailing ships are the best for hospl. purposes. These vessels should be under the order of the P.M.O. or C.G., and no naval officer should have power over them except upon purely professional points.

At present the responsibility is divided between the Admiralty and the W.O. in the following manner. The Admiralty will undertake the lodging, victualling, and conveyance of the sick, and for that purpose will provide the necessary shipping, fittings, bedding, food, medical comforts, disinfectants, and mess utensils of every kind. The W.O. will undertake to furnish the medical and other attendance necessary for the proper treatment and nursing of the sick, and the washing of all hospl. clothing and bedding used by them, and will supply all articles of personal and hospl. clothing, medl. and surgl. appliances, and hospl. utensils. Floating hospl. accommodation, whether stationary or for transport purposes, will be separate and exclusive of the hospl. accommodation for the force on land. The following will be the floating hospl. accommodation for an army corps. Each divin. of an army corps will have a depot hospl. ship (with steam power) capable of making up 200 beds, or 250 on an emergency. There will be one or more swift, powerful steamers, each making up 60 beds, which will be employed as relieving ships for the depot hospl. ships, to take the worst cases home. Despatch vessels, each fitted out with about 30 canvas cots, will carry less severe cases to any available packet station to meet the packets on their way home. Special arrangments will be made for carrying a small number of invalids in each packet. Each depot hospl. ship will have attached a small steam transport as a store ship. Every transport will accommodate temporarily in its sick bay, 3 per cent. of the entire force that it carries. Each depot hospl. ship will be supplied with 400 canvas cots in addition to the cots required for use on board. These will be fitted into transports remaining at the B. of O. when additional hospl. accommodation is required. Each of these hospl. ships will be provided with a sufficient staff of the A. H. C. for carrying out the hospl. duties.

See article (further on) upon hospl. ships, under the heading of "SEA TRANSPORT."

A commander should leave no stone unturned to get his sick and wounded removed from the theatre of war as quickly as possible. An army or a fighting force, no matter how small, should not have its action hampered by having to care for the welfare of sick or wounded men, or in

warfare with barbarous people, with their actual safety, which is still more embarrassing. Unless the L. of C. is along a navigable river or a rail. this becomes a matter of serious difficulty, as was the case for instance during the advance upon Coomassie.

Sick or wounded soldiers should be classed under two heads, 1st. those slightly wounded or only suffering from some passing ailment, who only require rest and good food for a few days or weeks to enable them to resume their duties; and 2nd. those not likely to be again fit for work during the campaign. These latter should be again divided into 1st, those seriously wounded or so ill that they must be conveyed to the B. of O. in a recumbent position; and 2nd, those who can be removed in a sitting position on board steamboats or by rail. This second class might perhaps with advantage be divided into two; *a*, the men who may safely be treated like ordinary passengers, and made to travel night as well as day, time being of course allowed for certain hours of halt during the day to dress wounds, obtain food, &c. &c., and *b*, the men who must be provided with sleeping accommodation every night, in either houses or tents.

As in most future wars the L. of C. will be a railway, I shall dot down briefly the general principles to be attended to for the evacuation of the sk. and wdd. by rail., which will, however, as principles apply equally to Ls. of C. along ordinary roads by means of horse transport, or by boats along lines of rivers.

The difficulties of arranging for these services are immensely increased when there is only a single line of rails, for in such cases, even with the utmost foresight, frequent delays must necessarily occur from accidental interruptions on the line, and from the fact that trains going in the opposite direction, carrying reinforcements and supplies of food and ammunition to the army in front, must be given precedence, thereby frequently necessitating the detention of ambulance trains at intermediate stations.

The line of rail connecting the army with its base—whether single or double—must be divided into such distances as it can be safely calculated trains will easily accomplish in the day, allowing a good margin for the detentions in the case of single track lines. At the end of such distances, sleeping accommodation should be provided for 200 or 300 sick and wounded men, intermediate stations having been prepared for supplying food. The carriages must be carefully prepared for the conveyance of the badly wounded; the various methods for doing so are tolerably well known now. Each train must be provided with a sufficient number of doctors—one of whom should be in charge—and hospital attendants, and one waggon should be fitted as a kitchen, to prepare coffee, &c,, &c., for the patients. In every carriage there should be a filter, to be replenished with water at every stopping-place. A great deal of the comfort of those being sent to the rear depends upon the goodness of the arrangements made at the feeding and hospital stations along the line. (See article on journey by rail.)

MEDICAL ARRANGEMENTS.—The system of regtl. hospls., which existed so long in our army has, I rejoice to say, been at last entirely abolished; it was unsuited to war upon any large scale, and was very expensive, and too cumbrous for rapid or constant moving. The sk. and wdd. with an army should be treated as follows. All slight cases of illness such as diarrhœa, colds, bruises, &c., &c., should be treated by the M.O. attached to each battalion. All cases that require the patient to receive more careful treatment and diet than can be afforded to men in bell tents, without hospl. appliances or equipment, should be sent to the Fd. Hospl., except cases of an infectious nature, such as typhus fever, small pox, &c., which should be sent direct, and with the least possible delay, to some general hospl. appointed especially for their reception. It will be for the M. Os. in charge of Fd. Hospls. to decide what cases shall be retained there for treatment until fit to return to their duty, and which shall be sent to the rear. One M. O. will in future be attached to each battalion, regt. of cavalry, and battery of R. A. All regtl. transport for the conveyance of sk. and wdd. has been abolished.

The M. O. doing duty with regts, will afford such temporary assistance as may be required in camp, on the line of march, and in action; all cases of sickness occurring in camp, and requiring prolonged treatment will be sent to the nearest Fd. Hospl. Two men a compy., trained as stretcher-bearers, will be under the orders of M. Os. doing duty with regts. and in cases of outpost duty or detached battns. will perform the duties that are performed divisionally by the men of the bearer compy.; in extensive actions they will also assist the wounded. It is desirable that Os. C. Regts. should cause 4 men a company to be trained to meet casualties. The regtl. stretcher-bearers will never be removed from battns. without the special sanction of the G. O. C. the division. Under ordinary circumstances, Fd. companions, in the proportion of 2 for each regt., and water-bottles, in the proportion of 2 for each compy., will be carried by the regtl. bearers. When the battns. are detached, or whenever it is considered necessary by the P. M. O. of Divn. he will cause additional medl. supplies or assistance to be furnished. A fd.-stretcher for each compy. will be carried on the line of march in the battn. compy. carts. When an action is expected, the regtl. bearers will leave their rifles and valises in the carts, and march under the direction of the M. Os. to the scene of action. In minor actions M. Os. doing duty with the regts. engaged will be assisted by M. Os. of regts. which are not engaged, in applying first dressings to wounded. In serious actions, M. Os. doing duty with regts. will only afford such temporary aid to the wounded as may be necessary until the staff of the bearer compy. arrives; on such occasions they will not, as a rule, undertake any serious surgical operation, but always keep in close proximity to their respective regt., &c.

In estimating the proportion of sick for whom provision should be made in any army or expeditionary force, the climate, the diseases common to the country to be operated in, the age, health, and physique of the soldiers, are most important considerations. Thus, in making this calculation for the Force sent to the Red River in 1870, and for that sent to Ashantee in 1874, very different rates of sickness had to be provided for, the climate in one instance being about the best, and in the other the worst in the world. The greater the care you can bestow upon the well-being of your men, the more attention you can pay to their food and clothing, the less you expose them to night duties, the fewer the straining demands you make upon their physical powers, and the more the sanitary precautions you can take against disease, the smaller will be the sick rate to be provided for. The medical history of the Crimean war is a shameful story, and tells of how an army may be destroyed by a Ministry through want of ordinary forethought and ignorance of military science; the general can learn from its pages the important lesson that the greater the attention he pays to the health of his men, the stronger will be his battalions on the day of battle. History informs us that every war has really had its own special rate of sickness; climate, the season of the year, the length of the war, the care or negligence of the officers in looking after the welfare of the men, and many other circumstances peculiar to certain campaigns account for this fact. The statistics published in our annual Army medcl. reports lead to the conviction that the age of the men employed greatly influences the rates of sickness and mortality, the young suffering most from disease, but having a smaller death-rate than their seniors. The following table speaks for itself:

	Under 20 years.	20 to 24	25 to 29	30 to 34	35 to 39	40 upwards.
Admissions to Hospital in the U. K. per 1000 soldiers.	1000·2	989	678·6	520·2	513	778·4
Death-rate per 1000 living	3·03	5·27	6·35	12·24	17·55	23·82

Troops in the field when well cared for should be quite as healthy as when in quarters in the same country, and for the following countries the number per 1000 of mean strength in our troops constantly non-effective from sickness may be taken as follows:—United Kingdom, 40·06; Gibraltar, 33·25; Malta, 41·15; Canada; 31·17; Bermuda, 35·47; West Indies, 43·96; Cape of Good Hope and St. Helena, 49·63; Mauritius, 56·58; Ceylon, 50·76; China and Straits Settlements, 56·19; Bengal, 55·46; Madras, 50·4; and

Bombay, 49·12. Except for the Indian Commands, which are based upon the 1876 returns, these figures are based upon the medical returns of the last 10 years. To be on the safe side, allow for sick at double these rates, when preparing for a war in the countries named. In many instances a margin to meet epidemics should also be allowed in calculating the hospital accommodation to be provided for an army or expeditionary force. In Abyssinia the proportion of doolies or dandies allowed was, at first, 5, and then 3 per ct., but as the army advanced into the interior, and the difficulty of supplies became very great, carriage for the sick was fixed at 1 dooley and 2 pad mules per 100 fighting men, and 15 doolies to each Fd. Hospl. In Ashanti, hammocks were allotted to English regts. at the rate of 6 per ct. of all ranks, and arrangements were made for sending back daily to the B. of O. sk. or wdd. at the rate of 1 per ct. of all the British soldiers employed in front.

The proportion of wounded to be calculated for previous to a battle is very difficult to determine, as every action would seem to have its own special rate, the loss on the losing side being generally much the heavier, and the more decisive the action, the more this fact becomes apparent. When the ground is soft and deep, as is generally the case after very heavy rains, the loss is less than when it is hard and stony, and some generals, either from recklessness of life, or from ignorance of their science, lose more men than others. Then again the nature of your enemies' arms, and their dexterity in using them, will always effect the rates of kd. and wdd. in any engagement. The statistics of wars prior to the introduction of the breech-loader are of little value in calculating the probable proportion of losses in an action between two European armies of the present day. During the great battles of the Franco-German war, the numbers engaged were so great that seldom more than two-thirds of those present were ever under fire at all. Sir A. Horne, on the data of a large number of recent battles, fixes the rate of total loss at 81 per 1000 men of those actually exposed to fire, which number he arrives at by deducting 360 from every 1000 soldiers present on the field. Surgn.-Genrl. Longmore in his most admirable work on gunshot wounds gives the following statistics regarding some of the principal actions of recent date (see page 112).

These 13 battles give an average of 0·75 killed, of 2·83 wounded ; of 0·54 missing or 4·12 per ct. as a total loss on the total numbers present, whether exposed to fire or not. For the battle of Königgrätz, the 1st line of figures gives the total strength of the Prussian army on the field ; the 2nd line (*a*) gives the number of Prussians actually exposed to fire ; the 3rd and 4th lines (*b* & *c*) give the same information regarding the Austro-Saxon army. The statistics of the battles in the Franco-German war refer exclusively to the German troops present at each, whether exposed to fire or not. The

Battles.	Strength.	Percentage of				1 to,
		K.	W.	M.	T. L.	
Königgrätz	220,984	0·87	3·14	0·12	4·14	3·6
,, (a)	129,000	1·49	5·38	0·21	7·08	1·6
,, (b)	215,028	2·69	8·28	3·64	14·61	3
,, (c)	150,000	3·86	11·87	5·22	20·95	3
Weissenberg	106,928	0·27	1·01	0·15	1·43	3·7
Saarbrück and Spikeren	119,033	0·72	3·05	0·31	4·08	4·2
Woerth	167,119	0·97	4·53	0·86	6·36	4·6
Vionville	151,858	2·16	6·77	0·82	9·75	3·1
Gravelotte	278,131	1·60	5·46	0·33	7·39	3·4
Sedan	190,239	0·86	3·40	0·48	4·74	3·9
Orleans	56,553	0·30	1·17	0·15	1·62	3·9
Coulniers	38,951	0·18	1·37	1·59	3·14	7·6
Amiens	52,430	0·34	1·95	0·06	2·35	5 7
Le Mans	123,749	0·23	0·72	0·09	1·05	3·1
Lizaine	64,735	0·36	1·66	0·35	2·37	4 6

In this table K. W. M. and T. L. stand for Killed, Wounded, Missing, and for Total Loss. The last column (1 to,) gives the ratio of wounded to every 1 killed.

proportion of killed to wounded throughout the whole war according to the above table is 1 killed to every 3·9 wounded, and of the latter, ⅓rd may be classed as severe, the other ⅔rds as slight injuries. As a rough calculation you may assume that in a battle between two European armies the total loss will never as a rule exceed 10 per ct., whilst frequently it will be less than half that amount, and that if you provide for the care and transport of wounded men at the rate of 6 per ct. of the total force you take into action, irrespective of whether they may or may not be exposed to fire, you will have done all that is necessary.

According to the German medical returns, the number of all ranks in the German army killed and wounded by rifle-bullets during the war of 1870, was 6969 kd. and 49,093 wd., whilst by artillery fire the numbers were 695 kd, and 4389 wd. ; that is, out of every 100 men but 91 were hit by infantry and only 9 by artillery fire. In previous editions of this pocket-book I have laid stress upon that fact that the effect of artillery fire is more moral than actual, and I trust that these figures will make the army, especially the infantry, fully recognize the truth of that assertion, and put a stop to the cry for more guns which one still hears occasionally. The medical arrangements for the march from Caubul to Kandahar in 1880 may

be taken as a very fair guide for Indian warfare, when a column has to depend upon what it takes with it, being in fact cut off for some weeks from any base of supply. Conveyance for the sick and wounded was provided at the following rates :—

	Bearer Carriage.	Conveyance on Mule or Pony.
European troops	5 per cent.	2 per cent.
Native „	3 „ „	4 „ „
Followers	1 1½ „ „	1½ „ „

Still transport of all kinds was attached to corps, and its maintenance and discipline provided for regimentally. 2 doolies and 2 dandies accompanied each battery ; 2 doolies and 4 dandies each European regt., and 2 doolies and 6 dandies each native regt. The remainder of all sick transport and all the sick marched with the hospital of their respective brigades. The sick transport, and the sick of the native regts. rejoined their corps at the end of each march. The Brigade-Surgeon of the Brigade on Rear Guard furnished the sick transport required for all stragglers in rear ; when 2 or more Brigades marched together, the Brigade Field Hospls. moved in rear in their allotted position in the column, *i.e.*, immediately in front of the 2nd Reserve of Ammunition.

In calculating the number of M.Os. required to take care of and attend upon any given number of patients, it may be put down at one M.O. to every 40 sick or wounded.

In providing for the care of the sick and wounded of an army, it is advisable to avoid collecting more than about 500 of the former, or 250 of the latter, in any one spot, when such can be avoided ; and when temporary buildings are erected for hospl. purposes, they should be spread over as much space as possible without interfering too much with facility of administration. No one tent or small building should have more than 20 beds. All the experience of late years goes to prove that sick and wounded, particularly the latter, do much better under canvas than in buildings ; it is, therefore, advisable that in establishing temporary hospls. for large numbers, one-fourth of the wounded should be provided for in tents, the other three-fourths in huts.

For a hospl. so constituted, the number of attendants, including orderlies, nurses, cooks, &c., &c., can be estimated roughly at 2 per ward of 20, or per marquee of 15 sick.

Weight, &c., of articles of Medical equipment.—Ambulance waggon, new pattern, complete, with 2 stretchers, weighs 18 cwt. ; it carries 8 wounded men, 2 of them lying down ; when full, its weight would therefore be over 32 cwt., a load greatly in excess of what 2 horses—its regulation complement—could draw across any country off the roads, and too great for

regular work even along first-class roads; we are greatly in want of a light 2-horsed ambulance waggon that can accompany troops wherever Fd. Artilly. go. *Stretcher*, old pattern, weighs 16 lb.; new pattern, 31 lbs. *The Pharmacy waggon* when packed weighs about 30½ cwt.; and the *G. S. waggon*, when fitted for hospl. equipmt., weighs 24⅜ cwt. *One pr. of cacolets*, 56 lbs., *pr. of litters*, 106 lbs.; *packsaddle complete* with bridle, harness, &c., 44½ lbs. *The Indian Dooly*, 123 lbs. or 136 lbs. according to pattern; those made in Hong Kong for the war in 1860 only weighed 58 lbs. and answered very well. *The Dandy*, used in Abyssinia, 54 lbs; it is used in the hills in India for sk. and wdd. *The Hammock*, used in Ashantee in 1874, weighed, with the pole, about 45 lbs.; it was carried on the heads of 4 men. *A pr. of Medcl. Panniers* complete with packsaddle weighs 267 lbs. *The Medcl. Fd. Companion* contains an assortment of the most urgently required physic, bandages, &c., and weighs 11¼ lbs.; it is carried by an orderly. *The Hospl. Marquee* holds 18 patients; *the operating tent*, double, circular, holds 4 patients; see pp. 89, 100.

Grave-yards.—There must be one in the vicinity of each large hospl. station; it should not be within view from the hospl., nor within easy lounging distance of convalescents. The dead-house should be in a retired spot, so that funerals can take place without attracting attention. The French, who wisely studied every trifle that may affect the moral of their soldiers, used to bury the dead from their large genrl. hospls. in the Crimea before daybreak in the morning. This should always be done when practicable. If on the sea shore, the dead might be taken out daily a few miles and buried in the sea, as it is much better in a sanitary point of view than burial on shore; but care must be taken to prevent them rising to the surface, or being washed ashore, a circumstance that created such horror in our army in Egypt, in 1809, when some hundreds of bodies that had been buried at sea were washed ashore. In all cemeteries the graves should be dug about 6 feet deep, and charcoal and lime should be freely used.

Convalescent Depots should be established in connection with genrl. hospls. It is not necessary that there should be equal numbers of each, for one of such depots may be made to receive the men discharged from several hospls. Establishments of this nature are much open to abuse, and are, unless well looked after, merely places of refuge for skulkers of all ranks. They should be under the command of a military offr. of standing, who should be carefully selected for this duty; he should be stern and determined, but just to all. Frequent inspections should be made of these places by G.Os.C., who should carefully examine all men who have been more than a fortnight there, going minutely into their cases with the M.Os. in charge. They should send in written confidential reports to the C. of the S. or A.G. upon

all offrs. at such establishments, as it is advisable to force men to leave the service who are physically unfit, or *imagine themselves so*, for the hard work of a campaign.

It must however, be remembered, that the old saying of *a man being either in hospital or at his duty*, is absurd ; a man may be so far recovered that it is cruelty to keep him in the restraint of a hospl., although at the same time he is really unfit for work. To send him direct to his regt. is merely sending him back to hospl. by a roundabout way, whereas if he is sent to some healthy depot, away from the depressing influence of a hospl., where he will be well fed for a fortnight, he returns to his duty a new man, both in mind and body.

The distance of the theatre of war from England, and the probable duration of the campaign, must determine the nature of the cases that shall be sent to England and those that are to be sent to the convalescent depots.

Pay Department.—The pay duties of an army in the Fd. will be carried out by the offrs. of the A. P. D. in accordance with the Finance Regs., and subject to the supervision and direction of any offr. who may be specially appointed by the S. S. for War to assume the general charge of the finance duties of the army. The principal Pay Office, and the principal Treasury Chest will, as a rule, be placed at the B. of O. where the senior offr. of the A. P. D. will be stationed. Military chests will also be established at the advanced depot, and with the Hd. Qrs. of the Army, and at such intermediate depots or stations on the Ls. of C. as the senior offr. of the A. P. D. may find necessary, subject to the orders of the C.-in-C. or the G. of C. When a chest is ordered to be established at any station, the paymaster in charge becomes responsible that he calls on the O. C. the station for proper accommodation for his office and for the chest, and for military protection. When specie is sent along the L. of C., whether by road or railway, an offr. of the A. P. D. will, when possible, accompany it, and a military escort will be demanded. On halting at any station on the L. of C., the paymaster will report his arrival to the Comdt., who thereupon becomes responsible for the security of the specie until the escort again moves on. Heads of Depmts. will, as far as possible, keep the senior offr. of the A. P. D. informed of the amount and description of specie they are likely to require at each station where there is a chest, so as to enable him to meet their wants. The senior offr. of the A. P. D. will be careful frequently to inform the C. G. of the description of specie or bills in which it is desirable to stipulate that payments to contractors are to be made at Hd. Qrs. and at outposts. All payments by the pay offrs. at the several stations, other than authorised imprests, will be, as far as possible, made on properly rendered accounts or claims, duly vouched as final transactions. Imprests will, as a rule, only be made to offrs. duly authorised by Regs. to receive them. When offrs. are detached on special

service, and in other exceptional cases, imprests may be made upon the written authority of the C.-in-C., the G. of C., the O. C. the Bs. of O., the Road Comdt., the C. G., the C. R. E., or the Senior Commisariat offr. on the L. of C. Any offr. receiving an imprest, will be held responsible for the total amount thereof until the account of its expenditure is rendered by him and found to be correct, and the pay offr. issuing the imprest will take steps for obtaining, in proper time, a due account of the disbursements. When the S. S. for War deems it advisable, he will appoint an offr. who will be specially charged with the direction of the finance duties of the army. The offr. so appointed will act under special instructions as financial adviser to the G. O. C. He will superintend, on behalf of the Treasury, the duties of the Treasury Chest, and will conduct, so far as it can be conducted locally, an examination of the accounts of the army. His office will be at the base of operations, or at such other station as the G. O. C. may determine to be more convenient for the necessary personal communications with the Hds. of departments.

The C. Gs. of divisions should always have a small supply of ready money (if possible, in the currency of the country) for the daily purchase of supplies. It should be carried in a waggon built expressly for the purpose. As stated under the head of Correspondence, all papers connected with accounts, whether of stores or cash, should be despatched weekly, or as often as necessary, to some depot in rear, where there should be an account and credit department to compile, classify, and finally close all the accounts of the army. With us, usually, a long time elapses before the accounts are audited ; the consequence is, that for months, and in some instances for years after money has been paid away, queries are sent forward regarding them to offrs. who have perhaps forgotten all about the circumstances. To force offrs. in the field to keep elaborate store accounts is to prevent them doing their duty to the army as well as they ought. Officers and others drawing pay, frequently require to remit money to their families at home : every facility should be afforded for doing so by the issue of drafts on the treasury at home. This plan, if well carried out, would reduce the amount of bullion to be sent from England to the seat of war. Sutlers with an army are only too glad to obtain the cheques of offrs. on their bankers at home in exchange for money which they have no means of keeping. How much more willingly would they accept orders on the treasury. If proper arrangements had been made in the Crimea, much of the money paid out from the treasury chest might have been returned to it in exchange for orders on the treasury at home.

Veterinary Department.—There will be a P. V. S. in charge of the whole department, who will be with the Hd. Qrs. of the army. He will be responsible for all the veterinary arrangements connected with the army.

The veterinary establishment for an Army Corps, &c., &c., in addition to the V. Ss. belonging to the Regts., &c., is as follows :—

A Division.	Officers.				Men.				Char gers.
	P. V. S.	I. V. S.	V. S.	Total.	Batmen.	Farriers.	Shoeing smiths.	Total.	
Head-Quarters . . .	. .	1	. .	. 1	2	. .	. .	2	2
Divisional duties . . .	. .	. .	1	1	2	3	3	8	2
1st Brigade*	. .	. .	1	1	2	. .	. .	2	2
2nd Brigade*	. .	. .	1	1	2	. .	. .	2	2
Total 1st Division . .	. .	1	3	4	8	3	3	14	8
Total of three Divisions .	. .	3	9	12	24	9	9	42	24
Hd.-Qrs. of Army-Corps.	1	. .	1	2	4	3	3	10	4
As a Reserve	. .	. .	. .	. .	. .	2	2	4	. .
Cavalry Brigade . . .	. .	. .	1	1	2	. .	. .	2	2*
Grand Total . . .	1	3	11	15	30	14	14	58	30

A pair of Fd. Vety. Medicine chests complete will be taken by each V. S., and a public animal and pack saddle will be allowed for their carriage when necessary. Each chest weighs about 30 lbs. when empty, and measures externally $26\frac{3}{4}$ ins. by $15\frac{1}{2}$ ins. by 14 ins., when filled it weighs about 78 lbs. The proportion of V. S. required for an army is one to every 300 horses or mules. One farrier and 1 shoeing-smith are required for every 50 animals to be shod, and there should be in addition, 1 farrier and 1 shoeing-smith to every 5 of each rank respectively, to be at the disposal of the P. V. S. One chest of tools (forge and shoeing) is required for every four farriers or shoeing-smiths ; a chest of farrier's tools, packed, weighs 124 lbs.; of smith's tools, packed, 360 lbs.; of wheeler's tools, packed, 299 lbs. and of collar-maker's tools, packed, 65 lbs. One forge waggon is allowed for every 400 horses.

Between the B. of O. and the advanced depots there will be a six months' supply of medicines, in charge of O. S. D., to which a V. S. will be appointed to act as purveyor, who will be responsible that this supply is always kept up, and for the care of these stores. V. Ss. will from time to time draw for the medicines they require through the I. V. S. of their Division, &c., &c.

All horses and transport animals to be newly shod before taking the field, and all should carry a complete set of spare shoes fitted previously to the

* Farriers and shoeing smiths' work done by sections of Transport.

feet, and in addition 15 per cent. to the number of animals should be carried regimentally. Four months' supply of horse shoes—say 50,000 sets per Army Corps, will be kept by O. S. D. in advanced depot and at B. of O. to be issued on payment to mounted corps.

When mules or other animals requiring peculiar shoeing are used, the services of persons in the habit of shoeing them must be obtained, and a supply of the necessary shoes, nails, and tools provided by the O. S. D.

When horse blankets are not in general use, 3 per cent. should be carried regimentally for sick horses.

When an officer or other person drawing forage requires his charger or bât animals to be shod, he will make a written requisition upon the V. I., whose duty it is to attend to the animals, who will on that document order the service to be performed. The document will support the expenditure of the shoes and nails, and will enable the amount to be recovered from the individual by the pay department. The prices to be charged for shoes, nails, shoeing, removing, &c., &c., will be published in G. O.

The veterinary duties in connection with the Line of Communications and remount depots will be found under the heads of "*Line of Communications*," and "*Supply of horses*," &c.

The Staff is to an army what steam is to a locomotive. The machine itself may be of the highest order, the engineer who directs it may be a man of first-class talent, but without the motive power of steam it is merely a huge collection of well-polished material.

Every successive invention applicable to military science adds to the necessity for a staff, increases its duties, and entails the employment of more officers on it. A knowledge of fortification, of the field-engineer's duties, of artillery, of military history and of the military sciences generally, is essential for the S. O. if he is to perform his duties in a thoroughly efficient manner; above all things he should possess a complete and intimate acquaintance with the regulations and customs of the army; this he can only secure satisfactorily by the performance of regimental duty. It is not necessary that he should know every minute detail in the drill of all three arms, but he must have a general comprehension of the system upon which each manœuvres. Our plan of making Staff and regimental officers interchangeable is admirable; when a man who has been for some years on the Staff returns to his regt. for duty, he takes with him information which to a great extent he imparts to his brother officers almost without knowing it, whilst he learns from his association with them what no books could teach him. In this way a proper sympathy is maintained between the staff and regimental officers, and prevents the former from being regarded or from feeling themselves as a corps apart from the great bulk of the army. It is not possible for the most transcendent genius to command an army successfully without able assistance from others in matters of detail. Armies are

held together by discipline, and discipline is essentially a matter of detail and attention to small things. By no means the smallest talent of great soldiers has been that which they have displayed in their selection of able assistants.

The best example of how helpless an army must be without an efficient staff is that afforded by the army organised at Washington by M'Clellan, and, in a lesser degree, by his successors. Many thousands of men were enrolled, splendidly equipped, abundantly fed, provided with all sorts of artillery and engineer material of the most approved patterns and upon the most lavish scale ; yet, as a distinguished officer said, it was a huge giant lying prostrate on the ground, who, though powerful in outward appearance, was destitute of bones and muscle, and consequently helpless for action. The bone and muscle required was a good staff to put it properly in motion. In the Southern Army, affairs were never so badly conducted as at the North, which, in a great measure, is to be accounted for by the fact of its having received into its ranks the large proportion of regular offrs. who had been educated at West Point.

The greatest care should be exercised in the selection of S.Os. The principal ones should be chosen by the G. O. C. an army in the field. If he is to be held responsible for its safety and success, it is not fair to force him to use confidential agents selected by others, and of whose ability he may, perhaps, have no opinion. If he is fit to command he is qualified to make a good choice, and if not, it is criminal to leave him in command for an hour. If he had no higher motive than personal interest, it would be enough to make him select the best men.

Since the establishment of the Staff College, all zealous officers can fit themselves theoretically for the highest duties in our service, and in our next great war we shall have but few on the staff who have not taken degrees there. The fatigues and privations of war, sickness, wounds, &c., soon make serious gaps in the ranks of the Regiments with which you begin the campaign, but the abler your staff, the stronger will be those Regiments in the day of battle; for if their arrangements have been good, the men will have been spared all unnecessary exertion, and will have been well cared for in every way. To watch over the fighting efficiency, the spirit of the troops, to see that their physical wants and comforts are provided for, are duties that should never be absent from the thoughts of the S. O.

With modern armies it is almost an impossibility that a man can be fit for any important command without long study and deep reflection thereon. We have the greatest of all Generals' authority for this, and he was ever most emphatic in urging upon others the necessity for pondering over the histories of all great soldiers. Doubtless there will always be men of weak minds, to whom reading can only impart a smattering of knowledge, which, in moments requiring promptness, will cause them to theorise instead of to act; men who make their doings subordinate to their book knowledge.

Well may it be said that a little knowledge is dangerous. See them in action, and they are busy attempting some grand manœuvre learnt from Jomini, which is probably only completed in time to have a long shot at the enemy's rear-guard. The higher qualifications for command can never be learnt from books, although he who is endowed by nature with the mental and physical power indispensable for an officer, can develop his ability a hundredfold by study. The S. O. should be young in body but old in mind; unless gifted with good eyesight he cannot be of much use on service, as it is essential that he should be quick and skilled in judging distances, and in forming correct estimates of the number of men formed in columns or deployed that may be occupying any position he has to examine from a distance. The practice acquired by the eye in surveying is invaluable, as it accustoms one to be observant of ground and of landmarks, and to estimate distances correctly.

The three great qualifications for all offrs., from the general to the ensign, are, 1st, daring courage; 2nd, quick ability; and 3rd, a healthy, powerful physique. We are prone to forget how much the last-named enters into the attributes of a good soldier. A man who cannot bear fatigue, who is not of active habits, and who cannot ride well, is useless as a S.O. Being a good sportsman, a good cricketer, good at rackets, or any other manly game, is no mean recommendation for staff employments. Such a man, without book lore, is preferable to the most deeply-read one of lethargic habits. The worst S.O. I knew in the Crimea had taken the highest degree in the senior department at Sandhurst. I do not wish to insinuate that learning is injurious, but to prove that scientific attainments alone can never make a staff officer.

We have no distinct staff corps like that existing in many foreign armies, and we include under the title of staff all officers of the A. G. and the Q. M. G. departments. Such confusion exists in our minds as to the term staff, that all the regimental officers of the native regiments in India are styled as belonging to a "staff corps." Many advocate the formation of a staff corps on the old French system, but, beyond all doubt, our plan of selecting offrs. from regts. as required is much better; they remain on the staff as long as required, and then return to regtl. work. It is desirable that all men should have opportunities of serving on the staff, and that employment thereon should not be strictly reserved for one especial corps. When an offr. who has never done any but regtl. duty all his life, becomes a general, he finds himself in a difficult position, which a little staff experience in war would have rendered him familiar with. To command all three arms on service is not so easy as it seems at a field day. When employed in the active duties of a campaign, S.Os. have such an extensive field for their study, and, being behind the scenes, such opportunities of learning their profession, that regtl. offrs. can seldom compete with them in the art of war. The amalgamation of our staff has not yet been carried out; its

division into two branches, the A. G. and the Q. M. G.'s, is in my opinion very much to be regretted, the heads of each at all our stations being co-equal. All who have served much on the staff in either or both of these departments during war, will generally admit that this system leads to great friction which is seriously injurious to the service. When an army takes the field, a C. of the S. is appointed to it; in a similar manner every army corps, division or brigade should have a principal S.O. to be the mouth-piece of his general, assisted by as many subordinate S.Os. as may be required.

Detail of Executive Staff for Corps, Divisions, &c., with an army in the field, is as follows:—

DETAIL OF THE STAFF OF A BRIGADE OF CAVALRY AND OFFICERS ATTACHED.

Tentage.				* The equipment of these Commisst. Offrs. is conveyed with the Commisst. Detachmt The baggage and equipmt. of the Staff of each brigade is carried in 1 cart belonging to the Section. of the Transport Co. allotted to each brigade. † These 9 tents if carried require cart. § These 8 „ „ „	Horses.				
Miscel.	Office.	Servants & Saddlery.	Offi rs .		Officers.	3rd Class Clerk.	Servants.	Private.	Public.
Guard, 1.	..	1	1	M.-General Commg.	1	..	3	5	..
	1	1	1	Brigade Major	1	1	2	3	..
				A. D. C.	1	..	2	3	..
	..	..	..	* D Commisy.	1	..	1	..	1
	..	1	1	Chaplain	1	..	1	..	1
			1	Assist. Vet. Surgn.	1	..	2	2	..
† 1	† 1	† 3	† 4	Total . . .	6	1	11	13	2

DETAIL OF STAFF OF AN INFANTRY BRIGADE AND OFFICERS ATTACHED.

Guard 1.	..	1	1	M.-General Commg.	1	..	3	5	..
	1	1	1	Brigade Major	1	1	2	3	..
				A. D. C.	1	..	2	3	..
				Attached.					
				*Assist. Commissy	1	..	1	..	1
	..	1	1	Chaplain	1	..	1	..	1
				Assist.-Vet. Surgeon	1	..	2	2	..
	§ 1	§ 1	§ 1	Total . . .	6	1	11	13	2

DETAIL OF THE STAFF OF A DIVISION AND OFFICERS ATTACHED.

Tentage.				Detail.	Officers.	Staff Clerks.			Officers' Horses.
Miscel.	Offices.	Servants and Saddlery.	Officers.			2nd Class.	3rd Class.	Servants.	
Staff Clerks . . . 1	..	1	1	Lieut.-General	1	..	..	4	6
Divisional Guard . .	..	1	1	Aide-de-Camp	2	..	..	4	6
	1	1	2	A. A. and Q.-M.-G.	2	2	2	4	6
	..	..	1	D. A. A. and Q.-M.-G.	1	..	..	2	3
	1	1	1	L.-Colonel, R.A.	1	..	1	2	3
			½	Adjutant, R.A.	1	..	..	2	2
	1	1	1	L.-Colonel, R.E.	1	..	1	2	3
			½	Adjutant, R.E.	1	..	..	2	2
	1	..	1	Ass. P. Marshal	1	..	..	1	1
			1	Inspect. Vet. Surgeon	1	..	..	2	2
	1	1	1	Ass. Com.-Gen. (Com. and Tr.) .	1	..	1	2	2
	1	..	1	P. M. O.	1	..	1	2	2
			½	Senior Chaplain	1	..	..	1	1
		1		Attached.					
			½	Chaplain	1	..	..	1	1
2	6	7	13	Total	16	2	6	31	40

28 Tents requiring 1 G. S. Waggon, if Tents are carried.

The Baggage and Equipment of—

16 Officers. . . . . } = 1 G. S. Waggon or 2 Carts. (Included in
39 Servants and Clerks . . } Transport Co. allotted to a Divn.)

DETAIL OF THE STAFF OF AN ARMY-CORPS AND OFFICERS ATTACHED.

Tentage.				Detail.	Number.	Staff Clerks.				
Miscells.	.	Servts. and Saddlery.	Officers.			1st Class.	2nd Class.	3rd Class.	Servants.	Chargers.
Guard . . 1 Staff Clerks. . 1	..	1	1	G. O. Commanding . . .	1	..	..	..	5	8
	..		2	Aides-de-Camp	4	..	..	..	8	12
	2	1	2	D. A. and Q.-M.-Gs.. . .	2	2	2	2	6	8
	..	1	2	A. A. and Q.-M.-Gs. . .	2	..	2	2	4	6
	..	1	1	D. A. A. and Q.-M.-Gs. .	2	..	..	..	4	6
	..	1	1	Officer C. R. A.	1	..	..	..	3	5
	1	1	1	Brigade Major, R.A.. . .	1	..	..	1	2	3
				Aide-de-Camp, R. A. . .	1	..	..	..	2	3
		1	1	Commg. R. E..	1	..	..	..	3	5
	..		1	Brig.-Maj. R. E.	1	..	..	1	2	3
				Aide-de-Camp, R.E. . .	1	..	..	..	2	3
	1	..	1	Commdt. at Hd. Qrs. . .	1	..	..	..	2	3
	1	..	1	Provost Marshal	1	..	..	..	2	2
	1	..	1	Princpl. Vet. Surg. . . .	1	..	..	1	2	2
	1	1	1	D. C. G. (Com. & Trans.) .	1	..	1	1	2	3
	1		1	D. C. G. (Ordnance) . .	1	..	..	..	2	3
	1	..	1	P. M. Officer	1	..	1	1	2	3
	1	..	1	Prinpl Chaplain	1	..	..	..	2	2
			1	Chaplain.	1	..	..	..	1	1
9	9	9	20	Total	25	2	6	9	56	81
40 tents (2 G. S. Waggons, if carried).										

For conveying the Baggage and Equipment of these 25 officers, 56 servants and 17 clerks, 2 G. S. Waggons are allowed: they are furnished by the Transport Co. Section attached to the Army Corps Hd. Qrs.

COMMANDANT OF HEAD-QUARTERS.—There is always such an offr. with armies in the field. As long as our staff continues to be divided into two branches, he should be an officer of the Q.M.G.'s department. His duty is to regulate all matters concerning the quartering of every one that is attached in any way to Hd. Qrs. ; he marks out the camp, when tents are used, and allots quarters to every one according to their seniority, when

Hd. Qrs. are to be in buildings. The best form for a Hd. Qr. camp is as three sides of a square, the general being in the centre, all the tents facing inwards, the clerks, orderlies, servants, &c., being in a second row.

The commandt. is responsible for the cleanliness and police duties in and around Hd. Qrs., and it must be clearly understood that all officers and soldiers, no matter what their rank may be, are implicitly to obey his orders as coming from the general himself. When a move is to be made, the commandt. sends round a written memorandum of instructions to all concerned, giving full details as to the order of march, the hour at which the baggage is to be loaded, tents struck, &c. Any officers failing to receive such instructions should understand that it is their duty to see the commandt. to ask for information. The commandt. should keep a nominal list of every individual attached to Hd. Qrs. and a return of the number of their horses. Heads of departments must notify all changes to him as soon as they occur. All ranks going to Hd. Qrs., if only to remain there for a night, must report their arrival to the commandt., who will allot them quarters, or point out where their tents are to be pitched. He also has charge of the forge, and the shoeing-smith at Hd. Qrs. will take orders only from him. He should have under him a couple of the military police, to assist in carrying out his orders. He will also be paymaster, and will estimate for, and draw from the military chest, the pay of all N.-C. Os. and privates attached to Hd. Qrs., consequently No. 1 reports must be sent to him with every man arriving there.

GENERAL DUTIES OF STAFF OFFICERS.—The following extracts are from the Queen's Regulations, and intended for the guidance of general and other S. Os. With an amalgamated staff all these duties will be performed by it under the orders of the senior S. O. with each Army Corps, Division, &c.

It is by the zealous exertions and constant superintendence of the G. Os. C. that the system of discipline essential to the reputation and success of Her Majesty's arms is to be maintained.

G. Os. C. intrusted with command are responsible, not only for the discipline of the troops, and their constant preparation for active service, but likewise—in case of attack—for the immediate and advantageous disposal of every description of force placed under their control. They are to inform themselves of the resources of their commands in regard to provisions, labourers, horses, and the means of transporting troops and stores, and to obtain an accurate knowledge of all the strategic features of the country, of all fortified places and their means of defence, and of every particular which may increase their power of acting with advantage against an enemy.

G.Os.C. are also to ascertain that the generals and S.Os. under their command are well versed in their several duties, and competent, both from general intelligence

and acquired local information, to render that assistance which the nature of their appointment requires.

G.Os.C. are to be prepared at all times to afford the C.-in-C. any information he may require, as to the efficiency of any particular corps with regard to its discipline, equipment, and preparation for immediate service.

G.Os.C. are not at any time to change the quarters assigned them, nor under any circumstances to quit their commands without special permission. In applying for temporary leave of absence from the C.-in-C., they are to report to the C. of the S. the name and rank of the officer on whom their command will devolve.

When any general or other offr. relinquishes his command, he is to deliver to the offr. who succeeds him all the official books and papers, including all confidential documents relating to his command.

Duties.—S. Os. should consider it a part of their duty to make themselves thoroughly acquainted with the nature of the country in their vicinity, more particularly with the roads, passes, defiles, bridges, and fords; this should be done, not only by consulting maps and plans, but also by personal observation, and by acquiring local information. They should further obtain a general knowledge of the resources of the country in the neighbourhood, as regards the description of crops usually grown, the supply of provisions, and means of transport. The zeal and industry which an offr. may exhibit on these points will not only afford a ready means of bringing himself favourably to notice, but will also enable him, when requisite, to render that assistance which, from the nature of his appointment, his superiors have every right to expect from him.

In order to avoid the possibility of being misunderstood, S.Os. are to make it a rule to deliver all verbal orders intrusted to them in the plainest and most concise terms, and these orders are to be obeyed with the same readiness as if delivered personally by the G.O.C. to whom such S.Os. are attached.

When the staff is divided into two separate departments, the detail of the duties is confided *to the A.G.'s department*, the senior officer of which is responsible for the accuracy of all returns. He is also the channel through which the orders are issued in the name of the G.O.C. It is essential, therefore, that he should have a clear and concise mode of communicating such orders. The various subjects of correspondence which should pass through the A. G. department, are detailed in page 131.

The officers of the Q.M.G. department are intrusted with the duty of quartering, encamping, embarking, disembarking, and moving the troops. Their special duties will be to regulate the order of march, to define the positions to be taken up, to direct the preparation of military surveys, to conduct reconnaissances, and to superintend the arrangements necessary for collecting information regarding the movements of the enemy and the resources of the country.

The Military or Assistant Military Secretary is the confidential S.O. and the head of the personal staff of the G.O.C. to whose staff he belongs. He is the channel of communication on all subjects connected with promotion and patronage,

and such as do not fall within the province of the departments of the A.G. and Q.M.G.

The B.M. is the S.O. of the Brigade and is not on the personal staff of the O.C. it. He issues the orders of the brigadier, and keeps and regulates the roster of the brigade duties, inspects all the guards, outposts, and picquets furnished by the brigade, and he is responsible for such guards, piquets, &c., being withdrawn when the brigade is to march. His station on a march is in front of the leading regt. of the brigade; he is to encamp in rear of the centre of the brigade, and he or an elderly adjutant is to be constantly in the lines of the camp. All reports and correspondence for the information of the brigadier are to be addressed to, and transmitted through, the B.M.

Strictly speaking, staff work is purely administrative, and not executive; S.Os. do not immediately command troops; they are the mouthpiece of the general in whose name and on whose authority they issue orders. As, however, they are generally the ablest men in the army—at least they should always be so—it is by no means uncommon to see them entrusted with the command or execution of some special or very important operation. As soon as an army takes the field, a *Topographical Department* should be formed; it should be an integral portion of the staff or of the Q.M.G.'s department when the staff remains as at present. All surveys and most of the reconnaissance work should be done by the officers of this topographical branch. Indeed, although road reports and many of the minor reconnaissances may be made by cavalry officers, the greater and most important portion of those duties are done in nearly all armies by officers of the general staff, and with us by officers of the Q.M.G. department.

S. Os. should carry in their heads all general information regarding the army with which they are serving; the composition and distribution of corps, divisions, brigades, &c.; they should remember as accurately as possible the strength of each battalion in their immediate division, and the names of the respective C. Os. Officers of the Hd. Qr. should know the position of every division or detachment each night; their composition and strength, and the names of their commanders, &c.

In communicating orders to others, S. Os. must speak and write in the name of their generals. They must remember that they have no power of themselves to confer favours, and that all patronage rests with the general. In theory they are merely his agents, and although in practice offrs. of importance have much in their power, they should be careful to prevent its being generally known. Their commander must never be ignored, even when they know him to be a fool. It is not that you injure an individual by slighting him, but that by doing so you deprive him of that general confidence which, for the public good, it is essential he should possess.

With young offrs. first appointed to the staff the position is for some time

very novel. The operations and movements they may have taken part in previously had been performed mechanically, their object being unknown, and but few caring to inquire into the subject. On the staff it is otherwise; one is more or less behind the scenes, and young men thus sometimes become the repository of important news, secrets, or orders. Regtl. offrs. look to their friends on the staff for information as to what is going on, and endeavour to pump them accordingly. Reticence is therefore a virtue that cannot be too much practised and fostered by all S.Os. Some seem to think it necessary by their manner to cause the outside world to believe that they are oppressed with hard work, and engaged upon secret duties of paramount consequence: that they are in possession of important secrets and know exactly the G.O.'s intentions, and what operations are contemplated. This is not only foolish but wrong, for if the impression they convey is correct it is nearly as bad as if they revealed all they had been ordered to keep secret. It is always advisable to profess entire ignorance regarding coming events. If men try to pump you, parry the questions by "indeed," and with all sincerity lead them to believe that you do not answer them because you do not know yourself. S.Os. should never be exclusive in their acquaintance, but should mix freely with regtl. offrs., as it is essential that they and the generals through them should be *au courant* of the camp-rumours and of the opinions of the army as to events and the actors in them. Camp-rumours are sometimes of importance, for the information transmitted to the enemy by spies will for the most part be framed upon them. Many a success has been obtained by circulating rumours of intended movements and then doing the very reverse.

It should be imperative that every S.O. should keep a journal; all that he does during the day, together with a precis of what goes on around him, to be noted therein. An official journal has hitherto been always kept in the Q.M.G.'s office, which entered into minute details regarding every operation. A similar journal was kept by the A.Q.M.G. of each division, in which full details were given regarding all its particular doings, the actions in which it is engaged, its effective strength, number of deaths, admission to and discharges from hospl.; the weather, &c., &c. Similar journals will in future be kept by the C. of the S. and by the senior S.O. with each division.

Correspondence.—The management of official correspondence in the field is a most difficult matter; the sooner an authorized system is established for it the better. When an English army begins a campaign, some system has to be inaugurated by the C. of the S., or, in his absence, by the heads of the several departments. The following practical suggestions may be of use to officers called upon to do so.

It should be remembered that on service the smaller the amount of paper and pen work the better. A certain quantity cannot be dispensed with, but

the absurdity of heads of departments corresponding with one another when their tents are close together, should be put an end to. When the existing division of the staff has been abolished, and all the duties are done under one head, the correspondence necessary for business will be much reduced.

Under any circumstances there is a great deal of work that is now done in writing which can be done verbally, and when it is necessary to send letters or memoranda to the several divisions, instead of entering them in a letter-book, they should be marked '*to be returned*,' the recipient signing them as seen, and returning them by the same messenger; when returned they should be kept in a guard-book, or sent to the depot for correspondence in rear.

All papers should, when written or received, be classed under three heads, say A, B, and C; A to be papers that must be retained with the army or division; B to be papers that are to be preserved, but which without inconvenience to administration can be sent to some depot in rear named for their reception; and C to be those of an ephemeral nature that may be destroyed at once, or within a few days after date.

To carry out such a system there should be an organised office for the correspondence of the army, somewhere in rear of the army, to be situated on a line of rail, or on the best line of communication between the base and the army.

Circumstances should determine its position and the distance it is to be in rear. There should be an officer in charge of it, to whom all papers of class B should be forwarded by the heads of departments at Hd. Qrs., who should collect them weekly from divisions. At such depot there should be a printing-press, and a special telegraph-wire should lead from the depot to army Hd. Qrs. If the war is of considerable duration, the offr. at the depot will take the orders of the C. of the S. as to the disposal of all papers over 3 months old, for it is advisable that they should be forwarded to England to the several departments concerned, or collected in some one office at the Horse Guards.

This is the general outline of how an army in the field may be kept clear of piles of correspondence, The R.A. above all other corps seem to revel in complicated returns; it would be well if a Board were assembled upon the breaking out of a war, to be composed of S.Os., who should go minutely into the question of the returns to be furnished by corps which are really necessary for the due administration of the army; they should take the opinion of able offrs. of the several arms, and having heard all that can be said in favour of the returns required in peace, determine those that are absolutely necessary in a period of war. The existing system is for corps to send in their returns to the staff of their divisions, by whom a general return is made out from them, and sent to Hd. Qrs., where the divisional returns are collated into one general return for the authorities at home. This is a

little farce which should not be acted in the field. The returns should be sent home in original.

In official letters there is some twaddle that can be dispensed with : the prelude is too long and the style too ceremonious. By substituting memoranda for letters, much can be done towards curtailing clerical labour. The half-sheet of foolscap on which they are written should be folded in four divisions, as is the custom. On the back of the first of these divisions a second memorandum can be written by the recipient in answer to it, or in forwarding it on to some other department. A sheet thus folded has places for four memoranda on the back, so that if it has to go to that number of people, all that they have to say on the subject is on the one half-sheet of foolscap. This system is common in India, where it works well ; the writer introduced it in Canada, where it has answered well for the last seven years. It is a great improvement on the system of turning down corners, for if there are several memoranda on the same paper, it is difficult to follow them in proper sequence when they are written without any order, and in all sorts of directions. Each department should have a registry book, in which should be recorded every letter or memorandum received and sent out, the latter to be in red ink ; there should be columns for the date and hour of receipt or despatch, the name of orderly intrusted with its delivery, from whom, or to whom sent, date and purport of the letter, and a spare column for other communications on the same subject, and for stating how the matter has been finally disposed of. To each will be given a general register *No.*, which will be recorded also on the paper itself in red ink. To this book there will be an alphabetical index at the end of each volume for facility of reference ; two volumes will be retained at Hd. Qrs. ; as soon as it is necessary to begin a third, the first will be sent to the depot in rear, where a general index will be made from all such books according to subjects, so that if the C. of the S. requires to refer back at any time to a subject disposed of some months previously, he can telegraph to the depot of correspondence, to have papers regarding it sent to him by next post.

The offr. in charge of the depot should be especially selected for the post as being accustomed to the routine of office-work, and the classification of correspondence.

The following extracts from the Queen's Regulations give the necessary information as to the proper channel of communication, and the departments to which the several subjects connected with an army in the field should be addressed :

With troops employed in the field, the O. C. them is to address his despatches to the S. S. for war.

General or other offrs. in command are to sign all official letters and reports which are intended for submission to the C.-in-C. ; and all offrs., in making reports or appli-

cations, and in fixing their names to any public documents, are to specify under their signatures—which must be legibly written—their rank and the regiments, or departments, to which they belong.

Official letters are to contain full information of all particulars upon the subject to which they relate, and are to be headed thus :—

From _____
To _____

Each letter is to refer to one subject only, and is to be written on foolscap paper, with a convenient (*i.e.*, from half to quarter) margin; the margin always to be left on the inner side of each page. The paragraphs are to be numbered and the inclosures (if any) described in the margin or in a separate schedule. As a general rule short letters should be written on a half sheet, but when the letter extends beyond one page, or is accompanied by inclosures, it should be written on a whole sheet. The transmission of unnecessary inclosures is to be avoided, and when additional papers are forwarded all blank fly-leaves are to be removed from them.

Superior offrs. and other intermediate authorities are responsible for the correctness of what is set forth in documents submitted by them. It is their duty to endeavour to adjust all matters that come within the scope of their authority; and in transmitting applications or correspondence to Hd. Qrs., they are invariably to state their concurrence, or otherwise, adding such additional observations, based on local knowledge, as may be necessary to enable the authorities to come to a final decision on the question without further reference and correspondence.

Applications from regimental offrs. are, in the first instance, to be submitted to the C.Os. of their corps. Applications from N.C.Os., trumpeters, drummers, and private soldiers are to be made personally through the captains or C.Os. of their troops, batteries, or companies to the C.Os. of their corps. C.Os. are to forward, through the prescribed channel, for the consideration of the C.-in-C., a statement of such applications or claims as are deemed to be correct and reasonable, specifying at the same time the grounds on which they recommend that the requests be granted.

A strict observance of the prescribed channel of communication is enjoined on the part of all offrs., whether in the actual performance of duty or not, except under special circumstances where a direct reference may be necessary. Any offr. who, on his own responsibility, transmits documents otherwise than through the proper channel, must fully explain the causes which induce him to do so, and, at the same time, forward copies for the information of the authority through whom they should have passed in regular course.

In direct correspondence between one G.O.C. and another, between C.Os., and between heads of departments, letters are to be signed by the superior offrs., and not by their staff or subordinate offrs. When an offr. employs his staff to conduct any correspondence with another offr. of similar rank or position, the staff of that offr. is to be addressed. As S.Os. carry on their duties under the authority of the G.Os.C.

to whose staff they are attached, they will always, in communicating orders to others, write in his name or sign "By Order."

Whenever general or other offrs. in command obtain temporary leave to be absent from their divisions, brigades, or stations, the offrs. next in command are to open any official letters that may arrive, and act upon their contents.

In addressing letters, the official position and not the names of those for whom they are intended, is to be written on the envelope.

Access to official records is only permitted to those who are intrusted with the duties of the office or departments to which they belong, and the same are not to be made public, or communicated to individuals unconnected with such offices or departments without the knowledge or sanction of the authorities concerned. The only legitimate use an offr. can make of documents or information of which he may become possessed in his official capacity, is for the furtherance of the public service in the performance of his duty. If his official conduct be impugned, he is at liberty to seek redress by an appeal to superior authority through the regular channel. On the other hand, his publishing official documents, or availing himself of them for carrying on personal controversies, or for any private purpose, without due authority, will be viewed and treated as a positive breach of official trust.

THE CHIEF OF THE STAFF.—All correspondence will in future, on active service, be forwarded through the usual channels to the C. of the S. Where the nomenclature of Adjutant and Q.M.G. is still maintained, the following subjects will be sent to those respective departments.

Adjutant General.—Correspondence connected with the personnel, duties, discipline, and general efficiency of the troops.

Quartermaster General.—Strategical and topographical subjects: The movement by land and sea and quartering of troops: Signalling and cooking.

Military Secretary or Assistant Military Secretary.—All applications regarding promotion, the bestowal of decorations, and other rewards. The confidential reports on officers, and appointment of officers to the Staff.

Orders.—The G.Os. are published by the C. of the S., or the A.G., as the case may be. They should only contain what it is advisable that every one in the army should know. The movements of individual divisions or detachments should be directed by special memoranda issued by the Q.M.G., or C. of the S., where there is no Q.M.G. The G.Os. should be telegraphed daily to the depot of correspondence in rear, and printed at once; they will be forwarded without delay for distribution to the several corps. They should be upon paper with a margin, so as to be put into a guard-book. It is a good thing to classify G.Os. under two heads—1, those that are of a

nature not requiring to be constantly borne in mind, such as the promotion of an ensign to a lieutenancy ; 2, those that should be read to the men once a week or fortnight, such as regulations connected with marching and discipline, &c. The latter should not appear in the daily G.Os., but be printed on separate paper in small type, so as to be easily pasted into the pocket-book. It would be a good plan to reprint, every three or six months, in a collected form, all such special orders, printing a sufficient number of copies, so that every officer might have one. They should be printed in small type, and on one side of the paper only, for the purpose of being pasted into the pocket-book. The A.A.G. or senior S.O. of each division will attend daily at a named hour, at the office of the A.G. or C. of the S., at Hd. Qrs., to receive orders. The B.Ms. or S.O. of the brigade will attend daily, at a later fixed hour, at the tents of the A.A.G. or senior S.O. of their divisions, to receive the divisional orders, and the adjutants of regiments will assemble at the brigade office, at a still later fixed hour to receive the brigade orders. Circumstances may, of course, render a change of hours sometimes necessary. All orders received by adjutants to be read to the men at the first parade. On marching days, the senior S.O. of each division (or the A.A.Gs. and A.Q.M.Gs., when there are such officers) will attend at the Hd. Qrs. of their army corps as soon as the camp is pitched. When there is not time to write out several copies of an order, S.Os. in communicating it to the brigades, and so on to the regiments, can send it round by an orderly to the several corps concerned, by whom it will be copied at once, and signed by the C.O., who will return it to the orderly to take it on to the next regiment, and so on ; when all have signed it, it is brought back to the S.O. who wrote it, who can see by the signatures that all have seen and copied it. All orders must be signed by the S.Os. that issue them.

Detailing Duties.—When any particular number of men are required for a duty, the largest possible unit of formation from an army corps to a company should be employed. When less than a battalion is wanted, the number of men and not the number of companies should be stated in the order to the C.O., who will, however, send as many complete companies as possible—a discrepancy of say 10 per cent. either above or under the number ordered being allowed—so as to prevent the necessity of breaking up companies.

Messages of all sorts sent by mounted orderlies should have the address written legibly on the covers, full particulars being given regarding the corps (and their locality) for which they are intended. The pace at which they are to travel and the hour of despatch to be also noted on the cover. The recipient will sign the envelope as received, stating the exact hour of receipt, and send it back by the orderly.

In sending important messages where it is possible the bearer may fall into the hands of the enemy, only the most trustworthy men should be employed. They should carry two despatches—one real, the other false. The latter, to be made up like an ordinary letter, will be carried in the pocket or sabretash. The real one, written in cipher on very thin paper, to be rolled up and placed in a short piece of quill, which can easily be concealed about the person or in a cartridge. Never trust to one messenger for the safe delivery of important messages; send a duplicate, and sometimes even a triplicate, at two or three hours' interval, without allowing the bearers to know that their messages are the same. All messages sent during an engagement or other military action should be carefully numbered, so if No. 5 is received before No. 4 the recipient will know that one has missed its destination, and if it does not agree in any particular with any order previously received he will know that the latest issued order is to be his guide. Messages must be expressed in simplest words and terms, and the names of men and places should invariably be written in Roman characters to prevent any possible mistake about words with which the receiver of the despatch may not be familiar: this should be laid down as a rule never to be departed from. These names of places should always be spelt as they are on the official map in use. Instead of referring to the "right" or "left," "front" or "rear" of a village, position, &c., use the expressions north, south, east, or west, as the case may be. The battle of Inkermann might probably have ended unfortunately for us had these points been attended to by the Russian S.O. who issued the orders for the attack upon our position. Even in delivering verbal orders this point should be attended to.

During an action or any extensive operations, it is frequently necessary to send written orders or instructions to the G.Os.C. detached forces or columns acting beyond the immediate control of the commander. These are always written in haste, but it is essential that they should be free from clerical errors, and expressed in the clearest terms; nothing can be worse policy than overhaste in writing such orders. Indicate at top of the paper the spot where you are writing; it is to be presumed that all the staff have the same map; find out on yours where you are, and describe the spot as it is there shown. For example: "Farmhouse on road to —— close to letter L of Ripley on staff map, about — miles from —— 6° 34′ A.M. 4th June, 1873." Never omit to state the exact hour. It is also advisable to give a rough outline of what is taking place in your immediate vicinity, and of the last reliable information obtained regarding the enemy's position, distribution, movements, and strength.

In delivering verbal orders, and in their dealings with superior offrs. the staff should be most respectful, remembering that they are but the agents of the general, and paid public servants. The S.O. should feel bound by his position, if not by his breeding, to treat every one with the courtesy due

from one gentleman to another. Some S.Os. acquire a notoriety by brusqueness and incivility. When such men are tolerated it is always to the detriment of the army. The motto for the staff should be "Affability and reticence."

Staff Duties during an Action.—The S.O. in action should be all eyes and ears. When stationary anywhere, his telescope should be employed without intermission, and everything remarkable that he sees at once reported to his immediate superior.

The staff should accompany their general, but should not remain too close to him. Generals should indicate beforehand what offrs. they wish to remain with them, and at what distance they wish the others to be. A large staff is likely to attract attention, and draw fire. It is advisable that a general should keep with him that S.O. in whom he confides, and whose opinion he most values. Two or three As.D.C. should follow at about 30 yards' distance. Unless called by name, they should take it in turn to go with orders. The rest of the staff should remain about 100 yards off, the senior officer taking care, when all the As.D.C. have been despatched with orders, that their places are taken by well-mounted, good riders, selected from the officers of the A.G. and Q.M.G. departments.

Every S.O. should take notes during an action of all remarkable occurrences ; his watch must be frequently looked at, and the hour when the first shot was fired, &c., &c., noted ; the time when the order is given for all important movements to be recorded, as well as the time when they were executed.

The S.O. should be cool to the utmost extent. If by nature he is excitable, a strong curb must be placed upon his mannar, for no one has confidence in reports that are made in an excited way. His verbal reports should be almost impassive in the style in which they are made. He should always look jolly and as unconcerned as if engaged in that complicated operation of attacking a supposed enemy at Cæsar's camp. Excitement is painfully catching. A staff offr. galloping, in a high state of excitement, with an order to a column, may play "old Harry" with the spirits of the men, and cause them to think there is some unknown danger, or that things in other parts of the field are not going on as they should : it gives rise to a hundred speculations of a gloomy nature ; whereas the man who gallops up, no matter how quickly, but with a smiling face, and gives his orders precisely without any flurry, having a nod for his acquaintances in the ranks and perhaps a flying remark for them, spreads abroad a feeling of security and success, which soon reaches the smallest bugler, making all feel that they are on the winning side.

I once saw a S.O. gallop with an order to a column of cavalry and artillery, which had been drawn up behind a village to be sheltered from fire,

and as he was near it a round shot struck the ground under his horse's belly. The horse made an effort to swerve a little, which was checked by its rider without taking a cigar he was smoking from his mouth, apparently taking no notice whatever of the occurrence. He galloped up to the column, coolly gave his orders, and galloped back again over the open space outside the village, where the round shot were striking pretty thickly, still smoking his cigar, as if he were taking his morning exercise. A few shots had previously plunged into the column and caused some excitement, as it always does when horses get knocked over ; but the jolly indifference of this offr., in fact the manner in which he appeared to ignore altogether the existence of any danger, had a capital effect upon the men, most of whom saw it, as every one watched him coming, thinking he was perhaps the bearer of an order to advance. Every one who has been often under fire with troops knows how much the coolness of individual offrs. influences those around them ; but a S.O. being mounted, and his approach being always a matter of interest, being generally seen by the majority, he has a greater opportunity of displaying this quality than any other offrs. ; he cannot therefore be too careful about his manner.

As S.Os. are the agents for carrying out the views of those in command, it is essential that before going into action they should be made acquainted with the general outline of the operations to be performed, of where the real attack is to be made, and which are to be the false ones, as they may frequently find themselves in positions where they must take upon themselves the serious duty of interpreting, as it were, the wishes, and of giving expression to the intentions, of the G.O.C.

To order movements upon their own responsibility is, indeed, a serious matter, and can only be justified by the extreme urgency of the case. It is a matter of history that Lord Hardinge at the battle of Albuera, when serving as an A.A.G., on his own responsibility directed the movement which won us the day. There is now but little doubt as to our disastrous light cavalry-charge at Balaklava having been ordered by a young S.O. A similar instance occurred at Sabugal, and others might easily be enumerated, where either peculiarity of temper or reasoning caused S.Os. to misinterpret the orders they were the messengers of, or where, in default of definite orders, want of judgment led them to originate movements that resulted in failure.

S.Os. assuming such responsibility should have great confidence in their own judgment, based upon experience, and must be prepared to assume all the consequences in case of failure, without claiming for themselves any great recognition of their services in the event of success, for it must be remembered that the orders they give are in the name of the G.O.C.

In conveying a verbal order during a battle or operations executed in presence of an enemy, they cannot be too particular in the first instance in understanding the exact intention, and in afterwards communicating it in a

clear, intelligible manner, throwing full light upon the spirit of it, should the recipient be somewhat dull in catching its precise meaning. S.O.'s in such instances, should be respectfully firm in insisting on its being carried out correctly; and having remonstrated in vain in case of any difference of opinion, they should lose no time in galloping back to the C.-in-C. to report the circumstance, so that the affair may be rectified in time.

G.Os.C. cannot be too particular in supporting their messengers in such instances, and should be most severe upon C.Os. who fail to obey the orders so conveyed, or who do not pay as much attention to them as if they had been delivered personally by the general himself. Generals who do not lend their staff support in this way, and who will not always back them up, cannot expect to be efficiently served.

It is essential that in many instances S.Os. carrying orders should wait to see them executed, so that when they return to their generals, they can announce not only that the orders have been communicated, but that they have been carried out. In giving orders to their staff for transmission to others, generals should state at what time they should be executed. In such instances, a S.O. should look at his watch immediately on his giving the order, and note the time, also when the movement has been put in execution or completed as the case might be. It sometimes happens that, before a S.O. bearing an order reaches the division it is intended for, circumstances have changed so as to render its execution no longer applicable or advisable. He ought to take upon himself the responsibility of galloping back for fresh instructions. If there is any doubt in his mind upon the point, he ought to communicate the order to the general for whom it was intended, but informing him at the same time that it was ordered by the C.-in-C. under the impression that the position of affairs was quite different. It will then be for the general to decide as to its execution. Whatever decision he arrives at must be communicated to the officer who bore the order, so that, having galloped at fastest speed back to the C.-in-C., he might inform him of what was done.

During an action it is at times very desirable that the G.O.C. the army, or even the Army Corps, should detach one of his staff with a few orderlies to remain with the troops engaged, for the purpose of keeping him constantly informed of how affairs are going on in the fighting line, especial care being taken to let him know immediately whenever the enemy show signs of giving way or of retreating.

During operations in the immediate vicinity of the enemy, it is at times eminently necessary for the superior general on the spot—it may perchance be the C.-in-C. himself—to withdraw for a moment a brigade, a regiment, or a detachment, from the command of the G.O.C. a division or an Army Corps alongside of you without first obtaining his permission. As a rule, of course the temporary loan or use of such troops should be obtained with the

sanction of the general in immediate command of them, but there may be cases when the emergency of the moment will not admit of your doing so, and in this event you should take care to lose no time in informing him of what *you have* done : it is a responsibility you should avoid as much as possible, it should not be assumed lightly, but at the same time it is one you should not hesitate to undertake, if you believe it to be emergently necessary. Like so many other things in war, and especially in action, it is purely a matter for the exercise of your own individual judgment : if your judgment is sound, you will be justified generally by results ; if not, those who have entrusted you in a position carrying with it so much responsibility, or who allow you to retain it for an hour after your unfitness has been ascertained, are guilty of treason to their country. It is an invariable rule that the O.C. the troops so detached should at once, when he receives such direct orders through an unusual channel, inform the G.O.C. the division or Army Corps to which he belongs, at the same time obeying without any delay or hesitation the direct orders he has received from a superior, although not from one immediately commanding the military unit to which he himself belongs.

The Obligation of obeying Orders implicitly.—The general rule is to act intelligently upon the order received which is of the latest date. Hence the absolute necessity for noting on every order sent to generals and subordinates, not only the date, but the exact hour when it was written and despatched. An officer who designedly disobeys an order, because in his opinion the condition of affairs in his own immediate vicinity at the moment he receives it, are different from what he knows, or presumes the writer of it imagined them to be, rendering it he thinks most necessary that he should act in a manner differing from the course indicated in the order last received, takes upon himself a responsibility so serious, that even the success of his own immediate operations may in no way justify his conduct : he may not know, or fully grasp the great object generally aimed at by his commander. There always will be cases, however, when disobedience is fully justified, but it is only men who have the fullest confidence in themselves and in their own judgment, and who feel they are fully in possession of the aim and view of their commander, who should presume upon it. The C.-in-C. is fully justified in depriving a disobedient subordinate of his command, a deprivation which is the worst of deaths to a soldier. This all points to the great necessity of fully and freely imparting to your subordinate commanders the aim and object of the operations to be undertaken. Officers taken prisoners should be careful to give the enemy as little information as possible ; their names and rank and regiments is all they should communicate. S.Os. should not state more than this, and be careful not to mention the name of their general, or the designation of the brigade or division to which they belong. If the Regt. to which they belong is not present with the force

engaged, they may state it with a view to puzzling and misleading the enemy as to the battalions, &c., in front of him.

Staff Duties after an Action.—A list of all captured guns, property, and prisoners remaining in possession of the division to be made out by the A.A.G., or senior S.O., and transmitted to the C. of the S., whose orders are to be taken as to their disposal. The Artillery Staff should, as soon as possible, make out a general list of the captured ordnance, giving full particulars regarding it. Os.C. corps to submit to their respective A.A.Gs. a detailed list of killed, wounded, and missing. These returns to be collected into one paper for each division and sent without delay to the C. of the S., or to the A.G., as the case may be. The A.A.G. of each division will make arrangements for the safe custody and provisioning of all prisoners remaining with it: their private property to be strictly respected. He will see to the burial of the dead; if there are any graveyards near, they should be used. When there are large numbers to be buried, trenches 7 feet wide should be dug for the purpose, the bodies being packed in layers as close together as possible, the upper one being at least 2 feet below the natural level, the surplus earth being piled up as a mound over the place. If troops are to be encamped in the neighbourhood, all the lime and charcoal to be had should be used in such burials. Officers detailed for this duty should be careful to note the Regt., number, and if possible the name of every man he inters, reporting this information to his Brigade Major.

He will also see to the formation of the camp or bivouac, and to collecting the several corps in his division that may have been accidentally detached during the day.

Every exertion to be made to clear out the Fd. Hospls. the day after an action, by sending sick and wounded to the rear. The reserves of ammunition to be replenished, if possible, the very evening of an action.

The G.O.C. must make up his mind quickly as to what he intends doing: there is a general tendency to idle during the first moments of relief to the strained nerves which victory brings with it, the best men even are apt to indulge in idle talk of the events that have just taken place instead of making arrangements for what still remains to be done. The enemy has retreated, is he to be pursued? if so, by what force and what troops? The men are tired, perhaps very hungry, and are lying about to snatch some rest. Before anything further is attempted, the reorganisation of your units is of the first importance. In war there are frequently such sudden changes of fortune, that even when victorious you must be prepared to ward off dangers, and you are ready for nothing when your troops are dispersed and intermingled. The G.O.C. must always have under his hand, and at his disposal, a sufficient military body—to be in proportion to the force engaged—which shall have all the coherence that organisation alone can give; no body of

men can be thus efficient if men of various battalions and companies are intermingled.

No time should be lost in detailing the troops to furnish the outposts, and in at once fixing upon the position to be occupied by the several divisions and brigades. Advantage to be taken of all shelter afforded by houses, villages, woods, &c. Remember that nothing is more aggravating to tired men than being shifted from a position which they had taken up with the idea they were to stay there for the night. They have made, or partly made, their cooking places, possibly have actually begun to cook, they have collected firewood and prepared their bivouacs, &c., &c., and then to be told they must move elsewhere is trying beyond measure to the temper of wearied men. For all this the staff is responsible. The hour of sundown is known, so when an action ceases the G.O.C. is aware of how much daylight still remains at his disposal, and he must take care to make the most of it. His men must have rest and food to be of use next day.

Prisoners.—The safe custody, &c., of prisoners the night of an action is often embarrassing. All men should be at once disarmed when taken, except those officers who will promise on their word of honour not to attempt to escape who may be permitted to retain their swords, the names of such officers to be carefully noted, and they should sign a declaration in their own language to this effect. The officers and N.C.Os. should be kept, at least for the first night, with their men, and told they will be held responsible for their good conduct. Prisoners should have their wants as regards food, &c., attended to, and every consideration should be shown to the feelings of brave men in this distressing position. At the same time, all must be warned that those who attempt to escape will be shot, and that in the event of any combined hostile act on their part the escort told off as their guard will fire upon them without any hesitation. As soon as possible detailed lists of all prisoners taken should be prepared and arrangements made for sending them to the rear under escort, the O.C. which should be selected for his knowledge of the prisoners' language; when he cannot speak it an interpreter should accompany him. This officer before starting should make out a list of the prisoners handed over to him, tell them off into squads or companies under their own officers and N.C.Os. If proceeding through an enemy's country all communication between the people and the prisoners should be prevented. At night they should be placed in walled enclosures, or in any large buildings that may be at hand, and a cordon of sentries placed round them with orders to shoot anyone attempting to run the gauntlet through them. On the march it is essential to have some mounted men with the escort. The O.C. this escort cannot be too kind or considerate to his prisoners, but he must also be very firm and determined in putting down ruthlessly all attempts on their part to resist or to escape.

Position of General Officers in Action.—We have no regulations on this subject, and in our drills and peace manœuvres our Generals contract a bad habit of commanding their troops from the front instead of from the rear of their men. The G. O. C. a Division forming part of an Army Corps in action should occupy some position in rear of his troops from whence he can obtain the best view of what is going on in his fighting line: the nearer he is to the reserves that he retains under his own immediate control, the better, but the first necessity is that he should be able to watch through his glass what is going on in his front. It is very desirable that the G. Os. C. Divisions and Army Corps should be easily found when in action: the French plan of each general being accompanied by a small flag is a good one for this reason. The distinguishing flags for G. Os. C. Divisions might be three-cornered, and square for G. Os. C. Army Corps: each Division might have these flags of a distinctive colour, and all transport and equipment might most advantageously be marked with the colour or symbol peculiar to the Division or Army Corps to which they belong. The C.-in-C. should in a similar manner have a small union-jack carried by his escort, and the C. of the S. or A. G., as the case may be, should invariably take care to leave behind an orderly with information as to where the Hd. Qrs. are to be found, when during the progress of an operation or of a battle it may be found necessary to shift their position from the spot previously notified to all concerned as that where the Commander would be found.

Negligence concerning such little trifling matters leads frequently to great inconvenience; and as our staff is not organised as a corps, but is collected from regiments at the commencement of a campaign, it takes some time to systematise its duties and organise their detail.

In action the General should above all things avoid fuss and hurry: having given his orders, he must calmly await their execution, allowing his subordinate commanders sufficient time to carry them out, interfering himself as little as possible in the details of the movements, except under very peculiar circumstances, such as an evident misapprehension of his orders by those entrusted with their execution. Nothing is more pitiable to see, or more injurious to the success of an operation, than a G. O. C. galloping about endeavouring himself to personally direct the movements of Regts. and Brigades. The General's mind should be clear and cool, so that at every varying phase of an action he may be able to grasp the real and true condition of affairs, and so be in a position to decide quickly and positively what steps he should take next. This is out of the question if he occupies his time in galloping fussily about from place to place. He must use his own discretion as to when it is time to take up a new position with his staff nearer to the enemy: it will be generally advisable for him to do so when his attacking troops have been successful, indeed, at some supreme moments it may be even desirable, nay absolutely necessary, that he should mingle in

the charge, encouraging all ranks by his cool daring, and giving a direct impulse to some final blow he wishes struck. This is very frequently necessary for subordinate leaders, such as Brigadiers or G. Os. C. Divisions, but the higher the General's position in the army engaged, the more he should, as a rule, abstain from taking any direct part in the operations of the fighting line, in order that he may properly fulfil the more important functions of his position. The configuration of the ground, the object for which the action is engaged in, and the particular movements undertaken for that purpose will generally indicate the best position to be taken up in action by the G. O. C. an army, or any part of it. The C.-in-C. should change his position in action as seldom as possible with all due regard to its successful issue.

Line of Communications.—No army can be thoroughly effective, unless it be well and regularly supplied with food, ammunition, and military stores, and unless it be almost daily freed from the encumbrance of sick and wounded. To secure these essential objects, it is necessary that the L. of C. connecting the manœuvring army with its base, should be secure against all attack, and that the traffic over it should be organised upon a good system. There have been instances where armies have cut themselves adrift altogether from their base of supply, trusting to the country to furnish food—Sherman's march to the coast in 1865, for example—but it is only under very exceptional circumstances that such an operation should be attempted, and the experiment will always be fraught with danger in an enemy's country.

An army actively engaged is in daily need of food and warlike stores, a very considerable proportion, if not all, of which must be drawn from the base in rear, perhaps at a great distance, to which it must send back its non-effective men and horses, and the prisoners taken in action. Along the L. of C. there will always be therefore two streams flowing in opposite directions, one of food and stores, of reinforcements of men and horses to replace casualties, from the base to the army, and the other consisting of sick and wounded men and horses, and of prisoners from the army to the rear. To feed and provide transport and accommodation for these detachments whilst on the journey, without in any way interfering with the transit of supplies to the army in the field, is no easy matter.

The wants of an army are so much greater now than they were in past times, that it may be accepted as a rough, practical axiom, that no force much stronger than a Division, except at a most ruinous cost to the country, can in future operate successfully for any length of time in an enemy's country where food is not in abundance, at a distance of more than about 100 miles from its base, unless it has a railway or a navigable river for the conveyance of its supplies. Without the assistance of railways, the supplies not only of food, but of the heavy war material now required for sieges,

could not have been sent to the German armies in France in 1870. Had Moscow been connected with the river Nieman in 1812, Napoleon's expedition to Russia would not have ended as it did. In the China war of 1860, our L. of C. was a navigable river; in Abyssinia by a road passable for pack animals, and in Ashanti by a road over which all supplies were carried by men and women, but in both these two latter instances the manœuvring force in front was very small.

In order to relieve the C.-in-C. of these many duties, so that he may have ample time to devote himself to the proper discharge of his higher functions, it is essential that the Ls. of C. should constitute a distinct command under an executive officer, who should take his orders from the C. of the S. and be in constant personal communication with him and with the C. of C. This system was adopted in the Ashanti war and in the campaign against Sikukuni, with the most satisfactory results.

The officer selected to be the G. of C. should possess great staff and military experience, be gifted with considerable powers of organisation, and well versed in the science and practice of his profession. His rank should depend upon the strength of the army, and the probable length of the L. of C.: with a force consisting of a Division only, his rank should be that of Brigadier; of an Army Corps it should be that of Major-General, and with an army of two or more Army Corps, that of Lieut.-General. Under all circumstances he should be junior to the C. of the S.

The etappen system of Germany should be carefully studied by all our staff and superior offrs., for without doubt, the successes of 1866 and 1870 were due to a great extent to its excellence and to the admirable manner in which it was administered. The German regulations, however, apply to the communications of a vast army operating over a wide extent of country.

Our regulations on this subject are drawn up for a small army of one or two Army Corps employed in a country provided with roads and railways. When operations have to be carried on in a wild country like that where our army was recently employed in South Africa, these regulations must of course be modified to meet the altered circumstances of the position, but the system indicated will still hold good.

The L. of C. will extend from the B. of O. to the advanced depot, the command of the G. of C. to include both. This L. of C. should be divided into stages, there being an officer in command at each.

The Hd. Qrs. of the G. of C. will be at the most conveniently situated station on the L. of C.

The staff of the G. of C. will depend upon the character of the operation to be undertaken, and the nature and extent of the country to be traversed. For a small army under ordinary circumstances the following staff, as prescribed by regulations, will be ample:

1 D.A.G., 1 A.A.G., 1 D.A.A.G., for the purpose of representing the

G. of C. at Army Hd. Qrs.; 1 A.A.G., for road and railway inspection duties; 1 A.A.G., 1 or 2 D.A.A.Gs., 1 A.C.G., with as many commissariat offrs. under him as may be required; 1 O.C.R.A.; 1 Adjt. of R.A.; 1 O.C.R.E.; 1 Adjt. of R.E.; 1 D.C.G.; 1 D.C.G. of O.; 1 P.M.O.; 1 I.V.S.; 1 offr. of A.P.D. In all about 20 offrs. In many instances it would be possible to reduce this number to 15, but there is no economy worse than reducing the number of S.Os. along the L. of C. As transport has not to be found for them, no addition to their number adds to the difficulties of supply for the troops in the field.

The duties of the G. of C. are thus described in our regulations:

(*a.*) The maintenance, defence, and police of the roads used as Ls. of C.
(*b.*) The railway service.
(*c.*) The C. and T. Dept. on the L. of C.
(*d.*) The O.S. Dept. on the L. of C.
(*e.*) The Medical Department on the L. of C.
(*f.*) The semi-permanent line of telegraph.
(*g.*) The field post.
(*h.*) The Veterinary Department and Remount Depots.

The authority of the G. of C. is paramount over all troops halted on or moving over the L. of C., and over all offrs. of every department of the army employed on that line. He will direct to the advanced depot all reinforcements of men and horses, and all supplies and stores required at the front, and will cause to be sent to the rear all men, horses, and stores not required, either temporarily or permanently, with the army in the field, as, for instance, the sick and wounded, escorts, and prisoners, unserviceable or surplus arms and equipments, trophies of war, arms, and other captured articles. He will authorise requisitions on the country, and enforce them if needful. The G. of C. holds to the heads of departments at Army Hd. Qrs. the same position that a G.O.C. a Divn. or an Army Corps does, according as the army is composed of one or more Army Corps. He will keep the C.G. of the Army in front continually aware of the amount of supplies in the advanced depot, in the intermediate depots, and at the base of operations, and in furnishing this information he will invariably state the time it will take to bring the supplies from the rear to the advanced depot. The G. of C. is held responsible for the harmonious working of all departments on the L. of C. Under instructions from the G.O.C. the Army, he communicates direct with the home authorities as to the requirements of the army, and receives from them information of all men, minerals, stores, &c., sent to the army.

These regulations omit all reference to the most important duty of the G. of C. in the German and French armies, namely the responsibility for feeding, clothing, and supplying the army in the field with everything it may require. With us there is an attempt to divide that responsibility between the G. of C. and the C.G., an arrangement that can only lead to failure and

disaster. I would rather describe the duties of the G. of C. as follows, believing it to be the true description of his functions:

1st. To supply the army in the field with food, ammunition, clothing, money, and in fact everything it requires.

2nd. The protection of the line of communication from the enemy. The command, organisation, and administration of all military posts, stations, and towns along the line, including the police duties along it.

3rd. The movement, feeding, and accommodation of all troops, prisoners, sick and wounded passing over the line.

4th. The organisation, administration, and working of the railways or boat service or ordinary horse or other transport constituting the means of conveyance, whether for men or stores, between the base and the advanced magazines, and the maintenance of the railways, roads, canals, and bridges along the line.

5th. The administration, maintenance, and, when necessary, the construction of a telegraph system along the L. of C.

6th. The postal service between the base and the army.

7th. The hospital service along the L. of C.

All the ports where troops or stores are landed or collected along the B. of O. should be under the command of the G. of C. In an enemy's country, he must arrange for the civil administration of the districts through which our communications run: if the civil authorities have remained at their posts, they will carry on their duties under his orders. Much will depend upon his management of them as to the assistance to be obtained from the inhabitants in the shape of labour, transport, and supplies. These are duties requiring great tact and knowledge of human nature in general, and of the country, its resources, and the character, disposition, manners, and habits of its people. It will be for him to place such restrictions as he may deem necessary upon local postal arrangements, the publication of newspapers, and the movements even of private individuals from place to place. A special corps of police, under intelligent officers conversant with the language of the place, should be sent from England for duty at the B. of O. and along the Ls. of C. His police by means of spies should keep him well informed of all that passes amongst the inhabitants, and his command over the P.Os., which should be strictly enforced, should supply him with much useful information.

The G. of C. will keep open the communications required for the road service, and he is bound to repress immediately, and with a firm hand, all irregularities or disorders, whether committed by soldiers or civilians. He has the entire disposal of the troops, departmental officers, and officials employed on the road. If he thinks fit he can place several S. Cs., or a portion of his L. of C. under one officer. But the officer appointed to such a charge must act as an inspecting officer, and whilst either himself or his

senior S. O. should always be present at his Hd. Qrs. station, the other should frequently be on the move, so as to ensure that all the officers under his control are working harmoniously together. The G. of C. will always, by early application to superior authority, have a sufficient number of officers for present requirements. He will make such inspections as he may think fit of the communications, and will employ those S.Os. specially appointed for inspection duties in constantly moving up and down the roads and railways. He will also, when necessary, proceed to the Hd. Qrs. of the army in the field, to confer personally with the G.O.C., taking care that himself and his senior S.O. are never absent at the same time from his Hd. Qr. station. He will also detach any of his officers, when he thinks fit, to places where special difficulties may require their intelligent direction. The situation of the advanced depot will at once be notified to G.Os.C. Corps and Divisions, who will keep the Comdt. of the advanced depot continually aware of the position of their Hd. Qrs. The position of all hospitals on the L. of C., and also of remount depots must be at once notified to the Hd. Qrs. of the army in the field by the G. of C., with the available accommodation for men and horses at each. If troops are halted for any time on the L. of C., or any delay takes place, information must be at once sent by S.Cs. to the G. of C., and to the Comdt. of Base, by telegraph or special messenger. The G. of C. will take such steps as he considers best for providing for the security of the L. of C., by intrenching important points, by sending small flying columns up and down the line or to the flanks, and he is responsible that proper arrangements for the supply of ammunition, water, and provisions, to the various intrenchments are made.

The base of operations must be for us some port or ports on the sea-coast. Their management is of the utmost consequence to an army, as all who can remember Balaklava in 1854 will understand. To such a place an able administrative officer should be appointed as commandant. He should take his orders direct, and only from the G. of C., and no other general officer, no matter what may be his rank, if even living there for several days, should have the power to give him orders or assume any authority whatever over him. The extent of the place and the size of the army must determine the staff required.

The Staff laid down in Regulations: 1 A.A.G.; 2 D.A.A.Gs., of whom one is to be detailed as a Landing Offr.; 1 Railway Offr. when required; 1 O.C.R.A.; 1 C.R.E.; 1 A.C.G.; A.C.G. of O.; M.Os. as required; 1 I.V.S. and an Offr. of the A.P. Dept. The duties of the Commt. of the B. of O. will be roughly:—

(*a.*) The arrangements for the defence of the place; the command of all the troops that may be there. The maintenance of order amongst the inhabitants, and the direct control over the police.

(*b.*) The embarkation and debarkation of all men, animals, and stores of all kinds.

(*c.*) The maintenance of all wharves, piers, landing-places, and store-houses, &c.

(*d.*) Arrangements for receiving and, if necessary, for taking care, previous to embarkation, of all sick, wounded, and prisoners.

(*e.*) The forwarding of all men, stores, &c., to the front.

(*f.*) Communicating with the navy on all matters in connection with embarkation and debarkation.

Quarters and an office for the Naval Transport Offr. must be found as near as possible to those of the officer told off as the Landing Offr. These two officers should work well together ; if they do not, all will go wrong.

The general division of duties between the army and navy at the base is as follows :—The navy unload and disembark all men, horses, and stores, provide the requisite boats, tugs, barges, or lighters, and deliver the loads at high-water mark or at the wharves or piers constructed and maintained by the army. The unloading of the boats or barges will be performed by the army. The army load all boats or barges at high-water mark, or at the piers, under the supervision of a N. O., who is responsible that the boats, &c., are properly stowed, and will give such instruction as he may think fit on the subject. When the boats, barges, &c., are loaded, the navy become responsible for their removal and transhipment to the transports or other vessels. On the arrival of a ship at the base, the N.T.O. will give immediate notice to the Army Landing Offr., sending him a return in general terms of everything on board, and stating how soon he will be prepared to discharge. The Army Landing Offr. will then make arrangements for receiving the contents of the ship, and will inform the N.T.O. when and where he will be prepared to receive them. No men, horses, mules, cattle, stores, or anything conveyed in any ship for the use of the army will be landed until the Army Landing Offr. has made a requisition upon the N.T.O. Although the foregoing are the general rules as regards the division of responsibility, it is to be distinctly understood that the O.C. at the base will render assistance of every kind to the N.T.O., such as sending working parties on board ship, manning or helping to man boats, if he asks for such assistance ; similarly instructions have been issued by the Admiralty that the navy should aid the army in every way on an application to that effect being made. The very difficult and complicated duties of embarking and disembarking troops and stores can only be carried out successfully so long as perfect harmony is maintained between the naval and military authorities at the B. of O.

In order to ensure the efficient supervision of those who may be temporarily detained at the base and detached from their corps, the cadres of a depot battalion, depot battery, and depot company of R.E. will be sent out

from England to the base as soon as possible after active operations have been decided on. These cadres will in the first instance comprise the commissioned and N.C. staff of a battalion and officers and N.C.Os. for 2 companies of infantry ; one officer and the necessary N.C.Os. for the battery of R.A. and the same for the company of R.E. The strength of these cadres may be subsequently increased if necessary. The C.Os. will take charge of all regimental documents and baggage which may not be required in the field, and they will be responsible that men ordered for embarkation take with them their documents complete, and a proper kit. Cavalry soldiers will be attached to the infantry companies.

In my opinion this division of responsibility between the navy and the army at the B. of O. is a very great mistake, pregnant with difficulties, if not with failure. I think the Commdt. at the B. of O. should be supreme there as regards every operation connected with the comfort, welfare, and safety of the army. To supply him with the naval technical knowledge he might require, a harbour-master of experience should be attached as an officer to his staff, over whom the naval officers should have no power.

It is a good thing to have a ship of war there, as the men can render invaluable services when there is any particular haste required, and they are clever at constructing wharfs. They are useful in enforcing the orders of the harbour-master as regards the police regulations afloat, established by that officer ; but it should be clearly understood, that no naval officer, no matter what may be his rank, should issue orders to the harbour-master or interfere in any way with the harbour regulations, as approved of by order of the commandant.

As stated in the article on police, the police duties in such a place are most important. Even supposing that there are no inhabitants, a large number of sutlers are sure to congregate there, and amongst them a host of spies. The first grand point to establish is a positive prohibition of the sale of intoxicating liquor stronger than light wines and beer. Circumstances must decide the strength of the garrison, but the fewer the soldiers the better. A special corps of police should be sent from England for duty there. The ordinary police duties being attended to, a corps of scavengers should be handed over to the chief of police, who will act upon the advice of the M.O. on the spot. The commandant's quarters and office should be under the same roof, and whenever he leaves them, even for an hour, one of his staff should remain there to represent him. He must establish a hospital, to be in the suburbs if possible, where, if necessary, sick men coming from the front can be temporarily lodged until sent home. Ample store accommodation should be provided at the B. of O. for regtl. baggage under the care of an O.S.O., or in the event of every regt., battn., &c., leaving a depot there, then under the charge of the O.C. that depot.

Previous to handing over the wharfage and store accommodation furnished

by the town to the Commissariat, a portion must be reserved for the medical and veterinary departments, in dividing the storage, &c., the relative proportions for the several requirements: 1st, for provisions of all sorts; 2nd, for what are generally known as military stores; 3rd, for the medical department; 4th, for hospital stores and equipment; and 5th, for veterinary purposes, may be assumed approximately to be 50, 33, 5, 10, and 2. There should be a capacious shed at the medical wharf for the protection of the sick whilst temporarily waiting for the boats which are to take them to the ships.

A corps of labourers, either natives of the country or civilians enlisted in that capacity in England, should be sent to work at landing stores, &c. They should be exclusively under army offrs., at the rate of about 1 offr. to every 200 men. A Chinese Cooley Corps would be far the best for this work, and it could easily be raised at the time at Hong Kong. Amongst other police arrangements, precautions against fire should not be neglected.

It is advisable to keep plenty of clear space round the wharfs, as the difficulty of landing stores is rendered most serious when they are confined, as at Balaklava and Peytang. If storehouses are to be built, they should be placed about 80 yards from the water's edge. In fine, it should be remembered, that upon the manner in which the duties at such places are carried out the success of all operations in the field must greatly depend, and that those duties can only be efficiently carried out under one man, to be a general or other S.O. of rank.

Station Commandants.—The duties of these offrs. must vary at each station, according to the service it has to fulfil. The police of the district assigned to each Commdt. by the G. of C., and the charge of all transport and troops so long as they are passing through it, either to the front or rear, are duties common to all stations where stores are to be collected, or where there are large hospitals, vety. establishments, a field arsenal, the terminus of a railway, or a break of gauge, will usually be considered as 1st class stations, and will have a Commdt. of higher rank with a large staff. Stations at the end of stages where animals for transport are kept, where no troops entrain or detrain, and where there are no general stores, will be considered 2nd class stations, and the S.Cs. will be of inferior rank. The S.C. will be responsible that the Commissariat and O.S.D. are supplied with proper working parties for loading and unloading stores.

The staff at each station will have to be fixed according to its position and the duties devolving upon the Commdt. in consequence. The normal establishments are thus described in our regulations. For a 1st class station, 1 Brigade Major; 1 railway officer, when required; 1 offr. of R. E., when required; 1 D. A. C. G. and 1 of the O. S. D.; 1 M. O., when required; and 1 V. S., when required. For a 2nd class station, 1 Adjt. and 1 Q. M. of the C. and T. dept.

These Station Commandants will be appointed by and will take their orders direct from the G. of C. or from his staff, with whom he will be in constant telegraphic communication.

It is manifest that as an army advances each successive halting-place on the L. of C. must have means for accommodating the horses and men passing through. Some of these stations will be of greater importance than others; but all will require to have an officer as Commdt.

Stations will be numbered consecutively from the rear, that at the base being always No. 1. At stations where hospitals, remount depots, and depots of supplies or stores are formed, doctors, &c., will be added as required, and if necessary an offr. of the P. D. At stations where there is a railway terminus, a break of gauge, or a general halting-place where troops entrain or detrain, there will be a railway S. O. As military operations vary, the importance of stations will vary also, and the staff required will vary accordingly.

Except in case of actual attack, the S. C. is not to be superseded by, or interfered with in the discharge of his duties by any offr. passing through the station who may happen to be his senior. In case of attack the senior offr. present will take command. The S. C. Com. will facilitate the transmission of everything going to, or coming from the army, and will be held responsible for the security of the roads and telegraphs within his district. He will also make such arrangements for defence as he may deem necessary.

The Commdt. cannot carry out his duties properly unless due and early notice of the movements of troops and convoys be sent to him. These notices will be sent by the Staff of the G. of C. and the S. Cs. on each side of him. Thus, should a convoy of stores or a body of troops be moving along the L. of C. he will receive notice from the staff of the G. of C. of the day they are expected to arrive in his district, and he will receive notice from the S. C. next to him of their safe arrival and the hour at which he may expect them on the following day; similarly, he will send notice on the arrival to the next S. C. He will further notify to the G. of C. the arrival or departure of all bodies of troops exceeding 20 in number, and will also send weekly reports showing all troops and details arriving at and leaving his station. He will keep himself acquainted with the state of supplies at his station, and will notify to the C. G. attached to the G. of C. should his supplies fall below the quantity he is ordered to keep in hand.

The S. C., except in urgent and unforeseen cases, when he may act on his own responsibility, reporting immediately what he has done, must not detain offrs., soldiers, or supplies passing through for service at his station. He will distinctly understand that by doing so he will interfere with the whole of the arrangements along the L. of C. He should take means to prevent all disorders and excesses occurring in his district; complaints made by

inhabitants should be inquired into without delay, and strict justice at once administered.

Offences committed by troops on the line of march are to be reported by the S. C. to the O. C. the troops, who will deal with them: if the party is not commanded by an offr., the S. C. will himself deal with them. To prevent stragglers, all soldiers falling out of the ranks will be furnished with a pass by the captain of their company. Soldiers not having passes will be arrested. The S. C. will exercise a supervision over the military police employed in his district. All strangers unprovided with duly authorized passports or passes will be arrested until the orders of the G. of C. or of his Chief of Police have been obtained. In a hostile or semi-hostile country he should seek to gain the confidence of the population, induce them to bring in supplies, and form markets in his station. He should take great care that they are in no way molested, and that all payments, whether for things purchased by individuals or for the public use, are made at once according to a fair and equitable tariff. In case of necessity, he may, under orders from the G. of C., levy contributions on the neighbourhood, such contributions may be of four kinds.

(*a.*) Contributions in money. These should be of the nature of fines on villages for bad conduct, attack on the troops or otherwise interfering with the operations. The money so received should be paid into the nearest military chest.

(*b.*) Contributions of cattle, provisions, or stores of any kind. The proceeds to be handed over to the Commissariat or O. S. officers.

(*c.*) Enforcing the supply of provisions or other articles on payment of fixed sums. Such supplies to be dealt with as pointed out in (*b*).

(*d.*) Pressing waggons, horses, and transport generally for the army, such transport to be paid for at fixed rates, and to be administered by the Commissariats in charge of the general transport. In most cases it will be sufficient to get transport so pressed to work one stage on the line. The S. C. will be very careful to check any ill-treatment by conductors of convoys of the drivers or horses so pressed, and to ensure an early settlement of their claims. The success of the operations of an army in the field depends much on the hired transport, and S. Cs. must not only check at once with a firm hand irregularities that may occur, but should report the steps they have taken to the G. of C.

Every S. C. will establish his office in a convenient, central, and prominent house, and will, if possible, live in that house: if he cannot do so, one of his staff must. His office will be indicated by a red flag by day and by a red lamp by night. Finger-posts will be erected indicating the way to his office, and the roads to the next station. A guard will be always on duty, and should be posted as near to his office as possible.

He will keep a journal, in which will be entered for each day all letters

received or issued, all arrivals or departures of troops, the state of the supplies every 7 days, a statement of all large contracts or purchases that have been made, all contributions that may have been levied, and all unusual occurrences. This journal will be inspected by the G. of C. or any of his staff appointed for the purpose. A report, being an extract from the Station Journal, will be furnished to the G. of C. every 7 days. This report will state whether additional supplies may be obtained in the district, or horses or other transport procured, either to hire or by purchase. All bodies of troops or individuals entitled to draw rations, when marching, will be furnished with routes signed by the proper authority. These routes will be produced on their arrival at the Route Station, and the S. C. may, if he thinks fit, verify the number of horses and men for whom rations are demanded with the actual number present, and will note any discrepancy in his journal and on the face of the route. Escorts with stores or supplies will, if possible, be made to do double marches, they may be halted for a certain number of hours to rest and refresh and again push on. Escorts marching at night will be furnished with guides, of whom there will be some retained ready for use at each station. No person connected with the army can deviate from the route laid down. All persons belonging to the army found off the road by which they are ordered to march will be arrested. The arrival of all parties, no matter of what size or by whom commanded, will be at once reported by the offr. in charge to the S. C. When special or extra transport is required, the fact of such being required must be noted on the face of the route. The S. C. has the power of granting or withholding such special facilities. A billeting return of each town or village in the neighbourhood will be kept, and a copy furnished to the G. of C. A place should be selected as a place d'armes or parade ground for troops, and another place to park waggons in. In case of large detachments passing through, the S. C. will use his discretion as to billeting a portion or the whole in out-lying places. All parties billeted will be furnished with a billeting paper, signed by the S. C., which will be the order to supply accommodation. This paper, signed on leaving by the senior offr. of the party billeted, will be the voucher on which payment will be made for the accommodation.

In small stations where there is no M. O. the S. C. will use his utmost vigilance to preserve a good sanitary state, and prevent the pollution of the water supply. When a M. O. is present it will be his duty to bring to the notice of the S. C. any violation of sanitary regulations, and suggest remedies.

Storehouses will be of two classes—those for local and those for general service. The former will be formed at every station, the latter at places indicated by the G. of C. No convoys should be allowed to pass through towns, if by making a short detour this can be avoided. If they must pass

through, it should be done carefully in detachments. Convoys should be parked outside the town; office and baggage waggons alone should be allowed to enter and halt in towns.

Veterinary arrangements for Line of Communication.—Attached to the G. of C. there will be an Inspectg. V. S. who will have charge of all the vety. arrangements from the B. of O. to the advanced depot, and including both. He will advise as to the most suitable locality for establishing the remount depot, with regard to facility of access, water, forage, shelter, isolation of suspicious cases, &c. He will make frequent inspections of these depots and regulate the duties of the V. Ss. attached. He will be responsible that horses fit for duty are not detained in these depots except under special instructions from the G. of C. He will see that the depots are properly supplied with the requisite medicines, instruments, &c., from the reserve store at the base.

He will be in constant communication with the Princl. V. S. and furnish him with full information as to the health of all animals belonging to the Army on the L. of C. He will take instant means to prevent or eradicate all contagious diseases that may break out, and he will especially be on the watch for epizootic disease amongst the animals of the surrounding country, and guard against its extending itself to cattle, the property of the army. The V. S. attached to the O. C. the B. of O. will be especially charged with the reserve store of vety. medicines, instruments, and surgical means. He will, through the G. of C., keep the P. V. S. aware of what is in store, and will forward requisitions for such supplies as may be requisite to England. He is responsible that all requisitions from the front are promptly met. He will take professional charge of the remount depot at the B. of O. He, or an offr. of the department under his orders, will superintend the embarkation and disembarkation of horses and cattle, and will inspect them, in order to detect infectious or contagious diseases. He will convene Boards of V. Ss. to recommend the destruction of animals that it may be advisable for sanitary or other reasons to destroy. He will receive all surplus vety. field chests from the troops in front, or from transports, and will see that all transports embarking horses are supplied with the same.

Remount Depots on Line of Communication.—A remount depot for the number of horses and other animals that may be determined on, will be formed at the B. of O. As the army advances, other remount depots will be formed as required at convenient places, and there should always be one at the advanced depot, which will advance or not with the army as the G. of C. may deem most advisable. These depots will be commanded by offrs. specially selected by the G. of C., and will be under the professional charge of the I.V.S. attached to the G. of C. Our regulations direct that

the remount depot at the B. of O. should consist of 4 troops, at the advanced depot of 2, and at intermediate stations of 1 troop each. The strength of these depots must, however, depend upon circumstances. Each remount depot is formed so as to divide, that at the base into 4, that at the advanced depot into 2 portions.

Establishmt. of Remount Troop.	Staff of Remount Depots.		
		Base.	Advanced Depot.
1 Captain.			
1 Veterinary Surgeon.			
1 Farrier-Sergeant.	Commg. Offr.*	1	1
2 Sergeants.	2nd in Command	1	..
2 Corporals.	Adjutant	1	1
5 Shoeing Smiths.	Qr. Mastr.	1	
1 Trumpeter.	Inspg. V.S.	1	1
60 Privates.	Sergt. Majr.	1	1
4 Bâtmen.	Q.M. Sergt.	1	1
—	Farrier Majr.	1	1
77	Total . .	8	6

The men will be furnished from the depot of the A.S.C. drivers, by convalescents of mounted corps, or by such natives of the country as may be hired for the purpose.

A remount committee will be appointed by the G. of C. for the purchase (locally) of horses, mules, &c. This committee should be formed of an offr. from the cavalry, R.A., and the C. and T. depot. Whenever purchases of animals take place without the authority of this remount committee, an immediate report must be made to the president, stating all particulars, accompanied by receipts for the horses, &c., purchased. All remounts and all horses the property of the public, or of offrs. that are foraged at the public expense, that may be pronounced unfit for work by the V.S. in charge, shall be received in these depots on the application of the O.C. the regiment or detachment. All suspected cases must be carefully isolated, and if possible, a few sheds or detached stables should be constructed for sick animals.

To prevent the advanced depot being too full of sick horses, those that are suffering from extensive wounds, severe sore backs, &c., or requiring

* This offr. to be a Lt.-Colnl. at Base, and a Major at Advanced Depot.

serious operations and time for recovery, should, if able to march, be sent to the remount depot at the base, or that at some intermediate station. Every horse sent to a remount depot from the front or elsewhere will be accompanied by a sheet containing a full statement of the case signed by the V.S. in charge ; every horse will bring his line equipment and grooming implements, a list of which will be written on the back of the order for his admission to the depot, a receipt for which will be given by the Adjt. or Q.M. of the depot to the person who brought the horse to the depot. All horses discharged from a remount depot will be accompanied by a Discharge Sheet which will be handed over to the person authorized to receive the horse, on the back of which will be noted a list of the articles received with him and of those sent back with him.

All men bringing sick horses, &c., will, if necessary, be rationed at the depot for the time they stay there. It may be desirable to use such men to take back cured or remount horses to the Divn. to which they belong.

A pair of light field vety. medicine chests, suitable for packsaddle carriage, will be supplied to each V.S. with the troops in front for temporary or emergent cases of sickness or lameness.

A regular journal will be kept by the C.O. at each remount depot in which all admissions and discharges of horses, giving full details regarding each, will be entered. These journals must be periodically inspected by the I.V.S. attached to the G. of C.

The cavalry and R.A. obtain remounts from these depots as required, all applications for which to go from G.O.C. the Divn. or Army Corps, as the case may be, direct to the G. of C. : mounted officers of all grades and branches of the service, when actually in the field, can also obtain chargers from these depots upon payment, the price being fixed in G.O., and it should always be very high, so that officers may be induced to provide themselves with horses.

The C. G. of O. with the G. of C. will keep the C. G. of O. with the army in front, constantly and directly informed as to the amount of stores, not only at the base, but also at the advanced and intermediate depots. He will receive orders from the G. of C. as to the position where those depots are to be located, and as to the nature and amount of stores to be maintained at each.

The O.S.O. at the Base will apply to the Commdt. for any assistance he may require, and to the Transport Dept. for transport. He will communicate direct with the S.N.O. as to the supply of ammunition and ordnance stores that may be required for H.M. ships, but in the event of a naval brigade being formed, its organization will come under the military authorities, and the O.S.O. will be governed accordingly. All general arrangements with the naval authorities requiring executive action will be made by

the Commdt. All communications as to details arising out of the above general arrangements which the O.S.O. may have to address to the naval authorities will be forwarded through the Military Landing Offr.

O. S. Os. at Intermediate Stations on the L. of C. will make their wants known to, and will obey all orders they may receive from the Commdt. of the Station.

The O.S.O. at the Advanced Depot will be attached to the staff of the Commdt. of that depot. He will organize his department in the manner most convenient for meeting the requirements of the troops in the field. He will take care that the transport waggons coming to the rear for supplies of ammunition or stores are not detained, and that the requisitions are promptly met. He will take the orders of the Commdt. of the advanced depot as to what articles are to be destroyed and what sent to the rear. The Commdt's. order to destroy stores, and a certificate to the effect that they have been destroyed, shall be deemed a sufficient discharge in the Commissary's accounts. A proper understanding must be maintained between the O.S.O. in the charge of the advanced depot as to how, when, and where the stores are to be drawn by the troops. This can only be done by direct communication—the more direct the better—between the R.A. offrs. receiving the ammunition or stores, and the Commissaries who have to issue them.

The Field Post Office will be under the G. of C., who will keep the army in front acquainted with any new post office that may be opened, and of all changes effected in the postal service generally. All transport required for postal purposes will be furnished by the Commisst. Offr. in charge of the general transport of the army. The offr. in charge of the post office will apply to the G. of C. for escorts or any military assistance he may require. The general working of the field post, the transmission of money-orders, &c., will be carried out under instructions proposed by the Postmaster Genrl. The postal staff for Army Corps, Divisions, &c., and for line of communications will be as follows :—

Each Offr. is allowed a public riding Horse.	Captn.	Lieut.	N.-C.Os.	Privates.	Bâtmen.	Total.
Hd. Qrs. Army Corps	1	1	1	2	2	7
,, Cav. Brigade	..	..	1	1	..	2
,, of 3 Divisions	..	..	3	6	..	9
At Base and on Line of Comtns. . .	..	1	4	31	1	37
Total . . .	1	2	9	40	3	55

These details will be supplied by the Postmaster Genrl. from the Post Office Volunteer Corps. The postal establishment for a small Expeditionary Force must be fixed by the G.O.C. according to the nature of the intended operations: the working of the postal service should, however, be carried out by the G. of C. The mails should, in my opinion, be made up in England in bags addressed to Divisions or Brigades, the letters for each regiment being made up in separate bundles, and none should be despatched from England upon which any charge for postage is to be made; it should be arranged that no stamps be required on letters sent from the army, the postage for which, at single rates, should be collected upon delivery in England. The object in all arrangements of this nature should be to relieve the army in the field of all but the most necessary duties, even although you may thereby greatly increase the duties of the Home Departments.

The Troops to Guard the Line of Communications.—It is quite impossible to lay down any absolute rule as to the number of troops required for the L. of C., so much depends on the nature of the country, the character of the inhabitants, whether actually hostile or not, the climate, &c. An English army will always have to form its base at a distance from England, and to establish its reserves of food and stores and its hospitals at places other than the actual base.

It may be assumed that about 150 miles of communication will require a strictly military organization, that the marches will be 12 miles in length, and that 3 military establishments for supply and other purposes will be required in addition to those on the L. of C. On this assumption, and that the population is not actually hostile, the following tables have been prepared. The calculation has been based on one Army Corps only operating, but it by no means follows that everything must be increased in proportion to the number of troops operating. Additions would undoubtedly have to be made, but would chiefly consist of augmentations to the Commisst., Medl., and Vety. departments. The number of troops and the staff of the Directing Offrs. would probably remain the same. Should heavy fighting be expected in front, a certain proportion of the troops guarding the L. of C. may be made available. In most cases a great deal of local labour can be obtained, and this labour can be best employed by using the military nucleus that exists for preserving discipline and organizing such labour.

DETAIL OF TROOPS AND DEPARTMENTS ON LINE OF COMMUNICATIONS.

	Officers and Men.						Horses.							
	Officers.	N.-C.O.	Drivers.	Clerks.	Bâtmen.	Total.	Private.	Public.	Troop.	Draught.	Spare.	Total.	G. S. Wags.	Other Carriages.
Staff of G. of C.	12	..	..	10	26	48	36	..	..	..	..	36	..	..
,, O.C. at base	11	..	..	15	23	49	32	..	..	..	..	32	..	..
,, Rd. Commdt.	13	..	..	10	27	50	36	..	..	..	..	36	..	..
,, O.C. advd. depot	6	..	..	5	13	24	17	..	..	..	..	17	..	..
3 special stations	36	6	..	6	42	90	15	3	..	..	..	18	..	..
6 1st class ,,	24	12	..	..	36	72	30	6	..	..	..	36	..	..
6 2nd ,, ,,	12	6	..	..	18	36	18	..	..	..	..	18	..	..
Remt. depot at base	13	287	..	..	16	316	16	..	500	..	..	516	..	..
,, ,, advanced	7	145	..	..	9	161	9	..	250	..	..	259	..	..
1 Regt. of Cavy.	31	600	22	..	..	653	91	..	480	40	4	615	8	2
2 Batts. Fd. R.A.*	14	206	128	..	..	348	4	12	36	188	24	264	..	20
3 Comps. R.E.†	12	360	..	..	24	396	6	18	..	..	..	24	..	..
3 Battns. Infy.	93	3,132	66	..	..	3,291	21	12	3	120	12	168	24	12
‡O.S.D.	**4**	..	..	**5**	**8**	**17**	**9**	..	..	..	..	**9**	..	..
	20	200	..	20	24	264	13	13	..	..	..	26		..
A.M.D. Staff	**3**	**3**	..	..	**6**	**12**	**7**	..	..	..	..	**7**	..	..
‡	14	19	..	..	16	49	6	8	..	..	..	14		..
‡ 13 Fd. Hosps.	104	481	..	..	104	689	..	..	..	..	..	..	..	..
Postal at base	1	35	..	..	1	37	..	1	..	..	..	1	..	..
‡ at base	**1**	..	..	**4**	**2**	**7**	**2**	..	..	..	..	**2**	..	..
‡	15	..	..	26	22	63	14	8	..	..	..	22		..
A.P.D. Army Corps	4	..	..	6	6	10	4	2	..	..	..	6	..	..
Line	4	..	..	4	4	12	..	4	..	..	..	4	..	..
Commisst. and Transpt.	**4**	..	..	**7**	**8**	**19**	**11**	..	..	..	..	**11**	..	..
Deprts. on Line	85	576	403§	57	79	1,200	17	70	26	832	34	979	154	85
Grand Total	531	6,065	619	159	490	7,864	385	157	1,295	1,180	74	3,091	186	119

* 9 pdrs. † Garrison Companies. ‡ Exclusive of the Staff with I. G. of Line of Communications, with Commandant, at base, with Road Commandant, and Commandant of advanced depot as shown in black type. § 203 are Drivers hired locally.

Prize Money.—All booty taken in war legally belongs to the Crown, and should not under ordinary circumstances be appropriated or distributed without the Sovereign's sanction. This view of the subject has not always been acted upon, but no G.O.C. in the field should depart from it except under most peculiar circumstances.

When a capture is made or expected to be made, the G.O.C. should call upon the officers to elect or appoint 2 or 3 officers to represent them as prize agents, and immediately when the capture has been made, the C. of the S. should have prize rolls sent to him from every regt., battn., and every dept. actually present at the time of capture. It will be for the G.O.C. to express an opinion as to the troops employed who should participate in the prize, the final decision on this point resting with H.Ms. Treasury. The prize rolls to be sent to the A.G. at the W. O. with least possible delay. If the navy has in any way participated in the operations, it is advisable that a naval officer should be added to the prize agents. In the appointment of prize agents, or in calling for prize rolls, it is indispensable to announce in the G.O. on the subject that no right or claim to prize on the part of any one is thereby constituted, and that the grant and distribution of any booty taken depends as it always has done upon Her Majesty's will and pleasure.

It will be for the G.O.C., having obtained the views of the prize agents, to decide how, when, and where the booty is to be converted into money, or otherwise disposed of: it may be considered advisable to sell all or a part of it by auction or private sale on the spot, or to send it home to be sold there; if it be sent home it may be considered advisable to send it in charge of a prize agent in some hired transport or ordinary steamer, in order to avoid any claim for percentage by the captain of the ship if sent in one of H.Ms. vessels.

All expenses legal and otherwise incurred by the prize agents in the discharge of their duties, to be charged against the prize fund. All expenses so incurred to be paid at once and the balance sent home to the Treasurer of Chelsea Hospital: prize agents are bound by law to do this within two months of the date of receiving all moneys. The remuneration to prize agents is to be 1½ per cent. upon the net amount—after all expenses are paid—paid over to Chelsea Hospital for distribution; this percentage is to be divided, share and share alike, amongst the prize agents by the Treasurer of Chelsea Hospital two months after the distribution of the prize shall have been begun by that official.

All guns and military stores captured must be handed over to the C.G. of O., who will make an accurate list thereof, giving the prize agents or captors from whom he receives them, a receipt in which their nature, the length and weight of the guns, &c., are to be described, but he is not to give any estimate of their value; copies of these receipts, together with the fullest

possible information regarding the captured articles, will be forwarded by him to the S. of S. for War. All horses and other transport animals, and all carts, waggons, &c., will be similarly handed over to the officer in charge of the transport, and all cattle for killing and eatables to the commissariat department, copies of the receipts given being in every case forwarded to the W.O.

I have felt it necessary to give these details, because no orders on the subject are to be found in our regulations.

In the event of its being necessary to divide prize on the spot, the following is the scale upon which the distribution of prize money is to be made in future. This scale is that approved of by the Treasury, although never published as an order to govern future issues; it is based on the relative daily pay of all ranks, the pay of the private soldier and of all regimental ranks for all arms being assumed to be at infantry rates, so that all officers, &c., of the same rank shall receive equal shares, the pay of the private being assumed to be one shilling, thereby entitling him to one share. In calculating the amount to which an officer is entitled, so many shares or half shares are to be allowed him as there are shillings or sixpences in his daily pay; nothing less than half a share is to be calculated for, and no allowances of any kind are to be included in the calculation. All general officers, brigadiers, and officers commanding regiments (whatever their rank may be) to receive double shares corresponding to their daily pay (exclusive of command money). The amount to be received by all other combatant staff officers to be calculated according to the amount of their daily staff pay plus half the regimental pay of their rank, one share for every shilling and half a share for any odd sixpence or odd pence over sixpence but under one shilling. The general or other officer commanding the army in the field to receive 5 per cent. of the clear divisible fund.

The practical effect of this principle will be to divide the available fund in the proportion of about one-third to the officers, and two-thirds to the N.C.Os. and privates, after deducting the share of the G.O.C. The number of shares to be received by each rank will therefore be as follows:—Lt.-Genrl. 152; Majr.-Genrl. 76; Lt.-Col. 34; Major 16; Captn. 12; 1st Lieut. $7\frac{1}{2}$ or $6\frac{1}{2}$ (according to rate of pay); 2nd Lieut. $5\frac{1}{2}$; S. Sergt. 3; Cr. Serg. $2\frac{1}{2}$; other Sergts. 2; Corporals $1\frac{1}{2}$; Private 1; Adjt. 10; Qr.-Mr. $6\frac{1}{2}$; Pay-Mr. $12\frac{1}{2}$; and Riding-Mr. 9.

Intelligence Department.—From the moment that war is declared until peace is made, it is of the utmost importance that we should know what the enemy is doing, indeed it is impossible to exaggerate its importance, so that no sums of money expended with that object in view should be grudged; it is always best to pay informers and spies by results. A general who has the means of always learning the enemy's movements and

intentions, is certain to annihilate an adversary to whom his doings are unknown, all other things being equal. Napoleon said that a general operating in an inhabited country, who was ignorant of the enemy's doings and intentions, was ignorant of his profession; in writing on this subject to his brother in Spain, he said that the single motive of procuring intelligence would be sufficient to authorise detachments of 3000 or 4000 men being made to seize local authorities, post-offices, &c., &c. Until the troops are actually in the field, such information must be gleaned by our Intelligence Department in London, and by our Foreign Office people, who should also during the war keep up a system of communication with the enemy's capital, and if possible with his army. The means of starting an intelligence department should, if possible, be taken with you from England, or sent on before you. The purlieus of Leicester Square could supply our armies with spies for every country in Europe.

When war is impending with any country, a number of offrs. should be sent to travel through it and collect information, although if our Treasury would pay for it, this could be much better done during peace, as is done by other nations.

Once in the field a knowledge of the enemy's doings must be obtained by the Commander in the best way he can. It is explained further on how reconnaissances for this purpose should be conducted. The other means of obtaining information are prisoners, deserters, by questioning the inhabitants, by intercepted letters, tapping telegraph wires, and by means of spies. The G.O.C. an army appoints an offr. as the chief of his intelligence department, working of course under the C. of the S., and the utmost care should be taken in the selection. If the army is a large one, one or two other offrs. should be employed in a similar manner at the Hd. Qrs. of corps or divisions that may be at some distance from Hd. Qrs.; it is advisable that the employment of these offrs. in this manner may be kept strictly secret from the army, and that they should themselves at all times disown having anything to do with spies, and profess utter ignorance of the enemy's movements. It is easy to make them A.D.C.'s and let them nominally attend to the general's private correspondence, or to notify their appointments in G.O. as posted to the A.G.'s department. As in some countries proper offrs. cannot be found for this purpose who can speak the language, English civilians taken from the consular service may be given this work to do, and be attached to the army professedly as interpreters. Whoever conducts the works should be of middle age, and have a clear insight into human nature, with a logical turn of mind; nothing sanguine about him, but of a generally calm and distrustful disposition. He should be intimately acquainted with the manners and customs of the people of the country. The organisation of the enemy's army should be engraven on his mind, and the names of all Os.C. corps, divisions, &c., &c., should be in his possession. He should be

in constant communication with the central office in London, to whom should be communicated at once all reliable information obtained in the field, and from which in a similar manner all information received from other sources should be transmitted to the chief in the field. The management of spies is difficult; out of every ten employed, you are fortunate if one gives you truthful information. It is important that spies should be unknown to one another. Care should be taken to make each believe that he is the only one employed. Some serve from patriotism, others for money, some receive pay from both sides; if such a one can be depended upon he is invaluable. All should be petted and made a great deal of, being liberally paid and large rewards given them when they supply any really valuable information. A few thousand pounds is of no consequence to a nation, but if well laid out in obtaining information, it may be the indirect means of adding to the victories of one's country. It is very necessary that all bonâ-fide spies should always have about their persons some means of proving themselves really to be whom they represent; a certain coin of a certain date, a Bible of a certain edition, a Testament with the 3rd or the 7th leaf torn out, &c., &c. These tokens should be changed frequently. A spy who was employed by an offr. in a neutral state, making his way to the Hd. Qrs. of the army in the field, could thus at once make himself known to the Intelligence Department there. In some instances, a pass-sign or word is better, as it is less compromising, such as putting up the right hand to the right ear and then to the left ear, &c., &c. The more extensive the system, and the greater its ramifications, both as to the numbers employed and the extent of territory from which information is obtained, the better chances you have of obtaining what you require. It is essential that one or more offrs. should, if possible, be posted in some neutral state as near the theatre of operation as can be done without exciting suspicion, with whom all the spies and secret agents employed there should be in communication: they should select towns or villages from which there was good telegraphic communication with England, so that the information obtained might be quickly transmitted to our Hd. Qrs. in the field. These officers should be provided with ample means to employ spies, and to pay well all those who supply them with trustworthy information. It is very necessary that specially prepared paper should be provided for the use at times of all offrs. and agents employed in the Intelligence Department, upon which letters can be written in ink that does not become visible until it has been subjected to a certain chemical process. It is necessary that a letter in ordinary ink should invariably be written on the same paper containing the information that it is required to keep secret.

All prisoners taken at the outposts should be led direct to Hd. Qrs. without being questioned elsewhere: the chief intelligence offrs. there will examine each separately, taking care that no one is present. It is much better that the enemy's movements should not be known to the army

generally: if they are, they will be canvassed by a host of newspaper correspondents, and in the end the enemy will learn that his doings are known, which will make him more watchful; whereas it is a great matter to lull him into the pleasing notion that we are a stupid people, without wit or energy enough to find out what he is doing or intending to do, and that we have no spies in his camp. As a nation we are bred up to feel it a disgrace even to succeed by falsehood; the word spy conveys something as repulsive as slave; we will keep hammering along with the conviction that 'honesty is the best policy,' and that truth always wins in the long run. These pretty little sentences do well for a child's copy-book, but the man who acts upon them in war had better sheathe his sword for ever. Spies are to be found in every class of society, and gold, that mighty lever of men, is powerful enough to unlock secrets that would otherwise remain unknown at the moment. An English general must make up his mind to obtain information as he can, leaving no stone unturned in order to do so. Much will depend on the disposition of the inhabitants; if they are friendly, as the Spaniards were during the Peninsular war, it is easy to organise a good intelligence department, for the great difficulty of conveying news from one army to the other is got over; with good spies in the enemy's camps, they can send their information by a trusty peasant, who of course can pass without suspicion. The letter sent should be written on a strip of very thin paper, which, if rolled up tightly, can be put into a quill 1½ in. long, the ends being sealed up; this can easily be concealed in the hair, beard, or in a hollow made in the end of a walking-stick. It is a good plan to write secret correspondence in lemon-juice across a newspaper or the pages of a book, which, like a Testament, if found on the person of a peasant, would excite no suspicion. Such writing leaves no mark, but if at any subsequent time it is held to the fire, or a hot iron is passed over it, every letter becomes legible.

In the article on Reconnaissances will be found lists of questions to be put to prisoners, and lists of the ordinary indications of movements on the part of an enemy; but it is only by studying his manners and customs that one can understand what he means.

In all the wars of this and future ages, the electric telegraph will be greatly used. It must be remembered, that a telegraph operator can, with a small pocket instrument, tap the wires anywhere, and learn the messages passing along them. A few such men living concealed within the enemy's territory could obtain more news than dozens of ordinary spies. Immediately before or during an action an enemy may be deceived to any extent by means of such men: messages can be sent, ordering him to concentrate upon wrong points, or by giving him false information you may induce him to move as you wish. The telegraph was used in all these ways during the American war between North and South. Spies can be made useful in spreading false news of your movements; indeed a G.O.C. should so keep his council,

that his army, and even the staff round him, should be not only in ignorance of his real intentions, but convinced that he aims at totally different objects from what are his true ones. Without saying so directly, you can leave your army to believe anything: and as a rule, in all civilised nations, what is believed by the army, will very soon be credited by the enemy, having reached him by means of spies, or through the medium of those newly-invented curses to armies—I mean newspaper correspondents.

The intelligence offr. (or offrs., if there are more than one) should every morning report in writing to his chief the information he has obtained from the offrs. employed uuder him, and other sources. All suspicious circumstances observed by the outposts to be reported daily through the general on duty to the C. of the S., who will at once inform the chief intelligence offr. It is a great object that a system should be established by which all information, whether gleaned from individual officers out amusing themselves, or from the outposts, or from any other source, should be placed at the disposal of the man to whom the G.O.C. looks for information. All offrs. should learn, accordingly, that it is their duty to report anything they may discover to the nearest S.O., who must remember that he must lose no time in informing the C. of the S. Although trifling events in themselves can tell but little, yet when they are collated in numbers, and compared with the information derived from spies and reconnaissances, each small piece of news becomes, perhaps, an important link in the chain of information.

Police.—No system of police is laid down in our regulations for an army in the field. We must, therefore, be guided by the regulations of foreign armies, and by the establishments that were brought into existence in our Crimean army, up to the date of its leaving for home. An offr. of at least the rank of a captain should be named Provost-marshal for a corps of two or three divisions. With a larger force, or if the army is divided, an assistant P.M. will be required.

According to the new organization lately laid down there is to be a troop of military police attached to each division, and one to the Hd. Qrs. of each army corps.

The Provost-Marshal.—The Army Act of 1881 thus describes his duties: "For the prompt repression of all offences which may be committed abroad, P.Ms. with assistants may from time to time be appointed by the G.O. of the G.O.C. The P.M. or his assistants may at any time arrest and detain for trial persons subject to military law committing offences, and may also carry into execution any punishments to be inflicted in pursuance of a C.M., but shall not inflict any punishment of his or their own authority."

As the power of inflicting summary punishment is no longer vested in the

P.M., he must in future, on the march, or during the progress of operations when he considers it advisable to make an example by the immediate punishment of a man whom he or any of his assistants have taken in the act, or against whom some inhabitant may complain of violence, &c., apply to the nearest C.O. to assemble a *summary court-martial* to try the prisoner. The Army Act of 1881 lays down the following rules on the subject.

104. (*a.*) A summary C.M. may be convened by the C.O. of any corps or portion of a corps on active service, or by any officer in immediate command of a portion of a body of forces on active service.

(*b.*) Where it appears to any such officer, on complaint or otherwise, that a person subject to military law has committed an offence, he may convene a summary C.M. to try such person, if he is satisfied that it is not practicable* to try such person by an ordinary C.M., and—where he is below the rank of F.O. and is not a C.O.—is further satisfied that it is not practicable* to delay the trial for reference to a superior officer.

105. (*a.*) Not less than 3 officers must be appointed, unless the convening officer is of opinion that 3 officers are not available,* in which case 2 may be appointed.

(*b.*) If the convening officer is of opinion that 3 other officers are not available* to form the ct. he may appoint himself president of the court; but if he is of opinion either that 3 other officers are available,* or that although 3 other officers are not available* he himself is by reason of his position as confirming officer or otherwise not available,* he should appoint another officer to be president who may be of any rank, but should not be below the rank of captain, unless in the opinion of the convening officer an officer of that or some higher rank is not available.*

(*c.*) The officers should have held commissions for not less than 1 year, and if in the opinion of the convening officer any officers are available* who have held commissions for not less than 3 years, he should appoint those officers in preference to officers of less service.

(*d.*) The P.M., an assistant P.M., and an officer who is prosecutor or a witness for the prosecution, must not be appointed a member of the ct., but save as aforesaid any available officer may be appointed to sit.

106. The ct. may be convened and the proceedings of the ct. recorded in accordance with the form in the 2nd Appendix to these rules; but where it appears to the convening officer that military exigencies or other circumstances prevent the use of such form, the C.M. may be convened and the proceedings carried on without any writing, except that such written record as seems practicable* must be kept by the P.M. or assistant P.M., if present, or if not, by the president and the officer charged with the promulgation, stating, as near as may be, the particulars set forth in the form, and stating at least the name (or, if the name is not known, the description) of the offender, the offence charged, the finding, the sentence, and the confirmation.

---

* *See rule* 121.

107. The statement of an offence may be made briefly in any language sufficient to describe or disclose an offence under the Army Act, 1881.

108. The ct. may be sworn at the same time to try any number of prisoners then present before it, but except so far as prisoners are tried together for an offence committed collectively, the trial of each prisoner will be separate.

109. (*a.*) The names of the president and members of the ct. will be read over in the hearing of the prisoners, who will be asked if any of them object to be tried by any of those officers.

(*b.*) If any prisoner objects to an officer, and any member of the ct. thinks the objection reasonable, steps will be taken to try the prisoner before a ct. composed of officers against whom he has no reasonable objection.

110. The president will administer to the other members of the court, and a member of the ct. when sworn will administer to the president, the following oath: — You, do swear, that you will well and truly try the prisoner [*or* prisoners] before the court according to the evidence, and that you will duly administer justice according to the Army Act now in force, without partiality, favour, or affection, and you do further swear that you will not divulge the sentence of the court until it is duly confirmed, and you do further swear that you will not on any account at any time whatsoever disclose or discover the vote or opinion of any particular member of this court-martial, unless thereunto required in due course of law. So help you God.

111. When the ct. are sworn, the president will state to the prisoner then to be tried the offence with which he is charged, with, if necessary, an explanation giving him full information of the act or omission with which he is charged, and will ask the prisoner whether he is guilty or not of the offence.

112. If a special plea to the general jurisdiction is offered by the prisoner, and is considered by the ct. to be proved, the ct. shall report the same to the convening officer.

113. (*a.*) The witnesses for the prosecution will be called, and the prisoner will be allowed to cross-examine them and to call any available witnesses for his defence.

(*b.*) The following oath shall be administered by a member of the ct. to every witness:

The evidence which you shall give before this court shall be the truth, the whole truth, and nothing but the truth

So help you God.

114. (*a.*) A member of the ct. or a witness may take an oath with such ceremonies and in such manner as makes the same binding on his conscience, and the words "you" and "So help you God" may be varied or omitted for the purpose.

(*b.*) A member of the ct. or a witness who objects to take an oath, or is objected to as incompetent to take an oath, may be allowed by the ct. in lieu of an oath to make a solemn declaration, which will be in the same form as the oath, with the substitution of "I" for "you," and with the omission of "You do swear that," and "So

help you God," and with the substitution or addition, where necessary, of "I do solemnly declare that."

115. The prisoner will be asked what he has to say in his defence, and shall be allowed to make his defence.

116. (*a.*) In the case of an equality of votes on the finding the prisoner will be acquitted.

(*b.*) The finding of acquittal requires no confirmation, and if it relates to all the offences charged against a prisoner will be declared at the time of the finding, and the prisoner will thereupon be discharged from custody.

117. (*a.*) The ct., if consisting of 3 or more officers, may award any sentence which a general C.M. can award; but if the ct. pass sentence of death the whole ct. must concur.

(*b.*) The ct., if consisting of 2 officers, may award any sentence authorised for the offence, not exceeding summary punishment or 2 years' imprisonment with hard labour.

(*c.*) The proceedings shall be held in open ct., in the presence of the prisoner, except on any deliberation among the members, when the ct. may be closed.

(*d.*) The ct. may adjourn from time to time, and may, if necessary, view any place.

119. (*a.*) Except in the case of acquittal the finding and sentence of the ct. shall be valid only in so far as the same are confirmed by proper military authority.

(*b.*) The P.M. or an assistant P.M. cannot confirm the finding or sentence of the ct.

(*c.*) A prosecutor of a prisoner or a member of the ct. trying a prisoner cannot confirm the finding or sentence of the ct. as regards that prisoner, except that if a member of the court trying a prisoner would otherwise under these rules have power to confirm the sentence, and is of opinion that it is not practicable* to delay the case for the purpose of referring it to any other officer, he may confirm the finding and sentence.

(*d.*) Where a sentence of death or penal servitude has been passed, the sentence shall not be carried into effect until confirmed by a general or F.O. commanding the force with which the prisoner is present at the date of his sentence;

Provided that in case of a sentence of death it shall be the duty of any such officer who is not in chief command of the forces in the field comprising the said force with which the prisoner is present, to reserve the sentence for confirmation by a superior officer, except where he is of opinion that by reason of the nature of the country, the great distance, or the operations of the enemy, it is not practicable* to delay the case for confirmation by the said officer in chief command or by any officer superior to himself in command of the said force with which the prisoner is present, and in that case he may confirm the same.

---

* *See rule* 121.

(*e.*) Subject to the exceptions in (*b*), (*c*), and (*d*), the finding and sentence of a summary C.M. as regards any prisoner may be confirmed by any general or F.O. or by the C.O. of a corps or portion of a corps, or by any officer not qualified as aforesaid, but being in immediate command of a detachment or portion of the body of the forces with which the prisoner is present; Provided that—

(1.) it shall be the duty of any such officer in immediate command as aforesaid, if not otherwise qualified to confirm, to reserve for confirmation by superior authority a finding and sentence, except where he is of opinion that it is not practicable* to delay the case for that purpose; and

(2.) it shall be the duty of an officer who has not power to confirm the finding and sentence of a general or district C.M. to reserve (save as provided by (*f*) for confirmation by an officer having that power a sentence awarding a punishment in excess of that which a regimental C.M. can award.

(*f.*) Where the punishment awarded by a sentence is such that an officer is required to reserve the same for confirmation, that officer may nevertheless, if he thinks fit, confirm the sentence, if in confirming it he mitigates, remits, or commutes the punishment, so as to make it a punishment a sentence for which he has power to confirm.

(*g.*) Any officer may, if he thinks it desirable, reserve any finding or sentence for confirmation by superior authority.

(*h.*) An officer not having power to confirm the finding and sentence of a district C.M. shall not have power to commute summary punishment into imprisonment for any period exceeding 42 days.

(*i.*) A confirming authority shall not send back a finding and sentence for revision more than once, and on any revision the ct. shall not take further evidence nor increase the sentence.

120. The rules, 53 (Mitigation of sentence on partial confirmation), 55 (Confirmation notwithstanding informality in or excess of punishment), 95 (Transmission of proceedings after finding), 96 (Preservation of proceedings), 97 (Rate of payment for copies of proceedings), and 98 (Loss of proceedings), shall, so far as practicable, apply as if a summary C.M. were a district C.M.

121. (A.) In the rules with respect to summary C.M., unless the context otherwise requires, the expressions "practicable" and "available" mean respectively practicable and available, having due regard to the public service.

(B.) The expression "C.O. of a corps or portion of a corps" means the officer whose duty it is under the provisions of Her Majesty's Regulations, or, in the absence of any such provisions, under the custom of the service to deal with a charge against any of the persons belonging to such corps or portion of a corps who are present under his command, of having committed an offence, that is, to dispose of the charge on his own authority, or to refer it to superior authority.

122. Any statement in an order convening a summary C.M. as to the opinion of the

* *See rule* 121.

convening officer, and any statement in the minute confirming the finding or sentence of a summary C.M. as to the opinion of the confirming officer, shall be conclusive evidence of such opinion, but this rule shall not prejudice the proof at any time of any such opinion when not so stated.

Too much care cannot be taken in selecting the officers to act as P.Ms. : they should have a good knowledge of soldiers, be of determined character, and of pleasing manners ; severe, but just. It is advisable that they should speak the language of the country : if they do not, interpreters should always accompany them on the line of march, and be permanently attached to them.

As a general rule, the P.M. should encamp with Hd.Qrs. ; it is advisable that he should be intimately associated with the offr. in charge of the intelligence department, as both should work hand in hand. If it is possible, indeed, to have one officer as head of both branches, it is all the better. According to our present division of staff duties, the P.M. reports and takes his orders from the A.G., whilst the intelligence officers, if not actually on the Q.M.G.'s establishment, would always report to the Q.M.G., and take their instructions from him. With a C. of the S. both would take their orders direct from him.

As regards a police establishment, it should always be remembered that we have the very best material in the Irish constabulary to draw upon. It was made use of when the army was first organised in the Crimea, but it was mismanaged, and had no useful result.

The first duty of the P.M. is to make out a list of all those (not soldiers) attached to the army in any capacity, either as servants (public or private), or as sutlers, or as belonging to societies for the relief of the sick or wounded. In his book each man should have a page, upon which should be noted all particulars regarding him. Men having wives with them, to have their description also entered. To each must be issued a ticket of residence, which, like the passports formerly in general use abroad, should have an exact personal description of the holder, to prevent its being transferred.

Photographs of every one to whom a passport is issued should be kept in the book, and a duplicate attached to the passport itself : every one applying for a passport to hand in two photos. of himself for that purpose ; the copy attached to the passport to be stamped and signed by the P.M. and by the holder of it. Every one to be obliged to carry his passport about on his person at all times.

Each passport to be numbered, and the number to correspond with the page in the general registry, to which there should be an alphabetical index. The following information should be contained in the passport and registry, to be made out thus :—

TICKET OF RESIDENCE. No.

Name . . . . . .
Country . . . . . .
Occupation . . . . . .
If a foreigner, has he a passport . . . . . .
Intended residence in camp, &c. . . . . .
Name of any one in camp who will vouch for his respectability . . .
Height . . . . . .
Colour of eyes . . . . . .
Do. hair . . . . . .
Age . . . . . .
Any marks about him . . . . . .
His signature . . . . . .

named above, has permission to remain until further orders.

By command.

(Signed)

Camp (date) of 188 .

The police offr. of each division will keep a similar register of all such people following, or belonging to his division, the number of each entry to correspond with that in the general register kept by the P.M. It will be his duty to see that no stranger lives with his division without such a register, and he will arrest any one not possessing one, and take him before a S.O. of his division. It would be a good plan to institute a fine for any remissness in these regulations, or for the loss, by accident or carelessness, of such registry. Of course, if there were grounds for supposing that there was anything criminal in the matter, the offender should be expelled from the theatre of war, or otherwise summarily punished.

Punishments with an army in the field must be summary. It should be remembered that laws which in peace suffice to keep the population of cities in order, will not answer the same purpose in armies during war. The former is an aggregate of men, women, and children, of all ages and all classes, both as regards position and education ; the soldiers of an army are, as a general rule, of one class in all respects, are in the prime of youthful manhood, full of fire, passion, and recklessness, and not brought into contact with the softening influences of old men and respectable women ; they are men in growth, with the failings and high spirit of the schoolboy. Without strict discipline such an assemblage would be a mischievous mob and not an army.

All camp followers, or individuals of any sort accompanying an army, either for business or pleasure, are to be made amenable to such punishments. On the march the P.M. and his assistants must hover about along the outskirts of the line of march, visiting every village and all large farm-

houses, &c., &c., to see that stragglers are not there, as it is by such men that crimes are committed. He should make prisoners all stragglers, and send back soldiers under escort to their respective corps. When on the march, all G.Os.C., or others in detached commands at some distance from the main body, will aid the P.M. by giving him guards, taking charge of prisoners, giving him patrols (they should, if possible, be cavalry), &c., when he applies for them, unless in their opinion there are sufficiently good military reasons for refusing to do so. If under such circumstances the P.M. considers he has not been properly supported, he must bring the matter to the notice of the C. of the S. or A.G., who will inquire into it.

When in camp, the P.M. and his assistants must be always on the move, visiting the neighbouring villages, and places at which they think breaches of order or discipline are likely to be committed. He must render every protection in his power to the inhabitants of the country, and be always prepared to inquire into their complaints. This will go far towards encouraging them to bring in provisions for sale. He will take charge of the markets (the positions of which will be, in the first instance, pointed out by the Q.M.G. or S.O. performing his duties). He is responsible for their good order and cleanliness. His police look to the former, and he must obtain fatigue-parties or use defaulters to insure the latter. He will bring to the notice of the staff of divisions any want of cleanliness in the vicinity of their camps, all irregularities at watering-places, &c.

All guards, whether commanded by officers or N.C.Os., must take charge of any prisoners handed over to them by the P.M., or any of the police acting under his orders. Those in command of the guards to take down in writing the crime and the name of the police-offr. handing the prisoner over. If such prisoners have not been reclaimed previous to the guard being relieved, they must be sent to their regimental guards with a report of the circumstances.

Taking it for granted that the base of our army is a seaport, the town should be under the closest police surveillance. It must have a P.M., with a sufficient police staff to keep order. He should take his orders from the offr. in immediate command as to the individuals to whom passports should be granted to enable them to visit the army in the field. All foreigners must come with regular passports from their own ministers. Travelling gentlemen, newspaper correspondents, and all that race of drones, are an encumbrance to an army ; they eat the rations of fighting men, and do no work at all. Their numbers should be restricted as much as possible. Strangers of all sorts upon arriving at any military post *en route* to join the army, must be at once visited by the P.M., or other officer in police charge, their registers examined, compared with their appearance, and signed by such officer.

It must be remembered that the enemy will do all he can to have paid spies in your camp. No stone should be left unturned to discover them, large rewards being offered to any one who will inform on them.

NEWSPAPER CORRESPONDENTS.

Soldiers of course object to their presence in camp upon military grounds, but as long as the British public's craze for sensational news remains as it is now, the English general must accept the position. The following rules have just been laid down on the subject for use in Egypt.

Rules for Newspaper Correspondents at the Seat of War.

1. All newpaper correspondents accompanying the Army in the Field must be furnished with a licence granted under the authority of the Field-Marshal Commanding-in-Chief. In this licence the paper or papers for which the correspondent is agent will be stated.

2. A correspondent may not write for papers other than those mentioned in his licence. If he desire to do so, he must get leave, and the permission must be duly registered on his licence.

3. Licences will not be granted to those whom it is considered undesirable to have as correspondents in the Field. Retired Officers will be preferred.

4. All correspondents in the field will be under the Mutiny Act during their stay with the Army.

5. Correspondents will not be allowed to go to the outposts without special permission.

6. The use of any cipher is forbidden to correspondents. French and German are the only foreign languages permitted.

7. A Staff Officer will be named to supervise all press matters. He will register licences granted under the authority of the Field-Marshal Commanding-in-Chief, and will grant licences to local correspondents *not accompanying* the Army in the Field. These licences will be issued under similar conditions to those granted to correspondents accompanying the Army. He will also grant passes when necessary to all correspondents at the Seat of War. He will be the channel of communication between the General Commanding-in-Chief in the Field and the correspondents. Each newspaper having a correspondent in the Field or at the Seat of War will send him a copy of every issue of their papers, so that he may, by examining their contents, be assured that the press rules in the Field are strictly adhered to.

8. This Staff Officer will have the power of insisting that all communications from correspondents to their newspapers must be sent through him; and he may detain or alter the communication should he deem it injurious to the interests of the Army.

9. The Military Authorities will give as much information, as they may consider advisable and consistent with their duty, to correspondents. The above-mentioned Staff Officer will fix an hour when correspondents may call upon him daily for information, and he will be authorised to tell them everything that can be published with safety to the Army.

10. The Military Authorities will facilitate, so far as they can, the despatch of the messages of correspondents.

11. Should the means of communication at the disposal of the General Commanding-in-Chief in the Field not be sufficient to convey the messages of correspondents, the latter may, under his sanction, arrange for a special means of transmitting their messages. It is, however, to be clearly understood that such arrangements are to be entirely under the control of the Staff Officer previously mentioned.

12. The General Commanding-in-Chief in the Field has power to revoke, at any time, any licence granted under the authority of the Field-Marshal Commanding-in-Chief, or under his own authority, should he consider it advisable, in the interests of the Army, to do so.

13. Editors of newspapers desirous of sending agents to the theatre of war, and the correspondents whom they propose for that purpose, will be required to sign the following declaration.

War Office, 4th August, 1882.

NOTE.—In the case of a correspondent *to accompany the Army in the Field* who is already at the Seat of War, the signature of the Editor or Manager of the newspaper for which he acts will be accepted "for the correspondent," and if a licence be granted a provisional one will be issued. This will hold good so long only as is necessary to allow of the correspondent's signature to the Declaration being obtained and received at the War Office; a permanent licence will then be forwarded to the Editor or Manager for transmission to the correspondent.

Managers of newpapers wishing to appoint local correspondents are recommended to sign a copy of the Declaration and forward it to the correspondent if already in Egypt, or with him, if proceeding there, in order that he may countersign and present it to the Staff Officer who is authorised to grant local licences under the authority of the General Commanding-in-Chief in the Field.

PART II.

COMPOSITION AND DISTRIBUTION OF AN ARMY.—The army is to be divided into army corps, consisting each of 22,386 (21 battalions) infantry, 3733 cavalry (6 regiments), 90 guns, with a proportion of engineers, &c., &c., &c. (these numbers do not include officers), the detail being as follows*:—

A BRIGADE OF CAVALRY (WITHOUT TENTS).

Details arranged as if forming part of an Army-Corps.

Detail.	Offrs. and Men.					Horses.					Carriages.		
	Officers.	N.C.Os. & Men.	Drivers.	Bâtmen.	Total all Ranks.	Officers.	Troop.	Draught.	Spare.	Total.	G.S. Waggon, 4-horsed. G.S. Forge and other Waggons and Carts.	To be requisitioned.	Total Carriages.
Staff	3	1	..	7	11	11	..	..	..	11	..	..	..
3 Regiments	93	1800	66	..	1959	273	1440	120	12	1845	30	..	30
1 Batty. H.A. 6 guns	7	102	72	..	181	15	56	96	18	185	10	..	10
Veterinary Department	1	..	..	2	3	2	..	..	..	2	..	..	..
Chaplain's Department	1	..	..	1	2	1	..	..	..	1	..	..	..
Medcl. Dep. ½ Br. Co. — Medcl.	5	65	..	5	75	5	..	..	..	5	8	11	19
Medcl. Dep. ½ Br. Co. — Transport attached	..	3	20	..	23	..	2	38	2	42	..	..	..
Commist. Dept. — 4th Sect. No. IV. Comp. Transport	1	10	62	1	74	1	3	110	14	128	19	..	19
Commist. Dept. — Supply	2	9	..	2	13	2	..	..	..	2	..	..	..
Postal Corps	..	2	..	..	2	..	..	..	..	..	..	..	..
Total	113	1992	220	18	2343	310	1499	326	44	2179	67	11	78

* Allowing for the men to be used for regimental transport purposes, each battalion of infantry should be counted as 1000 bayonets; and as there are only 480 troop horses in each cavalry regiment (not counting officers' chargers), each regiment of cavalry should be counted only as 500 sabres. If these numbers are taken, the total infantry would be 21,000, and the total of the cavalry would be 3000.

In India the Brigade of Cavalry will consist of 1 British and 2 Native Regts. and 1 Battery H.A. : the Brigade of Infantry of 1 British and 2 Native Battalions ; and the Brigade of all arms of 1 Infantry Brigade (as above), 1 Regt. Native Cavalry, 2 Field Batteries, and 1 Co. of Sappers.

A BRIGADE OF INFANTRY (WITHOUT TENTS).

Detail.	Offrs. and Men.					Horses.					Carriages.				
	Officers.	N.-C. Os. & Men.	Drivers.	Bâtmen.	All Ranks.	Officers.	Troop.	Transport.	Total.	Guns.	4-Horsed.	6-Horsed.	2-Horsed.	Requisitioned.	Total.
Staff	6	1	..	11	18	15	..	..	15	..	..	..	..	..	..
3 Battalions *	93	3132	66	..	3291	33	3	132	168	..	24	..	12	..	36
Commist. Dept. { 3rd. Sect. No. 1 Compy. . . }	1	11	22	1	35	..	3	44	47	..	9	..	2	..	11
Commist. Dept. { Supply. . . . }	..	9	..	..	29	1	..	..	1	..	..	..	..	..	..
Total . . .	100	3153	88	12	3353	49	6	176	231	..	33	..	14	..	47

In India a division of all arms will consist of 2 infantry brigades, 1 pioneer regiment, 2 native cavalry regiments, 1 battery H.A. and 3 field batteries, and 2 companies of sappers.

In distributing regiments into brigades and divisions, they should be grouped as much as possible according to regimental distinctions, the Fusiliers being together, the Light Infantry the same, and so on.

It is advisable that the divisions should be numbered 1, 2, 3, 4, &c., right through the army ; thus in an army consisting of three army corps, the second army corps would consist of the 4th, 5th, and 6th divisions of infantry. The brigades of cavalry should be similarly numbered. The brigades of infantry should be called right and left brigades of such and such a division.

"*The order of battle*" with all foreign armies, is a form giving the distribution of the force into divisions, brigades, &c., with the names of all the generals and brigadiers and their principal S.Os. as it would stand on parade for inspection. The names of the Os.C.R.A, and R.E. are also given. This "order of battle" has nothing to do with the formation in which the force would be engaged.

* These totals include 10 Bâtmen attached.

A DIVISION OF INFANTRY (without tents).

The details are arranged for a Divn. forming part of an Army Corps.	Officers and Men.					Horses.				Guns.	Carriages.				
	Officers.	N.-C. Os. and Men.	Drivers.	Bâtmen.	All Ranks.	Officers.	Troop.	Transport.	Total.		6-Horsed.	4-Horsed.	2-Horsed.	Requisitioned.	Total.
Divisional Staff	16	8	..	31	55	40	..	..	40	..	..	..	..	..	..
2 Infantry Brigades	200	6306	176	24	6706	98	12	352	462	..	..	66	28	..	94
1 Battalion of Rifles	31	1044	22	..	1097	11	1	44	56	..	..	8	4	..	12
1 Regiment of Cavalry	31	600	22	..	653	91	480	44	615	..	..	10	..	..	10
3 Battalions of Field Artillery	21	338	214	..	573	24	66	358	448	18	27	3	..	..	30
1 Company of R. E.	6	158	26	12	202	11	4	31	46	..	..	6	..	..	6
1 Infy. and R. A. Amn. Reserve Column	6	85	123	..	214	7	16	234	257	..	27	2	22	..	51
Vety. Department	1	6	..	2	9	2	..	..	2	..	..	..	..	..	..
1 Troop Mil. Police	2	73	..	..	75	2	63	..	65	..	..	..	..	..	..
Commissariat Department. Staff	1	1	..	1	3	1	..	..	1	..	..	..	..	..	..
Commissariat Department. For Transport of 1st Line, No. 1 Section, No. 1 Co.	2	11	46	2	61	2	4	92	98	..	1	19	1	..	21
Commissariat Department. of 2nd Line, No. 2 Section, No. 5 Co.	1	10	67	1	79	1	3	134	138	..	..	32	..	..	32
Commissariat Department. For Supply of 1st Line Divnl. Details	2	10	..	2	14	2	..	..	2	..	..	..	..	..	..
Commissariat Department. 2nd Line Depot	3	26	..	3	32	3	..	..	3	..	..	..	..	..	..
Med. Dept. Staff	2	2	..	2	6	2	..	..	2	..	..	..	..	..	..
Med. Dept. 1st Line. 1 Field Bearer Co. Medical	11	131	..	11	206	11	..	..	11	..	..	..	..	..	..
Med. Dept. 1st Line. 1 Field Bearer Co. No. 2 Sec., No. 1 Co. Transpt.	1	43	8	1		1	3	86	90	..	..	..	17	23	40
Med. Dept. 2nd Line. 2 Field Hosp. Medical	16	74	..	16	106	16	..	..	16	..	..	12	4	8	24
Med. Dept. 2nd Line. 2 Field Hosp. No. 1 Section, No. 5 Compy.	2	11	46	2	61	2	4	92	98						
Postal Department	..	3	..	..	3	..	..	..	..	..	..	..	..	..	..
Total	355	8905	785	110	10155	327	656	1487	2450	18	55	158	76	31	320

AN ARMY CORPS (without tents.)

Detail.	Officers and Men.					Horses.				Guns.	Carriages.				
	Officers.	N.-C. O.'s and Men.	Drivers.	Bâtmen.	All ranks.	Officers'.	Troop.	Transport.	Total.		6 horses.	4 horses.	2 horses.	Requisitioned.	Total.
Genrl. Staff of A. C.	25	17	..	56	98	81	..	..	81	..	..	..	..	..	..
3 Divisions	1064	26714	2355	329	29462	980	1967	4401	7348	54	165	474	228	93	960
1 Cavalry Brigade	113	1992	220	18	2343	310	1501	408	2219	6	7	50	10	11	78
Corps R. A. — Regimtl. Staff	6	3	..	12	21	16	..	..	16	..	..	..	..	..	..
Corps R. A. — 3 Batts. R. H. A.	21	306	216	..	543	45	186	318	549	18	27	3	..	..	30
Corps R. A. — 2 Field Batts	14	236	150	..	400	16	44	256	316	12	18	2	..	..	20
Corps R. A. — Reserve Ammtn	18	255	240	..	513	21	48	444	513	..	..	93	6	..	99
Corps R. E. — Regtl. Staff	2	1	..	4	7	5	..	..	5	..	..	..	..	..	..
Corps R. E. — 1 Co. and Field Park	7	165	50	14	236	13	9	73	95	..	..	15	..	..	15
Corps R. E. — 1 Pontoon Troop	9	164	148	18	339	17	20	206	243	..	30	1	..	..	31
Corps R. E. — ½ Telegraph Troop	7	92	66	14	179	13	22	74	109	..	8	5	..	..	13
1 Troop Mil. Police	2	73	..	..	75	2	63	..	65	..	..	..	..	..	..
Vety. Department	1	10	..	2	13	2	..	..	2	..	..	..	..	..	..
Commissrt. Deprt. — Departl. Staff	2	2	..	3	7	3	..	..	3	..	..	..	..	..	..
Commissrt. Deprt. — Transport. — Staff	4	3	..	5	12	5	..	..	5	..	..	..	..	..	..
Commissrt. Deprt. — Transport. — 1st Line for Corps Details 1, 2 and 3 Secs. No. IV. Company	4	31	113	4	152	4	10	186	200	..	..	29	1	..	30
Commissrt. Deprt. — Transport. — 2nd Line for Do., 3 and 4 Secs. of No. VI. Company	2	20	77	2	101	2	6	154	162	..	..	37	..	..	37
Commissrt. Deprt. — Transport. — No. VIII. Co. (Reserve)	5	41	224	5	275	5	13	448	466	..	..	104	8	..	112

| | | |

CAVALRY.—The proportion of cavalry in an army corps is $\frac{1}{6}$th of the infantry. If the units are counted as stated in note, page 173, the proportion would be $\frac{1}{7}$th of cavalry (in foreign armies it is about the same). The nature of the service upon which an army is sent, and the character of the country to be operated, must always greatly influence their proportion.

In open countries where forage is plentiful, one cannot have too many cavalry (provided they can fight on foot as well as mounted); and even in the closest countries, if forage is to be had, the more mounted men (whether you call them cavalry or mounted infantry it matters little) you have, the more formidable will be your army. A brigade of cavalry armed with breech-loaders that have a range of 800 yards, might go anywhere, even in the closest country, by dismounting $\frac{2}{3}$rds of their numbers; with a strong force of cavalry one might do wonders during a campaign or an action, by cutting in upon an enemy's flanks, rear, communications, &c. For a pursuit they would be invaluable; but then they must make up their minds to fight on foot whenever required to do so.

ARTILLERY.—The proportion of guns to sabres and bayonets in an army corps is as nearly as possible 3 guns to the 1000 men. If the calculation is made according to the numbers given in note, the proportion would be 3·75 guns to the 1000 men.

This proportion must always depend upon the nature of the service which the army is to be employed upon, the topography of the theatre of war, and the quality of the troops; the better they are the smaller the number of the guns required. An army occupying defensible positions requires more guns than does one engaged in offensive operations in the field.

Too many are always a heavy burden, that hampers the movements and withdraws a large number of fighting men from the force for their protection. Armies like that of the U.S. during the late war, who have an immense artillery to make up for the inferiority of their infantry, lose whole batteries at every period of a campaign. The question of siege trains is not considered here; the nature of the service upon which the army is to be employed, and the number of fortified places in the theatre of war, must determine their necessity or otherwise, as also their composition, &c.

Modern inventions have so improved the precision of fire, the range and the mobility of artillery, that there is an outcry at present to increase the number of guns per 1000 sabres and bayonets. This cry is made chiefly by men whose only knowledge of guns is from seeing them fired at a target, or with blank cartridge at a review, where the precision of aim in the first instance and the terrific noise in the latter have sent those gentlemen home with the notion, that "one cannot have too many guns." For the real damage done by artillery see article on that head farther on. An inordinate number of guns with any force is most embarrassing, for any guns that

cannot be brought into action are most injurious in their effects upon the result, as they block up the roads, and hamper every movement; at present, under ordinary circumstances, I believe 3·75 guns per 1000 fighting men to be about the maximum proportion that can be taken in the field with advantage at the beginning of a campaign, when the regiments of cavalry and infantry are up to their full establishments.

ENGINEERS.—One company is attached to each division, of which it is to form an integral part whilst the army is in the field. When a siege is determined upon, it may be deemed necessary to collect all or several of the companies together.

The proportion of engineers to sabres and bayonets has usually been counted as 1 to 30. This proportion was laid down before the duties in connection with the maintenance of railways and working of telegraphs were included in engineer duties. In the Franco-German war the engineers were nearly 1 to 28 sabres and bayonets in the 2nd army.

The proportion of pontoon equipment with an army must depend upon the number and size of the rivers in the theatre of war. The quantity of telegraph wire required with an army in the field will depend upon the extent to which lines of telegraph exist in the country to be operated in.

Sea Transport.—Under existing regulations, the transport of troops by sea is entirely subject to Admiralty control, a system which many think a very bad one. When conveyance by ship is required for men or stores, application is made for it by the S.O. of the District or Division, &c., to the senior naval officer on the spot, specifying the exact numbers, with their several ranks, and the quantity of baggage to be conveyed. It rests with him to decide whether he can provide conveyance in any of H.M.'s ships at his disposal, or whether he must hire merchant vessels. If the latter course is decided on, tenders of vessels are advertised for. All ships that are offered should be invariably inspected, previous to being taken up, by a S.O. and a naval officer, for the purpose of ascertaining if their general character fits them for the conveyance of men and horses. It is the especial duty of the former to see that they are generally calculated to accommodate troops with comfort; that they are well ventilated or capable of being made so (troops must not as a rule be berthed on a deck unprovided with side scuttles); that they are not infected with vermin; that no bad smells exist which cannot be easily remedied; and that the height between decks from deck to beam is at least 6 ft. for men. The greater the height the better, but when it exceeds 7 ft. it becomes necessary, in order to sling the hammocks so that the men can get in and out of them conveniently, to "*block down*," the height to be 78 in. For horses, the ships with the greatest height between decks should be selected, and as a rule that height

should not be less than 7 ft. When, however, an army corps or other large body has to be embarked, it may not be possible to obtain a sufficient number of ships so high between decks. The "Himalaya," which has been a most successful horse-ship for the last 27 years, has only a height of 81 in. between decks. If horses are to be carried in the hold, the height from ceiling to beam must not be less than 12 ft. Vessels with less than 30 ft. beam are not suited for the conveyance of horses. For the conveyance of elephants, the beam should be at least 2 or 3 ft. more. The hatchways for horses must be at least 10 ft. × 10 ft.; 12 ft. × 10 ft. is better. There should be the least possible amount of deck hamper, so that the troops should have ample deck room.

Steamers are always preferable to sailing vessels, as they make much shorter voyages, which is a consideration of the first moment in the conveyance of horses, mules, &c. The larger the steamer, the better she is adapted for transport purposes. It may be assumed that in future troops intended for active operations will only be embarked in large 1st-class steamers for long voyages; they are more economical, comfortable and healthy, and enable complete units to be embarked more satisfactorily than small ships (many small vessels have no side scuttles); they have a higher speed than small vessels, thus shortening the voyage, and reducing the chances of being captured by an enemy. The space occupied by the flotilla, whether at sea or at anchor, is smaller, rendering its protection and direction a more easy naval matter; they have a *pro tanto* greater capacity for the accommodation of troops and animals, and for the stowage of military material, stores, and coal, and the strain upon the floating factories (which must invariably accompany a large fleet of steam transports if sent for from all dockyards) for the repair of machinery, &c., is much less. The average size of the 36 steamers employed in 1879–80–81 to take troops, &c., to South Africa was 1979 tons net each. Small ships should never be used for horses, but in calm seasons, and especially for short voyages, they can be conveniently carried in large sailing ships towed by powerful steamers.

Hospital Ships must have 2 regular decks below the upper deck, each provided with ports or scuttles. The main deck must not be less than 7 ft., and the lower deck not less than 6 ft. from deck to beam. The main deck must be quite clear fore and aft, and have a large entry port each side abreast mainmast: also stern ports and a large bowport on each side. The ship to be painted white outside.

Tonnage required. In the movement by sea of large organised units, such as a Division or an Army Corps, the amount of net tonnage required may be roughly calculated thus:—

1st. For very short voyages, such as crossing the English or the Irish Channels, $1\frac{1}{2}$ tons net per man and $2\frac{1}{2}$ tons net per horse.

2nd. For voyages not exceeding a week, 2 tons net per man and 6 tons net per horse.

3rd. For long voyages to any part of the world 2½ tons net per man, and 7 tons net per horse. These estimates include space for 1 month's forage and provisions for voyages under a week, and for three months for long voyages over a week in duration, and in both cases for the 1st line of transport complete. In calculating for a number of vessels for long voyages, it may in some instances be advisable to add 10 per cent. extra for loss of space which the unsuitableness in construction of some steamers will entail. When a large amount of transport vehicles and animals are embarked, it may be necessary to add a small percentage, but the estimates given above will provide ample accommodation for all the guns, waggons, horses, stores, &c., constituting the Army Corps or Division when at war strength, together with the above specified proportion of forage and provisions for all embarked. When very large bodies of troops have to be embarked for long voyages, the gross tonnage required may be roughly calculated at 10 tons per horse and 4 tons per man, this result to include all stores, guns, provisions, 1st line of regimental transport, &c., as in the previous calculation.

To reduce gross to net, for H.M.'s troopships multiply gross by ·6, and for merchant steamers multiply it by ·65; to raise net to gross for H.M.'s troopships add 66 per cent. to net, and for merchant steamers add 53 per cent. to it; the results will be roughly accurate.

The force sent from India to Cyprus in 1878 consisted of 471 Europeans of all ranks, 5631 native officers and sepoys, 2539 followers, 1336 horses, 496 ponies, 43 bullocks, and 12 guns. It was conveyed in 28 hired ships (having a net tonnage of 37,946 tons), of which 12 were steamers and 16 were sailing vessels (the latter were towed by steamers); the net tonnage of the steamers was 17,581, and of the sailers, 20,365 tons. Calculating for the conveyance of this force at the rate of 2½ tons per fighting man, 2 tons per follower and 7 tons per horse, pony and bullock, the total net tonnage required would be 33,520 tons. A large quantity of stores and of special provisions for natives were taken in these ships.

In 1879 the force sent to South Africa was 8136 of all ranks with 1851 horses and 238 waggons; it was conveyed in 18 steamers, the gross and net tonnage of which was 55,131 and 35,404 tons. The amount of tonnage required upon the scale of 2½ tons per man and 7 tons per horse for such a force would be 33,297 tons (net), no allowance being made for the 238 waggons.

When troops were despatched to the Transvaal in 1880–81, 7374 men of all ranks, 2297 horses, 145 mules, 12 guns and 80 waggons were embarked in 19 hired steamers with a total net tonnage of 38,175 tons. Without making any allowance for the guns or waggons, at 2½ tons per man and 7 tons per horse, the amount of tonnage required would be 35,459 tons for

those numbers of men and horses. At the same time 5165 of all ranks, and 22 horses were embarked in 5 of H.M. troopships, with an aggregate net tonnage of 12,156 tons; calculated for as above those numbers would require 13,066 tons; or if those embarked in both class of vessels be added

Military Units.	1st Supposition.		2nd Supposition.		3rd Supposition.	
	Net tonnage required.	Probable number of ships.	Net tonnage required.	Probable number of ships.	Net tonnage required.	Probable number of ships.
Battn. of Infantry, 1097 of all ranks, 55 horses, 4 carts and 8 waggons. . . .	1800	1	2500	2	3000	2
Regt. of Cavalry, 653 of all ranks, 615 horses, 1 cart, and 9 waggons. . . .	2500	2	5000	4	6000	5
Battery of R.H.A. 182 of all ranks, 185 horses, 6 guns and limbers, & 10 waggons	720	1	1500	2	1800	2
1 Field Compy. R.E. and Field Park, 236 of all ranks, 95 horses, and 15 waggons.	650	1	1050	1	1300	1
1 Pontoon troop, R.E., 339 all ranks, 244 horses, and 31 waggons.	1300	1	2450	2	3000	2
1 Telegraph troop, R.E., 315 all ranks, 202 horses, and 24 waggons . . .	1100	1	2000	2	2400	2
1 Transport Compy. A.S.C., 146 all ranks, 97 horses .	500	1	850	1	1100	1
A Division, 10,155 of all ranks, 2450 horses, 18 guns, 65 carts, and 224 waggons.	21,000	17	35,000	26	42,000	30
An Army Corps, 36,045 of all ranks, 12,939 horses, 90 guns, 280 carts, and 1153 waggons	87,000	74	150,000	110	180,000	135

together (12,539 of all ranks and 2464 horses and mules), they would at the same rate require 48,595 tons (net), whilst the 24 ships in which they were actually embarked had an aggregate net tonnage of 50,331 tons. In all these instances, however, it must be remembered that the troops did not take their regimental transport with them, although a certain amount of general service waggons, &c., were embarked.

The foregoing table gives a fair estimate of the freight required for our several military units (without tentage) under each of the three suppositions given (see opposite page).

These figures give roughly the actual tonnage required for the several units complete with their stores, arms, ammunition and regimental transport (1st line), but make no provision for ships fitted specially as hospitals, factories, &c., &c., nor for ships required for 2nd line of Regtl. transport, extra military stores, nor for food beyond provisions and forage for 1 month for voyages not exceeding a week, and for 3 months for long voyages. They include ordinary hospital accommodation on board of each transport, except in the calculations given under the 1st supposition. The Divisional Staff are placed together in a suitable steamer carrying part of the Division. In the tonnage given for an Army Corps, allowance is made for a suitable steamer for the exclusive conveyance of the G.O.C. and his staff, horses, and the carts and animals required for the conveyance of their baggage, &c.

H.M.'s troopships would carry the following numbers of men and horses:—

Names of Troopships.	1st Supposition.		2nd Supposition.		3rd Supposition.	
	Men.	Horses.	Men.	Horses.	Men.	Horses.
Serapis, Orontes, Crocodile, Malabar, Himalaya, Euphrates, and Jumna .	2194	20	1097	58	1097	58
Tamar	1097	10	1097	10	1097	10
Simoon	800	10	600	10	600	10
Assistance . . . . or	800	8	800	8	800	8
	160	138	160	138	160	138

Under the 1st supposition, permanent fittings, such as mess-tables, stools and hammock fittings are not necessary, as the men can use their own canteens, camp kettles, knives, &c., but sufficient cooking space and meat dishes are indispensable. The fittings required for horses need not be so elaborate under the 1st supposition as those required for long voyages.

In calculating the amount of space required for provisions, 10,000 rations (according to the scale laid down at page 53) will occupy 950 cub. ft. if the biscuit is in bags and the meat is salt beef, or 1350 cub. ft. if the biscuit is in barrels and the meat is salt pork.

In converting the regulated weight of baggage into cub. ft., 100 are allowed for each ton, but the common marine ton is only 40 cub. ft.

Boats.—If the troops embarked are to be landed in an enemy's country, it is most necessary that each transport should carry a sufficient number of boats so that there may be thrown on shore at one time all the infantry (without their regimental transport) all the Divisional Artillery, with 2 waggons per battery, one charger for all mounted officers of Infantry, and 2 chargers for all general and combatant S.Os., together with at least the Divisional Cavalry, if not the whole of the cavalry, but without its transport.

If the disembarkation has to be effected on an open beach with a dangerous surf, special surf boats must be provided, such as those used in 1873-74 on the Gold Coast. The adoption into our transport service of collapsible boats enables the boat accommodation possessed by each ship to be very largely increased without adding inconveniently to the stores to be carried on deck.

In all hired transports there must be the following boats, all being hung at davits and fitted with approved lowering and disengaging gear:—

Ships, tons.	Boats.			Aggregate Cubic Contents.
	Life.	Ordinary.	Total.	
				Cubic feet.
Over 3000	4	6	10	3800
3000 to 2000	4	4	8	3200
2000 to 1000	2	5	7	2000
1000 and under	2	4	6	1500

The life boats for the 3 first classes of ships must be 28 ft. × 8½ ft. with a depth of 3½ ft. ; for the last class they may be 2 ft. shorter. Each boat to be complete with masts, sails, oars (2 spare oars in each), 3 boat-hooks, rudder, tiller, 1½ sets of crutches or thole pins, 2 two-gallon barricoes, bucket and bailer, and a good painter at least 18 ft. long. Each lifeboat is to carry in addition a good sharp axe or tomahawk in case, and a life jacket or belt for each of the crew. The watertight compartments must contain at least 1½ cub. ft. for each 10 cub. ft. of the boat's capacity.

In the class of steamers usually hired as transports, there are generally in all ships over 2500 tons measurement, 10 boats capable of carrying 350 fully equipped infantry, and in vessels between that size and 1200 tons, 8 boats that could carry from 150 to 200. In the Indian troopships, the boats can carry over 500, and all others of H.M.'s troopships named on previous page can carry 400.

The capacity of a boat is determined by regulations, by multiplying together the extreme length, breadth and depth (if fitted with rowlocks the depth to be measured from the bottom of the rowlocks), multiplying the product by ·6, which gives the capacity in cub. ft. The capacity in cub. ft. divided by 10 gives the number of men each boat will hold.

Horse boats.—Those made in 1878 were used in the disembarkation on the open beach at Cyprus, and answered well; each carried 10 horses, or 2 fd. guns with their limbers ; they were fitted with fall down sterns, which served as broughs. Each transport carrying troops to be disembarked in open boats should carry 1, 2 or 3, according to its capacity ; but there should be at least 40 in all with the ships carrying each Infantry Division, and 20 with those carrying the Cavalry Brigade ; with the ships carrying an army corps complete, should be at least 100.

Steam launches.—One should be carried by each transport, its size to depend upon the size of the transport, but as a rule it should be able to tow ashore all the other boats of the ship when they are laden with troops. The 1st class steamers of the great passenger lines are now carrying steam launches. In the embarkation or disembarkation of large bodies of troops it is essential that the C. of the S. or other S.O. entrusted with direction of the operation, should have at his exclusive disposal a steam launch or despatch vessel, and it is most desirable that the G.O.C. each Division should also have a similar boat at his exclusive disposal.

Numbering of transports.—Each ship should have a number, which should be painted in black figures 3 ft. long on a white ground on each bow and quarter, and should have similarly painted on each broadside, the Regt. or the department, &c., she carries. It is a good plan to have the numbers of all ships carrying mounted corps painted in red to distinguish them,

ships carrying only provisions and stores to have their numbers in white figures, and the ships carrying each of the 3 Divisions of an army corps to be distinguished by carrying a flag at the fore, main or mizen.

Provisions, bedding (for the men only), medical comforts and forage are almost invariably supplied from our own stores, but all fittings, mess utensils and other articles for troop use, together with all cabin fixtures (including bedding of all sorts) and equipment required for the officers' mess, are to be supplied by the owners.

THE CARRYING CAPACITY OF SHIPS can be estimated as follows:—*The number of officers a ship can carry* generally corresponds with the number of 1st class passengers she is fitted for. It may occasionally be necessary to add to this if there is not accommodation for the proper proportion of officers required for the number of men to be embarked.

Officers' cabins and messing.—The cabins must be in every way fitted, supplied and equipped as is usual in passenger steamers of the 1st class, except that officers must provide their own towels and napkins. The O.C., whatever his rank, will have a cabin to himself of not less size than 42 superficial ft. (exclusive of berth place), and provided with a table, chair, lock-up drawer or cupboard for papers, and a swinging lamp; a separate w.c. is also allowed him. Cabins for other officers must not be less than 30 superfl. ft. for 1 offr., or 42 ft. for 2 officers; when more than 2 are put into a cabin, 10 additional ft. are to be allowed for each, these measurements to be exclusive of bed place, which is never to be less than 6 ft. by 2 ft. There must always be a w.c. on deck for the exclusive use of the officers. The supply of bed linen to be sufficient to allow a change weekly. There should be a cook-house for the officers' mess separate from that for the men. *The mess* is to consist of the usual meals, the table to be well kept, and at least equal to those provided in the best passenger ships. The number of cooks, stewards and servants to be fixed by the surveyor at not less than is usually provided in first-rate ships for a similar number of 1st class passengers.

The number of N. C. Os., Rk. and File that a ship can carry usually corresponds with the number of hammocks that can be conveniently slung between decks plus the number of staff sergeants, &c., who can be accommodated in any standing berths or other existing 2nd class passenger accommodation. In emergencies, however, or for very short passages of 1 or 2 days' duration, in addition to the number that can be accommodated below, one-fourth more may be embarked. The space occupied by a hammock when slung is 9 ft. by 16 in. (sergeants are allowed a width of 18 in.); but in slinging a number they overlap lengthways, so that in reality each only occupies a space of 6 ft. by 16 in. To calculate the number you can

sling upon any given deck, leaving out of the calculation all spaces occupied by hatches or any obstruction, the following formula can be used:— $\frac{L-3}{6} \times \frac{B}{16} = n$. L being the length in ft. and B the breadth in inches of the space where hammocks can be hung; if $\frac{B}{16}$ does not leave a remainder greater than 8, then 1 must be struck from the result; fractional remainders must be struck out. The cub. space required for a man and horse on board ship may be fairly calculated at 52 and 126 cub. ft. respectively. In making all these estimates, the space required for hospital purposes must be struck out.

Hammock hooks should be 5½ in. long of ⅝ in. iron, well screwed into the beams, and with numbers painted beside them to correspond with number on tally of hammock when practicable.

To ascertain the number of horse stalls that can be constructed on any deck, you have only to divide the running length of space available by 27 in., but before you determine upon the extent of that available space, you should mark off a space of 3 ft. all round the ship's side for a passage to be kept clear behind the stalls, and of a similar width alongside all hatchways or other obstructions. When the clear width of beam between the inner sides of any deck is 36 ft. or upwards, three rows of stalls can be constructed, the passage between the rows where the horses are to stand head to head being at least 6 ft. in the clear between stanchions, and where they stand head to tail being at least 54 in. No horses or other animals should, as a rule, be placed near the boilers or stoke-hole; in some vessels, owing to the thickness of the bulkheads, the wings on the main deck on each side of engine room and boilers are often the coolest parts; heat is likely to bring on inflammation. For every 110 stalls there are fitted in any ship, only 100 horses, mules, &c., are to be embarked.

THE FITTINGS REQUIRED FOR TROOPS ARE:—*Mess table*, fitted with cross legs, to be 6 ft. long by 27 in. wide, and fitted with a 9-in. shelf underneath; these tables to be numbered in large figures, odd numbers on one side, even on the other side of the ship, beginning forward on main troop deck. *Benches*, fixed to tables, to be 6 ft. by 9 in., and made of 1¼ in. wrought deal. *Valise battens* to be 4½ in. wide, nailed to under-side of beams. *Accoutrement hooks* to be 7½ in. long, 3 for each soldier, as near his mess table as possible. *Racks for sea kit bags* to be constructed where most convenient of light fir. *Arm racks*, to hold all the rifles embarked, to be in most convenient places, where freedom from rust is best secured. *Latrines* to be built on deck at the rate of 3 per cent. of men embarked. *Urinals*, lined with lead, to be provided on deck as required. *Seats of ease* will

always be fitted in the head when practicable. *House on deck for waterproof coats and capes*, fitted with sufficient hooks to hang the coats supplied for use of troops on board. *Hammock platforms* to be built on upper deck, with stanchions and side battens of deal, and bottoms fitted with gratings to be provided with well painted canvas covers, fitted with stout stops all round 18 in. apart: *a slop shoot* to be fitted on each side of upper deck through a convenient port.

LAZARETTE DECK, of not less than 2 in. thick, to be laid on beams thrown across for that purpose, so as to be strong enough to carry the weights to be stowed on it. The following fixtures, &c., are to be constructed upon it: an *Issuing room*, to be of such size as may be required, never less than 6 ft. square, to be fitted with shelves, dresser, hooks, door, &c., as thought desirable. *Bread Room* to be constructed against the issuing room as may be required, and filled with shelves. *Magazine*, size as required, made of 2 thicknesses of $\frac{3}{4}$ in. deal, crossed and nailed with copper nails, door hung on metal hinges, with brass padlock, hasp and staple. To be large enough to carry 100 rds. per rifle in ships carrying infantry going on active service, 30 rds. of which will be landed in the ammunition boxes in the S.A.A. cart, or with the regulation pack-saddle equipment if the Regtl. Reserve is to be carried on mules. *Baggage room* to be large enough to contain all the regulation baggage of those embarked. *Helmet room* of sufficient size to hold all the helmets or busbies of those embarked.

A cooking galley for the exclusive use of the troops should be provided, to be complete with fire-hearth, funnel, and double boiler, poker, shovel, rake, &c., and a hot plate; it is to be of sufficient size to cook at one time for all the troops embarked; it must be 6 ft. 6 in. high in the clear, and when it includes the bakehouse also it should have a superficial area of 30 ft. for the first 100 men, with 15 superficial ft. extra for each additional 100 men. It is to be lined throughout with tin, the boilers to hold 3 pts. for every man embarked, and each boiler to have a large brass cock; it should be paved with tiles.

A bakehouse to be provided sufficient to bake enough fresh bread for issue on 4 days each week to all troops embarked. A baker is provided by the ship to bake, but one or more soldiers will be required to assist him.

Iron tanks, sufficient to hold 14 days' water for all troops on board, and for the crew at the rate of $1\frac{1}{4}$ galls. daily per head. In mule or horse ships, the Govt. will supply all tanks required to hold the water for the animals. *Lift pumps* to be fitted at convenient spots to pump the water from the tanks to each compartment on which troops are carried; special hoses will be required for this purpose.

Distilling apparatus.—One or more to be in every ship used for long voyages, and to be carefully tested and warranted to make, in 24 hours, 1½ galls. of pure cold water for each person on board, and 10 galls. for each horse or mule. The stores required to be as directed by the Surveyor.

Prison accommodation to be provided for 2 per cent. of troops embarked. A prison for 4 men to be 6½ ft. by 12½ ft. in the clear, to be divided by 3 moveable bulkheads into 4 cells.

Ventilation.—In addition to any special system of ventilation provided, the decks may be cut, and air-tubes and air-funnels, with large cowls, fixed as may be deemed advisable. This matter is of the first importance, and every practicable arrangement should be made beforehand to provide for it sufficiently. Good portholes or scuttles are indispensable. Windsails, of from 4 to 6 ft. in circumference, according to size of ship, must be supplied for each hatchway or scuttle, each deck carrying men or animals, having its own windsail down each hatchway leading to it. At least half must be square-headed, and fitted with yards from 4 to 6 ft. long. Dr. Edmond's system of ventilation is now commonly used in all large transports.

Life buoys, from 12 to 24, according to numbers embarked, must be distributed about bridge and upper deck, and hung so as to be readily thrown overboard. Each buoy to be capable of floating 24 hours with 40 lbs. of iron attached to it.

Lightning conductors, one to each mast.

Lime and whitewash brushes to be provided as considered advisable by the Surveyor.

Accommodation ladders.—Two are all that are ordered in the Regulations, at least two; but those for infantry ought, I think, to have 2 on each side, or even 3 when the length of the ship admits, or when a rapid disembarkation is required. Each ladder to be long enough for use when the ship is light; to be strong enough for the use of infantry crowded on it in heavy marching order, and to have a good landing platform at the bottom, fitted with 3-in. man-ropes, fastened to the side stanchions. These ladders to be entirely independent of the gangway ports, where the horses and waggons (if any) are to be hoisted in and out. It is a good plan to have a Jacob's ladder on each side of poop for the sailors' exclusive use.

Step ladders, with hand rails, to be fitted to each hatchway, and secured at foot with strong cleats, steps to be hard wood, and from 20 to 36 in. wide.

Awnings to be provided fore and aft, with curtains for one side.

Fire engines.—The donkey to be always fitted as a fire engine, and provided with sufficient 2½ in. hose to reach the furthest end of the vessel down below. Good portable fire engines to be supplied at following rates: vessels over 3000 tons, 4; and from 3000 to 2000 tons, 3, with 18 fire buckets in both instances. From 2000 to 1000 tons, 2; and under that size, 1, with 12 fire buckets in both instances. *Fire buckets* to be either of wood or leather, and fitted with lanyards long enough to draw water from the poop when the ship is light: these buckets never to be used for washing decks.

Hatchways to troop decks have booby hatches, also awnings that will keep out rain, and all to be fitted with gratings.

Hospital.—For long voyages a sufficient space in most suitable part of ship is to be screened off, with canvas screens made to roll up, to accommodate 5 per cent. of men embarked, of whom 3 out of every 5 should be accommodated in standing bed places made in 2 tiers, the remainder being in swinging cots; these bed places to be well clear of the deck and sides of the ship, and to be 6 ft. by 27 in. in the clear.

A dispensary to be built aft of the hospital bulkhead, 4 ft. by 8 ft.

ARTICLES FOR TROOP USE:—*On troop deck*, police lamps, with lock and key to be supplied as demanded by Surveyor. The number required varies not only with the number of men, but also with number and size of decks and compartments on which they are berthed. Each compartment requires at least 4; each harness room, 2; each latrine, 1; or, if over 20 ft. long, 2; washing place, 1; or, if over 20 ft. long, 2. Long decks, without compartments, require about 2 for every 100 men on them. Half of these lamps to be supplied with candles to burn day and night, the others with enough to burn daily for 12 hours. Hexagonal safety candle lamps, with brass padlocks for use of N.C.O., &c., 4 for each 100 men, besides one for the hospital, issuing room, troop galley, the w.c. of S. Sergts., and 2 for use on deck for the men to light their pipes at. All these to be supplied with candles to burn 12 hours daily. For each mess the following articles and 5 per cent. spare:—1 tin mess kettle of 2½ galls., with lid to form dish; 1 pair of carving knives and forks; 1 mustard pot to hold half a pint; 1 pepper dredge; 1 pickle jar to hold 4 pints; 1 salt jar (1 pint); 1 oval tin dish; 1 potatoe net to hold 12 lbs.; 1 pudding bag; 2 zinc tallies, stamped with number of mess and fitted with pliable wire lanyard; 2 bass scrubbing brushes; 1 set of 3 washing tubs of 22, 20 and 18 in. diameter respectively. For every 2 messes, 1 galvanized iron pail to hold 2 galls., with same percentage spare as before. For each soldier, with same proportion of spare, 1 tin plate, 1 tin pint pot, 1 iron spoon, and 1 wooden hammock tally, 6 in. by 3 in., marked on each side in large letters the number of the mess, and also a capital letter from A on, according to number of men in each mess,

and fitted with a strong grommet of white line about 12 in. long ; 2 hanging airing stoves per cent. embarked, but not more than 12, with 6 bushels of coke for each stove ; 3 sets of *Leg iron* per cent. embarked, 1 iron drinking tank, with brass cock, in each compartment, sufficient to hold 2 qrts. for each person in it. Four per cent. on the numbers embarked of the following :—bass brooms, with fixed handles ; hair brooms, with fixed handles ; combined brushes and squeegees, and white wool mops with fixed handles. For every 100 men, 2 No. 2 size shovel.

For use in wash place, three 12-in. iron enamelled wash-basins per cent. on numbers embarked.

For use on deck, 4 round wooden spittoons for every 100 men.

For use in issue room, 1 set of pewter imperial measures, quart, pint, ½ pint, gill, and ½ gill ; 1 set of tin ditto, ½ gall., quart, and pint, or 2 sets if there are over 500 men embarked : 1 set of strong spring balances, to weigh 40 lbs. by 2 oz. ; 1 pair of counter-balance scales, with weights, 4 lbs. to ¼ oz. ; 1 set of flour counter-balance scales, with weights, 4 oz. to 14 lbs. ; 6 tin scoops, with various sizes ; 2 copper pumps for porter ; 1 porter tub, to hold 20 galls. or 2, if number of men exceed 500 ; 1 cooper's hammer and driver ; 4 strong lever knives for opening preserved meat-tins, or 6 if number of men exceed 500 ; 1 claw hammer, with iron handle ; 1 meat saw (16 in.), or 2 if number exceed 500 men ; 1 meat cleaver, 7 lbs. with iron handle ; 2 large hand choppers, or 4 if number exceed 500 men ; and 1 hexagonal lantern.

For use in Hospital, 1 zinc bath, 5 ft. long, or 2 if numbers on board exceed 100 men ; 1 Fyffe's chair, or 2 if number exceed 250 ; 1 spitting cup, 1 urinal, and 1 bed pan, all of pewter, to every 100 men on board ; 2 toilet cans (2 galls.) per 100 men or less number, but never more than 4 ; 1 galvanized iron pail per cent. of men, but not more than 2 ; 1 hair broom, with fixed handle ; 2 hand bass scrubbing brushes per cent. of men, but not more than 4 ; 30 lbs. of soft soap for cleaning hospital and dispensaries for each 100 men, but not more than 120 lbs. ; 2 hexagonal safety candle lamps per 100 men, but never more than 6 ; candles for ditto, to burn 12 hours daily for all the voyage ; and 2 japanned 10-in. thermometers.

For use in Dispensary, 14-in. enamelled wash-basin, enamelled soap dish, japanned toilet can (8 qrts.), japanned receiver and swinging candle lamp, 1 of each. Sufficient candles to burn 12 hours daily during voyage ; 1 good filter of size ordered, 1 hair bannister brush, and 1 dust pan.

For use in galley, 1 poker, 1 shovel, 1 rake, 1 hook, 2 tormentors, 2 flesh knives, and 3 galvanized ladles to hold 1 pint, 1 qrt., and 3 pints ; 4 cook

knives of assorted sizes, 2 wooden tubs to hold 40 gallons each ; 2 galvanized iron pails, 2 candle lanterns and candles, and saucepans and kettles, &c., for hospital purposes as directed by Surveyor.

For use of Baker.—15 tins for baking bread (to hold 4 lbs.) for each 100 men, and in proportion for smaller numbers ; 1 each of the following, liquor tub, wood pail, 10-in. knife, hair sieve, wire sieve, dough scraper, tin strainer and bowl.

BEDDING FOR N. C. OS. AND RK. AND FILE.—It is all provided by Government. For each sergeant, 1 hammock, slung ; 1 hair bed (of not less than 7 lbs. of hair) ; 1 hair pillow (of not less than 1½ lbs. of hair), and 2 blankets ; for each soldier, 1 hammock, slung and numbered, with 2 per cent. slung as spare, but unnumbered ; and 2 blankets, with 5 per cent. spare. These blankets are not to weigh less than 4 lbs., or to measure less than 6 ft. by 45 in.

For hospital use, beds containing 21 lbs., and bolsters containing 3½ of hair for 5 per cent. of men embarked ; cots, 2 per cent. ; blankets, 10 per cent., and sheets 20 per cent. of same numbers.

FITTING A SHIP FOR HORSES.—An officer fitting up a ship for the conveyance of a mounted corps should be most particular that the men have a compartment to themselves distinct from the horses : this is indispensable on the score of health ; doors are frequently opened out between where the men and where the horses are—this is objectionable, as the effluvia of the horses should be kept from the men in every possible way. Every horse transport should have as many stalls on deck as possible, so that horses suffering below could be moved up there for a few days to recover, which they do quickly in the fresh air. There should be ample stowage-room for saddles and harness in a place specially enclosed for that purpose ; harness should be carefully packed in vats, all the iron having been previously varnished or coated with mercurial ointment to keep it from rusting. The saddle and bridle to be put in the corn sack and placed in the room allotted specially for the purpose.

There should be no water tanks on the horse decks, they are in the way, and the slightest movement near them frets the horses ; they should be in the hold with one or more pumps communicating with them from each horse deck.

Loose Boxes.—When it is possible to do so, it is advisable to have a loose box near a hatchway to admit of a sick horse lying down in smooth weather : 1 loose box is allowed for all ships carrying horses, and 2 if more than 150 horses are on board : each to be the size of 3 stalls.

There should be a dispensary with fittings for the veterinary surgeon, and a forage issuing room large enough to hold one day's allowance for the horses embarked, fitted with bins lined with tin for oats and bran.

Stalls for horses purchased in England should be 6 ft. long, from inside of padding on breast-piece, to the inside of haunch-piece, and 2 ft. 2 in. clear width between the padding on side bales; 10 per cent. should, I think, be 2 in. narrower; 5 per cent. 6 in. longer, and 2 in. wider is allowed by regulation; spare stalls at the rate of 5 per cent. of the horses embarked are allowed. All hatchways and their coamings through which horses are to be slung, must be provided with canvas linings, and padded, and straw must be provided for laying on the decks to receive the horses as they are slung on board.

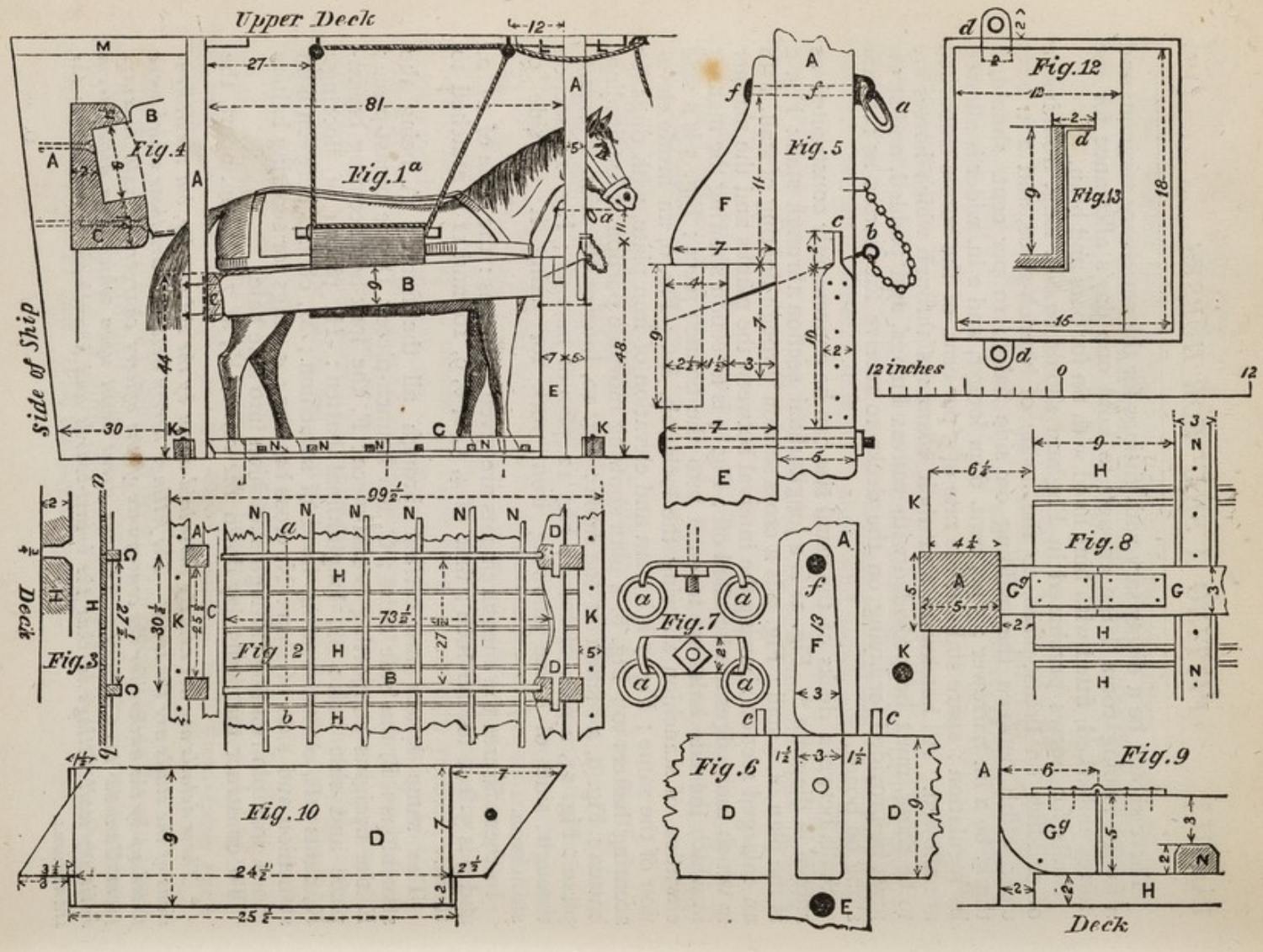
Stalls between decks of the usual size can be conveniently constructed as shown in diagram.* Fig. 1a is a longitudinal section through stall; Fig. 2 is the plan of a stall; Fig. 3 is a cross section through flooring of stall, with an enlarged section showing the interval between the planks and the manner in which their edges are bevelled off; Fig. 4 is a section showing the manner in which the side bales are tenoned into the haunch-piece; Fig. 5 is a side elevation of stanchion showing the lock-bolt, &c.; Fig. 6, an inside elevation of the same; Fig. 7 is a plan and elevation of iron plate, with rings for securing halters to; Fig. 8, a plan showing movable portion of longitudinal batten; Fig. 9, a section of the same; Fig. 10, interior elevation of breast-piece; Fig. 11, a plan of same; Fig. 12, plan of manger; Fig. 13, section through side of same showing iron work for fixing it to side of stanchion.

In these figures the measurements are given in inches: the scale of 1a 2, and 3 is 5 feet to the inch; that of 4, 5, 6, 8, 9, 10, and 11 is attached to them.

The same letters are carried through all the figures, A being the stanchions: B, the side bales; C, the haunch-piece; D, the breast-piece; E, the uprights supporting breast-piece; F, the lock-bolt securing breast-piece and side bale: G, longitudinal batten: H, planks of flooring; K, cants; L, cleats securing head of stanchion; M, chocks between hind stanchion and side of ship: N, cross battens; *a*, rings for securing halters to; *b*, iron pin running through stanchion into side bale.

To construct the stalls, lay down *the cants*, K, at 7 ft. 5½ in. apart, the

* *These details are not exactly those laid down by the Admiralty, but the dimensions of the stalls are the same. The fittings herein described are those which were fitted up by the author for the conveyance of the officers' chargers of 13th Hussars from Canada to England. The one great point upon which they differ from ordinary stall fittings is, that the breast-boards and haunch-pieces are within the stanchions.*


Upper Deck
Side of Ship
Fig.1a
Fig.2
Fig.3
Fig.4
Fig.5
Fig.6
Fig.7
Fig.8
Fig.9
Fig.10
Fig.12
Fig.13
12 inches
Deck

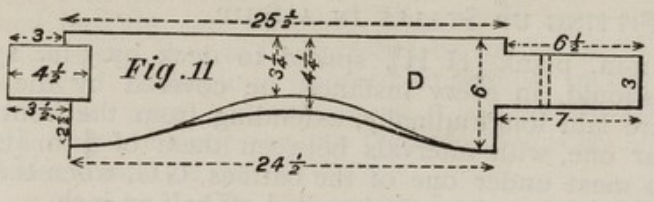


Fig. 11

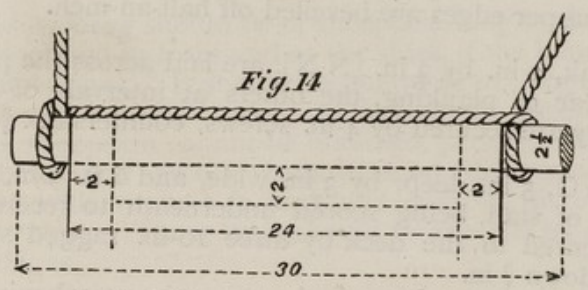


Fig. 14



Fig. 15

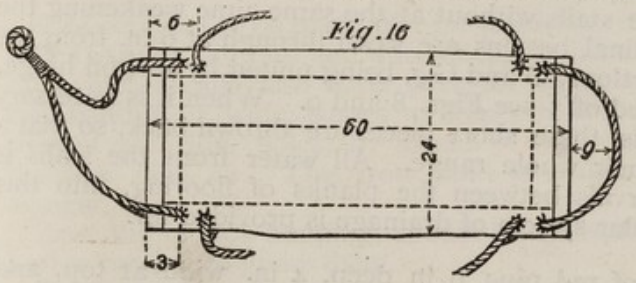


Fig. 16

outer one being, if possible, 3 ft. from the ship's side [certainly not less than 2 ft.]. They are of red pine, 5 in. by 5 in., and secured to the deck by wrought iron one-inch bolts. They are scored ¾ in. deep on the insides, at intervals of 2 ft. 6½ in. [from centre to centre of score] to receive the heels of the stanchions, AA. *These stanchions* of red pine, cut to the exact height [from deck to deck] are of the same sized stuff, and rest below on the deck, fitting into the scores in the cants; they are secured to the deck above by means of elm or ash cleats [L], and by chocks [M], extending from the hind ones at intervals of about every 10 ft. to ship's sides. The cleats are fastened to deck by 5-in. spikes; the same sized spikes are driven in obliquely both above and below to secure the stanchions to the decks.

The short uprights, E E, are next placed: they are 4 ft. long, of any sort of pine, 7 in. by 6 in., and secured to front stanchion by a ¾-in. bolt at 12 in. from top: below they are secured by spikes like the stanchions, and by the flooring, cut away to receive them.

FITTING UP STALLS IN A SHIP.

The flooring is of 2-in. plank [H H], spiked to deck by 5-in. spikes, driven so that they should, in every instance, be covered by the cross battens ; the planks are laid longitudinally, extending from the front cant to within $6\frac{1}{4}$ in. of rear one, with intervals between them of $\frac{3}{4}$ in. [except where they happen to meet under one of the battens, G G, when they are put close together]. The upper edges are bevelled off half-an-inch.

Six battens of elm or oak, 2 in. by 3 in. [N N], are laid across the planks beginning at 9 in. from rear of planking, the others at intervals of 12 in. from centre to centre ; they are secured by 4-in. screws, countersunk $\frac{3}{4}$ in.

Longitudinal battens, G G, 5 in. deep, by 3 in. wide, and 6 ft. 9 in. long, are laid along each side of stall, being scored underneath to receive the cross battens ; each is secured to the deck by three 10-in. ragged spikes, the heads being punched down $\frac{3}{4}$ in.

To facilitate cleaning the stalls without at the same time weakening the construction, these longitudinal battens are sawn through at 6 in. from the hind stanchions, the two portions, G and G*g*, being united by an iron hinge, the end of G*g* being rounded off ; see Figs. 8 and 9. When it is necessary to sweep in rear of the stalls, these short pieces are thrown back, so that a clear space is left along their whole range. All water from the stalls is carried along the $\frac{3}{4}$ in. intervals between the planks of flooring, into this space in rear, so that a regular system of drainage is provided for.

The haunch-piece, C, is of red pine, 9 in deep, 4 in. wide at top, and $5\frac{1}{2}$ in. at bottom, cut on the bevel, so as to afford a resting place for the horses' hams. It is secured to the inside of each stanchion by two $\frac{3}{4}$-in. bolts [Fig. 4], so that its top may be 3 ft. 8 in. above the deck ; it should be planed all over the top and inside, being well rounded off so as not to scratch the horses.

The breast-piece, D, of ash, 6 in. thick by 9 in. deep, is cut as shown in Figs. 10, 11. The breast-piece of each stall is thus removable ; its ends rest in the short uprights, E E [cut away to receive them, Fig. 5] ; and as they are cut diagonally, each keeps the piece on its right in its place. Fastened to the inside of each front stanchion is a lock-bolt of any hard wood, F [Figs. 5, 6], moving on a $\frac{1}{2}$-in. iron bolt, *f f* ; when down it keeps the breast-pieces and side bales in their places. The upper side of breast-piece is 3 ft. 11 in. above the deck.

The side bales, B B, should be planed all over, the edges above and below being well rounded off. They are of red pine, 9 in. by 3 in., and on a level

in front with the breast-piece, in rear with haunch-piece: behind they are tenoned into the haunch-piece [Fig. 4]; in front they slide into the short uprights, being kept in their places by the lock-bolt, F, and by the pin, *b*, of $\frac{5}{8}$-in. iron. This pin is fastened to a staple in the stanchion by a small chain 14 in. long, and passes in a sloping direction through both the stanchion and breast-piece into the side bale (Fig. 5); 15 per cent. of spare side bales should be embarked.

The padding should be of sheepskin long in the wool, put on double; it is only required in front and at the sides, if the haunch-piece has been properly smoothed over. It should be put on 24 in. lengthways along middle of side bales, and it should cover the inside and upper side of the breast-pieces. When sheepskin cannot be obtained, padding may be dispensed with on the side bales, and circular bags (shaped like a cavalry valise) of stout canvas stuffed with straw, 2 ft. long and 7 in. in diameter, may be used for the breast-piece. These bags should be secured by 4 strings at each end to the stanchions.

The mangers to be made of 1-in. planking, 18 in. long, 15 in. wide at top, and 12 in. at bottom, and 9 in. deep [all inside measurements], lined with tin, which should also cover over the upper edges; Figs. 12, 13. A $\frac{3}{8}$-in. iron band, 2 in. wide, passes underneath, the ends turning out [*d d*] being pierced with $\frac{5}{8}$-in. holes, by means of which the manger is suspended to the iron pins, *c c*. This iron band is nailed to the bottom and sides of manger.

Zinc, tin, or iron hooping, should be nailed along the stanchions wherever horses can get to gnaw them.

The horses' heads are secured by the halters of the head collars to the rings *a a*, which are fastened thus to the pin *f* [already described]. A piece of $\frac{1}{2}$-in. iron, 5 in. long, and 2 in. wide, has a $\frac{5}{8}$-in. hole pierced through the centre to admit the bolt *f*, and a hole of same size, at half-an-inch from each end. The ends are then bent forwards, and the rings, *a a*, of $\frac{1}{2}$-in. iron, and 2 in. in diameter inside, are inserted in the outer holes. A nut screwed upon end of the bolt, *f*, fastens the whole to the stanchion; Figs. 5, 7.

All the iron bolts, spikes, &c., to be of the best wrought iron.

There must be 10 per cent. of spare stalls, and there should be a loose box constructed near a hatchway to admit of a sick horse lying down.

Each stall to be numbered, the side bales, breast-pieces, and mangers, being marked with the number of the stall they belong to.

Movable shores, 4 in. by 4 in., should be provided, by means of which the stanchions can be shored up against the combing of hatchways, the masts, &c.; they should also be fitted between every 8th rear stanchion and the ship's side; these shores to abut upon the stanchions on a level with the

breast-piece. They are only to be fixed in very bad weather. In narrow ships, a few shores might with advantage be placed so as to extend from the front stanchions on one side of the vessel to those on the other side.

Four blocks for the ropes of the horse hammocks should be placed over the side bales, two at 1 ft. from the front stanchion, and two, 2 ft. 3 in. from the hind one. The front ones to be double, the hind ones single blocks. An iron belaying cleat is fastened to the deck above, opposite each front stanchion, to which the ends of these ropes are secured.

It is advisable to have as many stalls on the upper deck as possible, unless extremely bad weather is to be anticipated. They are constructed like those already described, except that they are covered in above by a sloping roof laid upon rafters connecting the stanchions.

Kicking boards should be provided at the rate of 10 per cent. of the number of horses embarked. They should be of 1½-in. deal. 8 ft. 3 in. long, and 1 ft. 6 in. broad. They should be fastened to the stanchions by 4-in. screws as required.

The horse-hammocks should be of stout web or of double No. 1 canvas, 5 ft. long by 2 ft. wide; each end passes round an ash stick, 2 in. in diameter and 30 in. long, to which it is securely stitched. It is bound along the sides by a piece of webbing or doubled canvas, so that its edges are of four thicknesses of canvas 2 in. wide. A 2-in. rope 30 ft. long is passed round each stick, in a single clove hitch, as shown in Fig. 14 [being lashed together where it crosses], so that the rope from the rear side of hammock shall be 3½ ft. longer than it is from the front side. The hammock is kept in position on the horse by a breast-band, 40 in. long, and a breeching, 56 in. long, both 4 in. wide. To keep them again in their places, a wither strap, 38 in. long, and a croup strap, 52 in. long, both 2 in. wide, are required: both should be united along the horse's back by a band, 32 in. long, and 2 in. wide; the wither strap to be attached to breast-band at 12 in. from the centre of it. The croup strap to be fastened to the breeching at 17 in. from the centre of it, all to be of stout web or double canvas. The breast-band and the breeching to fasten with stout straps and buckles to the hammock. See Fig. 1*a*.

The slings hitherto issued for embarking horses are too short and too wide: they should be 5 ft. long and 2 ft. wide, made of stout web or of double canvas, secured at each end by sticks 2 in. in diameter. The sides are frequently bound by a rope which hurts the horse, and are likely to make him restive; the same strength can be obtained by a 2 in. binding at the edges on both sides, made of stout canvas doubled. Breast and breech ropes, (2-in.) 9 ft. long, are fixed to each side, and are tied together, when the sling has been put under the horse. The loop attached to one stick is

9 in. long, that attached to the other is 2 ft. 11 in., and has an iron eye (3 in. inside measurement in diameter) fixed in the end. These loops to be of 4-in. rope. See Fig. 16.

A headstall is shown in Fig. 15: it is made of double canvas, the band going over the head being $2\frac{1}{2}$ in. wide and 35 in. from x to x measured round by x': the nose band measured from x to x, round the nose is 16 in. long and $2\frac{1}{2}$ in. wide; the forehead band, 2 in. wide, is $17\frac{1}{2}$ in. long. There are holes in the head band and face strap, so that they can be shortened by passing a string through them and tying the ends together; the throat strap is fastened by strings.

Portable horse boxes, if considered necessary, should be provided for all ships carrying mounted troops at the rate of 1 for each infry., and 2 in each cavr. ship with under 200 horses, and 3 in those having over that number to every 25 horses. They should be 63 in. long, and 29 in. wide in the clear, thickly padded all round where the horse's chest, flanks and quarters are likely to touch. They should be very strongly built, and fastened together with bands of iron running under the bottom.

In India the stalls fitted up for mules are only $5\frac{1}{2}$ ft. long by 20 in. inside measurement: care is taken that the lower edges of the front and side pieces are only $2\frac{1}{2}$ ft. from deck. The hay nets are of wire netting, and the rope portion of the headstalls also of wire; this is advisable, as mules are very destructive with their teeth. *Draft bullocks* embarked from India are given separate stalls, 6 ft. by 2 ft. *Pack bullocks* are placed 3 in a stall, each animal being allowed 5 ft. by 20 in. One attendant is allowed to every pair of draft bullocks, but 1 man can well look after 6 or 8 pack bullocks on board ship.

Elephants are usually placed in the hold, where they feel the motion less, as many as possible of the planks of the main deck being removed for ventilation. When the hold is not boarded, a temporary flooring must be made of stones and shingle, 2 or 3 ft. deep, with a top layer of sand. Three tons of sand for each elephant should be shipped for a 30 days' voyage, in order that the saturated portion may be replaced daily by fresh sand; the stones and shingle must be kept well covered to keep the feet dry and uninjured. Great care is required that the pumps used to clear out the bilge into which the urine is conducted through scuppers, are not allowed to choke with the sand made use of. Elephants are placed tail to tail, with their heads to the ship's sides. A ship with 32 to 33 ft. beam admits of two rows so placed, with a gangway between the two rows broad enough for the attendants to pass and clean up dung, &c. One fore and both hind legs must be tethered. The stalls must be of very stout stuff, and should fit the animal, about 14 ft. by 6 ft. is a good size; there should be 2 side bales on each side of stall, 1 ft. deep and 8 in. thick. One spare stall should be left amidships, close to

the hatchway, for a sick animal. It is very desirable that all animals very ill and likely to die should be moved near the hatchway, so that if they die the carcasses may be easily slung up on deck. For if an elephant dies where he cannot be so slung, he must be cut up in order to remove him, and the smell of blood and flesh excites the other animals.

Utensils for horse ships. In addition to the stores already detailed as necessary for infantry on board ship, the following articles have to be provided by the owners in ships carrying horses, mules, &c. For every 10 stalls 1 hand safety lamp complete with oil and wick. Police lamps with locks and keys in sufficient number to thoroughly light wherever the horses, &c., stand (on no account is any mineral oil to be used for lighting). For each animal embarked, 1 curry comb and 1 brush, 1 hammock complete and 5 per cent. spare, 1 canvas halter and 5 per cent. spare, 1 breast-pad and 15 per cent. spare. For every 3 animals 1 deck scraper, 1 wooden hoe, 1 iron hand-shovel (like a cinder-shovel), 1 hand rasp, 1 small basket, 1 hay net, 78 in. long by 4 ft. wide. For every 5 animals, 1 coir mat, 80 in. by 26 in. For every 5 animals, 1 canvas water-bucket and 1 bass broom. For every 10, one wooden bucket. For every 50 animals or less number, 1 mash-tub to hold 50 gals., and 2 peck measures. For every 20 animals or less, a quart and a 3-quart measure, and 1 canvas bag to hold 2 bushels and 1 to hold 3 pecks, with one of each spare for every 50 animals. Three horse-slings complete for every 50 animals, or 2 if less than 50. For each animal standing near a hatchway, 1 horse blanket 76 in. by 74 in. Shovels and rakes for arranging ballast as may be approved.

The supply of medicines for 50 horses on board ship for 3 weeks is as follows :—

	lbs.	oz.	No.
Cathartic balls	..		6
Diuretic „	..		12
Fever „	..		12
Colic mixtures	..		6
Turpentine liniment	2	0	..
Tincture of myrrh compound	0	6	..
Sulphate of copper, powdered	0	2	..
Nitre, powdered	0 per horse	1	..
Oil of turpentine	0 per week	8	..
Blister ointment	0	2	..
Mustard	3	0	..
Sulphate of zinc, powdered	0	4	..
Tow	1	0	..

	lbs.	oz.	No
Digestive ointment	0	2	..
Nitre spirits of ether	0	10	..
Tincture of opium	0	4	..
Linseed oil	..		$0\frac{1}{2}$
Clyster pipes	..		2
Bladders	..		2
Sponge	..		2
Suture-needles, wire and thread	..		6
Linen bandages	..		6
Fomenting cloths	..		4
Paper for balls	..		$0\frac{1}{2}$
Scissors	..		1
Foot-swabs	..		2
2 oz. graduated glass measure	..		1
4 ox. guaranteed glass measure	..		1

SCALE OF DAILY RATIONS FOR HORSES, &C., ON BOARD SHIP.

Daily Ration for each.	Hay.	Oats.	Oil Cake.	Bran.	Grain.	Pepper.	Vinegar.	Salt.	Nitre.	Flour or Rice.	Water.
	lbs.	lbs.	los.	lbs.	lbs.	oz.	Gills.	oz.	oz.	lbs.	Galls.
Horse*.	10	5	..	5	..	..	$\frac{1}{3}$	..	$\frac{1}{2}$	..	8
Horse†	10	4	1	4	..	..	1	1	1	..	6
Mule†	8	..	$\frac{1}{2}$	1	2	..	..	$\frac{1}{2}$	..	..	5
Ponies, Mules, and Asses†	10	..	..	$\frac{5}{8}$	4	..	..	..	..	..	5
Elephant†	170‡	..	..	..	..	..	..	$2\frac{1}{2}$	..	18–20	40–50
Camel†.	20	..	..	..	3	..	..	..	..	..	8
Bullock†	12	..	..	..	2	..	..	..	..	..	6

* According to Admiralty regulations this same ration is also allowed for mules. In addition to this ration, there is put on board for each animal daily 5 oz. McDougall's powder, 2 oz. of chloride of lime, and 2 oz. of powdered gypsum, to be used at the discretion of the O. C. as disinfectants.

† This scale of forage, &c., is according to Indian regulations. Our regulations lay down that each animal is to be fed 8 times daily, as follows: 4 times with 1 qrt. of oats and 3 qrts. of bran, and in the intervals 4 times with $2\frac{1}{2}$ lbs. hay. As large a supply of carrots as the Transport Officers may direct is to be provided in addition. Oats and bran are to be stowed in *tight* casks. Hay is to be either "common pressed" or "highly compressed," or in such proportions of each as may be ordered. The forage, &c., supplied by owners will be specially surveyed as to quality, &c. Oats must not be less than 38 lbs. to the bushel, bran 14 lbs. to the bushel. The full daily ration should not be issued, if in the opinion of the O. C. the animals do not require it. Before each feeding time the bags provided for the purpose are to be filled with oats and bran, and a measure for each bag. After the horses are fed, the bags with the measures in them are to be returned to the issuing room.

‡ In lieu of this allowance of dry fodder, 320 lbs. of green may be substituted; the fodder should consist of hay, paddy straw, stalks of plantain leaves, and sugar cane; it should be given in small quantities at a time. Chuppatees of flour are generally considered better than rice. When the Indian troops were sent to Cyprus, the grass-cutters' ponies on board-ship received $\frac{1}{2}$ the ration of forage, &c., and $\frac{3}{8}$ of water allowed for horses. Os.C. on board were, however, left a discretion on this point.

SCALE OF RATIONS PER MAN ON BOARD SHIP.

Days of the Week.	Daily.														Weekly.				
	Salt beef, oz.	Flour, oz.	Suet, oz.	Raisins, oz.	Salt Pork, oz.	Split Peas, pint.	Preserved Meat, oz.	Compressed mixed Vegetables, oz.	Biscuit, oz.	Fresh Bread, lb.	Rice, oz.	Porter, pint.*	Preserved Potatoes (uncooked), oz.	Sugar (unrefined), oz.	Tea, oz.	Vinegar, pint.	Mustard, oz.	Pickles (of various descriptions), oz.	Pepper, ground, oz.	Salt, oz.
Sunday	12	6	1	2	..	..	..	..	12	..	..	1	2	4	¼					
Monday	..	..	..	..	..	..	12	..	..	1	4	1	..	2	¼					
Tuesday	..	..	..	..	12	⅓	..	1	12	..	..	1	..	2	¼					
Wednesday	12	6	1	2	..	..	..	..	..	1	..	1	2	4	¼	⅛	½	6	½	2
Thursday	..	..	..	..	..	..	12	..	12	..	..	1	2	2	¼					
Friday	..	..	..	..	12	⅓	..	1	..	1	..	1	..	2	¼					
Saturday	..	..	..	..	..	..	12	..	..	1	..	1	2	2	¼					

* The supply of porter to be put on board is to exceed by 10 per cent. the quantity required by this scale.

All the articles are to be served out by full imperial weights or measures.

NOTES.—Temperance Men not receiving porter (or spirit, as a substitute) are each to be allowed daily 1 oz. of sugar, and ¼ oz. of tea, in addition to the quantities of these articles specified in the scale of rations;—those men who do not receive these additional quantities will be credited in office with a penny a day.

Neither porter nor spirit is to be issued to prisoners or 'Punishment Men,' except under medical advice, and with the sanction of the military C. O.

Preserved meat is to consist of beef and mutton, which are to be provided in equal quantities, and to be issued alternately.

Fresh meat and fresh vegetables are to be issued, *whenever practicable*, 1 lb. fresh meat being considered equal to 1 lb. salt meat; and 8 oz. of fresh vegetable are to be the ration. When fresh vegetables are not procurable, preserved potatoes (uncooked) 2 oz., or compressed mixed vegetables 1 oz., are to be issued in lieu.

Fresh vegetables are to be issued, whenever procurable, with salt or preserved meat, in lieu of the flour, suet, raisins, peas, compressed vegetables, preserved potatoes or rice, specified in the scales.

Fresh meat and fresh vegetables are always to be issued when in port, and a supply equal to at least 2 days' consumption, should the weather admit of its keeping, will be laid in on leaving each port.

In cases in which it may be impossible to provide fresh bread, biscuit is to be issued as the ration, in the proportions shown in the respective scales.

When fresh meat is issued, bread or biscuit, in addition to supplies according to the above scale, is also to be issued at the rate of 4 oz. of bread or 3 oz. of biscuit for each man. Oatmeal may be issued for thickening soup, when fresh meat is issued to such extent as may be considered necessary; and the extra issues are to be separately certified to.

The O. C. the troops will report to the military authorities, on his arrival in port, if he should consider that biscuit has been at any time improperly or unnecessarily substituted for fresh bread. Any articles in the foregoing scales of rations may be stopped or changed, but only in individual cases, upon the special requisition of the M.O. The scales of rations are to be regarded as generally applicable to invalids, as well as to persons in health; invalids are, however, to be provided with fresh bread *every day*. In ships carrying invalids, there is also to be provided a liberal proportion of live stock (oxen, sheep, and poultry, *but not pigs*), with provender and water for their subsistence. The extent and nature of these supplies are to be, in each case, at the discretion of the naval or other Govt. authorities at the port, and they are to be replenished, as far as may be practicable, at any ports at which the ship may touch. Issues of poultry are to be made at the discretion of the M.O.

WATER. When there is a distilling apparatus on board, water is to be issued on the most liberal scale possible; but the minimum daily allowance of water (distilled or filtered) is to be for each individual embarked, including the crew of the ship, 6 pints when out of the Tropics, and 1 gallon when within the Tropics, which quantities are to suffice them for all purposes. When Government supplies the provisions they will also supply the water.

SCALE OF SUBSTITUTES. The above scales of rations being sufficiently varied for health, are to be adhered to except as regards the substitution of fresh for salted or preserved provisions, when practicable, in the proportions shown below. In order, however, to meet cases in which it may be actually necessary to depart from the scale, a list of equivalents is appended:—

Fresh bread	1 lb.	To be esteemed equal to ¾ lb. biscuit.
Flour	¾ lb.	
Rice	¾ lb.	
Fresh meat	1 lb.	,, ,, ,, 1 lb. salt meat.
Spirits *	½ gill	,, ,, ,, 1 pint porter.
Coffee (roasted and ground)	1 oz.	,, ,, ,, ½ oz. tea.
Chocolate	1 oz.	
Fresh vegetables	½ lb.	To be esteemed equal to 2 oz. preserved potato (uncooked), or 1 oz. compressed mixed vegetables.

* When spirits are issued it is to be given to the men mixed with at least 3 parts of water to 1 of spirit, and issued in presence of the officer of the day.

Flour	¾ lb.	May be issued in lieu of each other.
Split peas	⅞ pint	
Calavances	⅞ pint	
Dholl	⅞ pint	
Rice	¾ lb.	
Oatmeal	⅞ pint	,, ,, ,, ⅞ pint of split peas.

Medical equipment, for the use of troops and crew, will be put on board of all transports as follows:—1 medicine chest complete, 1 case of surgeon's instruments, 1 case of tooth instruments, 1 stomach pump, and 1 box of fracture apparatus. If the M. O. in whose charge it is lands with the troops, he will duly hand it over to the master of the ship.

SCALE OF MEDICAL COMFORTS FOR 1000 MEN FOR ONE DAY. Provision is made in this scale for the regulated number of days' victualling in each case, *in addition* to the ordinary rations.

Brandy, bottles.	Rum, gills.*	Port wine, bottles.	White wine, do.	Preserved meat, lbs.	Prepared soup, pints.	Essence of beef, tins, ¼ pints.	Sago, lbs.	Arrowroot, lbs.	Rice, lbs.	Preserved milk, to make pints.	Lime juice and unrefined sugar, each., oz.†	Sugar, refined, lbs.	Tea, best black, lbs.	Vinegar, pints.	Soap, lbs.	Pearl barley, lbs.	Preserved potatoes, lbs.	Compressed mixed vegetables, lbs.	Pickles of various sorts, bottles.	Disinfectants.‡	Ale or porter, in pint bottles.§
1	8	8	4	3	12	50	2	4	8	20	500	15	2	2	2	3	12	3	1	++	25

* For occasional use at the discretion of the M. O.

† *Lime juice*, with sugar, is to be issued at the discretion of the M.O.

‡ *Disinfectants.—Carbolic acid* (crystallized) in the proportion of 120 lbs. for 1000 men for a year: to be in stoppered bottles, packed securely in a case, and to be placed in charge of the Master, for issue to the M.O. as required: printed directions for its use will be issued with it. *Condy's patent fluid* (crimson), in the proportion of 20 pints per 1000 men for a year: to be in pint bottles, with printed directions for use on each bottle. *Chloride of lime* (in stone jars) in the proportion of 14 cwt. per 1000 men per annum. *McDougall's disinfecting powder* (in 50-lb. casks with dredger and instructions) in the proportion of 200 lbs. for each 1000 men on board: no ship to have less than one 50-lb. cask. *Articles for fumigation: Sulphuric acid*

in the proportion of 16 oz. for ships of 1000 tons and under, and 4 lbs. for those over that size. To be in ½-lb. stoppered bottles, carefully packed in boxes, clearly marked: to be in special charge of M.O. *Peroxide of Manganese* (in stone jars) in the proportion of 1 lb. for ships of 1000 tons and under, and 4 lbs. for larger vessels. *Common salt*, in the proportion of 4 lbs. for ships of 1000 tons, and 16 lbs. for larger ships.

§ This quantity is to be increased at the discretion of the authorities at the port in the event of draught porter not being procurable in sufficient quantities as an article of ration.

BENGAL SCALE OF VICTUALLING INDIAN TROOPS AT SEA.

Articles daily.	For every cooking Soldier (not a Sikh).		For every Sikh Soldier.		For every non-cooking Soldier.	
	lbs.	oz.	lbs.	oz.	lbs.	oz.
Rice, or Atta in lieu	1	..	1	..	..	..
Dhall, Moony	..	4	..	4	..	..
Choora	..	..	..	..	..	12
*Turmeric	..	¼	..	¼	..	..
*Garlic	..	¼	..	..	..	..
*Chillies	..	¼	..	¼	..	..
*Blackpepper	..	⅛	..	⅛	..	..
Onions	..	½	..	½	..	..
Gram "parched"	..	..	..	..	..	10
Ghee	..	1	..	1	..	2
Salt	..	1	..	..	..	1
Sugar	..	2	..	2	..	6½
Tamarind	..	..	..	..	..	4
Chunam	..	¼	..	..	..	¼
Kuth	..	⅛	..	..	..	⅛
Coals or	1	..	1	..	..	..
Firewood	2	..	2	..	..	..
	gall.		gall.		gall.	
Water	1	..	1	..	1	..
Eating tobacco	..	⅔	..	..	..	⅔
Smoking do.	..	1⅓	..	..	..	1⅓
				dram.		
Coriander seed	..	..	..	1	..	..
Cummin seed	..	..	..	½	..	..
Cloves	..	..	..	½	..	..
Oil per week	..	4	..	4 oz.	..	4

* One-half oz. of "mixed currystuff" may conveniently be supplied in lieu of these articles.

Three-fourths of the above scale to be shipped for followers. Rations for non-cooking soldiers for one-fourth of the voyage should be shipped besides for the whole detachment, for it will be found convenient to give all the men, or to such as demand them, rations for non-cookers for the first day or two, until they become accustomed to board-ship; besides, in wet or stormy weather, it may not be possible to cook, and in cases of sea-sickness, rations for non-cookers are necessary. For Sikhs or Punjabees potatoes or some kind of vegetables should be shipped instead of dhall, for issue 3 times a week, and one dram of rum per man per diem for issue upon payment, at discretion of C. O.

EMBARKATIONS take place always under the immediate superintendence of the G. O. C. at the port. They should be conducted with all practicable speed, and as soon as the duties of the S. O. superintending the embarkation in connection with each ship are finished he will at once inform her captain, or the naval transport officer, if there is one present, to prevent any undue delay in the sailing of the vessel. Under ordinary circumstances, if the voyage is to be a long one, it is advisable that the ship should not leave until the day following the embarkation.

The ship being reported by the naval authorities as fit for the reception of troops, an inspection is to be made of her fittings, &c., by a Board, consisting of the following officers: a S. O. (who should have had considerable experience in the requirements of troops on board ship), another military officer (not under the rank of a captain), and 2 naval officers. The P. M. O. of the station, and always when practicable the M. O. in charge of the troops to be embarked, will accompany the Board, and will express their opinion on the sanitary arrangements.

This inspection will, as a general rule, take place at the port to which the ship may first proceed for the embarkation of troops. At any subsequent port of embarkation the ship is not to be subjected to any further formal inspection before the troops embark; but only to the visit of the military O. C. at the port, to ascertain whether any cause of complaint on the part of the troops exists, or whether the Transport Regulations have been departed from.

Immediately after the inspection, a report, on the form given below, is to be made out in duplicate, and signed by all the inspecting officers. One copy is to be forwarded to the Director of Transport Services, the other copy to the O. C., the district in which the inspection may be held, for his information (and directions if necessary), and for transmission by him, together with his remarks, to the C. of the S. of the force embarking, or if in England to the Q. M. G. of the Army.

REPORT OF THE INSPECTION

Of the hired ship , fitted at , for the conveyance of troops from to , and now lying at .

1. Tonnage (gross, if a steamer).
2. If a steamer, horse-power of engines.
3. If Board of Trade certificate is on board.
4. Name of master.
5. When accepted.
6. Height between decks in ft. and in., poop, main, lower and orlop.
7. No. ordered to be embarked.
8. Officers' mess-place and cabins, if complete and properly furnished.
9. Officers' mess—if proper arrangements have been made.
10. State of hammocks and bedding for the troops, and if a proper supply is provided.*
11. Number of berths for sick, if sufficient, and supplied with proper bedding.
12. Prison accommodation, if satisfactory.
13. Troop decks, cabins, &c., if in a clean and proper state for the embarkation of the troops.
14. Hammocks and bedding, if a space has been allotted for their stowage on deck, with painted covers for their protection in bad weather.
15. Mess tables and stools if they are in place.
16. Mess utensils, if all the articles required by regulations are provided, and in good order (see lists given at page 190).
17. Arm racks, and stowage for valises and accoutrements, if satisfactory.
18. Place for helmets, if provided.

	Tons at 40 cub. ft. per ton measurement.
19.† Space for regtl. baggage	
,, camp equipage	
,, other stores	

20. If the proper space for the baggage and other stores is clear and ready.
21. Medicines, if on board.
22. Disinfectants, and articles for fumigation, if on board.
23. Ventilation, if satisfactory, and windsails if hoisted and trimmed.
24. The cooking galley for the troops, if complete and adequate, and if arrangements for the cooking are satisfactory.
25. What number can be cooked for at one time?
26. Coals for cooking, for how many days provided?
27. Arrangements for the issue of provisions and water, if satisfactory.
29. For what number of men the ship is provisioned, and supplied with water, and for what period of time.
30. Is the distilling apparatus in good working order, and what number of galls. of fresh water can be distilled by it daily?
31. Are the arrangements for baking bread satisfactory, and for what

* If issued from a Govt. Depot, the provisions, bedding, &c., are not to be examined.

† 100 cub. ft., or 2½ tons naval measurement, are allowed for every ton weight of baggage sanctioned for troops by H.M.'s Regulations.

number of men can it be baked 4 times per week?

32. Have provisions, medical comforts, and water, been examined, and found complete and good?*
33. Are the fire-stations, routine, victualling scales, &c., hung up where they can be seen?
34. Ammunition, whether sufficient magazine space is provided and properly fitted and secured.
35. Tarpaulins for hatchways, if approved.
36. Awnings, if approved, and whether they have been spread.
37. Latrines, urinals, and wash-place for troops, if satisfactory.
38. Fyffe's water chairs for the use of troops, if satisfactory.
39. State of the well.
40. Number of boats, and how many persons they would carry.
41. State of the boats in case of emergency, and if provided with 2 plugs fitted with lanyards.
42. Size of hatchway for horses, ft. in. by ft. in.
43. Height of horse deck.
44. Number of horses to be conveyed.
45. No. of stalls.
46. If there is 2 spare stalls for every 5 horses.
47. Stores for horses, if all the articles (required by regulations as detailed) at page 200 are provided, and in good order.
48. Places for saddles, &c., if provided and satisfactory.
49. Are forage scales hung up?
    No. of days' consumption on board.
50. Forage—Oats.
    ,, Hay.
    ,, Bran.
    Water.
    Vinegar and Nitre, if sufficient quantities are provided.
51. If arrangements for the accommodation of the troops are satisfactory.
52. Are all the documents and forms on board?

* If issued from a Govt. depot, the provisions, &c., are not to be examined.

REMARKS BY THE BOARD.

Dated at this day of , 18 .

Naval Inspecting Officer. Military Inspecting Officer.
Do. do. Do. do.

REMARKS BY THE MILITARY MEDICAL OFFICERS.

The P. M. O. of the station.
M. O. in charge of troops to be embarked.

Final Inspection.—At the last port at which troops may embark, as soon as possible after they are on board, and before the ship proceeds to sea, a final inspection of her is to be made by the following officers: 1 military F. O.* (not belonging to the corps embarked), another military officer, not under the rank of a captain, and two naval officers. A military M. O. (not in charge of the troops embarked) will express his opinion as to the sanitary arrangements. Before beginning their inspection they should

* *He should be if possible a S. O. of considerable experience.*

inform the O. C. on board, and request him to accompany them. The report to be in duplicate, and dealt with in the same manner as the 1st report.

REPORT OF THE FINAL INSPECTION

before sailing of the hired ship now lying at having on board troops for

1. Has the memo. of Equipment been received by Military O. C.? or is it in possession of the Transport Officer on board?
2. ARMS.—Are they placed in the racks provided for them?
3. VALISES AND ACCOUTREMENTS.—Are they stowed in the places provided for them?
4. HELMETS, &C.—Are they stowed in the places provided for them?
5. HAMMOCKS AND BEDDING FOR THE TROOPS.—Have those for present use been issued?
   Are they stowed in the places allotted?
   Are those on deck provided with pointed covers for their protection?
6. MESSES.—Have the troops been told off to the tables allotted to them?
7. PROVISIONS AND MEDICAL COMFORTS.—Are the arrangements made for "getting them up," and issuing them, being carried out?
8. COOKING.—Are the arrangements being carried out?
9. FUEL FOR COOKING.—Are the arrangements for providing it and supplying it to the cooks being acted on?
10. FIRE REGULATIONS.—Have they been read to the troops by the Military C. O., and has their attention been called to the printed copies hung up between decks?
11. BAGGAGE, REGIMENTAL STORES, CAMP EQUIPAGE, &C.—Are they properly stowed in the appropriate places (if not, the reasons to be stated)?
12. LATRINES.—Have proper arrangements been made for keeping them clean? viz.—
    Those for officers;
    Those for men.
13. TROOP DECKS.—Are they perfectly clear of baggage, stores, &c.?
14. HORSES.—Are they in the places provided for them?
    Are the proper number of spare stalls available?
    Are the stores provided ready for use?
15. FORAGE, DISINFECTANTS, &C.—Have proper arrangements been made for supplying and issuing it?
16. SADDLES, HARNESS, &C.—Are they stowed in the places provided for them?
17. Is the ship in all respects ready to proceed to sea?
    Remarks by the Board.

Dated at this day of 18

Naval Inspecting Officer

Do. do.

Military Inspecting Officer

Do. do.

Remarks of the Military M. O.

N.B.—The above reports are only made upon hired transports. No Inspection report is made when troops are to embark in H.M.'s ships.

RETURNS REQUIRED BY CAPTAINS OF SHIPS.—Immediately on the embarkation of troops in H.M.'s ships of war or commissioned troopships, the under-mentioned returns are to be furnished by the military C. O. to the commander of the ship, in order that each person may be entered on the ship's books, and that no delay may take place in the issue of their provisions :—

I. A nominal list of officers embarking, according to seniority, showing also the appropriation of the cabins.

II. A numerical list of staff sergeants.

III. A numerical list of N. C. Os. and men—not including S. Sergts., specified in II.

IV. A list of temperance men embarked, distinguishing those who wish to receive tea and sugar.

V. A return of all ammunition which may accompany the troops on board.

When troops embark in a hired ship, the foregoing information is also to be furnished by C. Os. to the master of the vessel, except that numerical lists only of the officers need be given. The superintending S. O. will furnish the O. C. the troops on board of each ship with all the blank forms he will require during the voyage. Dinners for the day on which the troops embark to be always prepared on board unless orders are given to the contrary by the military authorities.

The transports having been told off for so many men and horses, the force to be embarked in each must be named by the C. of the S. in the most convenient manner, so as to keep corps, or units of them, such as squadrons and companies, as much together as possible ; each unit to be complete in itself, having its regimental transport, &c., in the same ship with it, so that, when disembarked, it may be at once ready to fight or to march inland some miles to camp or bivouac. Too much stress cannot be laid on this point, for nothing is more fatal to efficiency than the system frequently followed in past wars by our storekeepers and commissaries—and still advocated by many of them—of placing the men in one ship, their food in another, their camp equipment in another, their carts in another, the horses for the carts in another, and so on. If 4 ships, say, are necessary to convey a battalion with all its equipment for field service to the point where the landing has to be effected during war, it is in my opinion essential that each ship should contain so many companies, according to the carrying capacity of each ship, who should have with them—in accordance with the nature of the operation to be undertaken upon landing—every necessity to enable them to act efficiently the very hour they disembark. The theory that I have heard propounded by some of the ablest men we have in charge of stores, 'that in every war we undertake, it would be necessary to collect our *materiel* at the point of disembarkation before despatching our fighting men to it,' is the theory of the storekeeper, and not of the S.O. who has had much war experience ; it is opposed to all sound military principles. The artillery with us has hitherto been the only corps permitted to embark with

each unit of its organisation complete on board the same ship, instead of having its guns on board one ship, the horses in another, and the men in another. It is to be hoped that the next time we have to undertake an operation like our landing at Old Fort in 1854, our infantry as well as our artillery may disembark with its regimental transport, &c., so as to be ready for immediate service. Every little detail for the embarkation must be put on paper in the form of an order by the responsible S.O., and communicated by him to all concerned. The larger the force the more this is necessary. In doing so, he must make his arrangements with the senior naval officer on the spot.

Sea-kits.—When troops are ordered for embarkation, every O. C. will at once obtain by requisitions from the Army Clothing Department an ample supply of necessaries to enable his regt. upon disembarkation to take the field at once complete in every respect. If the voyage is to be to any of our stations in Asia, it is usual to *issue free* to each man embarked, 1 drill frock, 1 pair of drill trousers, and 1 white cap cover for use on board ship. In peace every soldier is obliged to pay for the following articles when embarked for the Mauritius, Ceylon, Straits, China, or India in ships going round the Cape, 1 serge frock, 1 pair of serge trousers, 1 cotton handkerchief,* 8 pieces of marine soap, 4 pieces of yellow soap, 3 balls of pipeclay, 2 tins of blacking,* 1 scrubbing brush,* 1 clasp knife* (for corps not already in possession of), 1 clothes bag, 1 housewife, 1 blue worsted cap, 1 flannel shirt* in addition to kit, and 2 cholera belts.* For those that smoke, 3 lbs. each of *tobacco* to be provided regimentally. When troops go to these places by the Suez Canal, the handkerchief and the extra shirt is dispensed with, and only 5 pieces of each sort of soap, and 1 of pipeclay and of blacking are necessary. For troops going to South Africa, only 4 pieces of marine and 2 of yellow soap are necessary, and in addition to the articles already enumerated as unnecessary for voyages via Suez, those marked with * are dispensed with, and the free issue above described is not allowed. For regts. embarking for active service, beyond the kit described at page 30, it is not desirable, except for long voyages, that any special sea-kit should be provided.

Inspection of troops ordered to embark.—When troops are ordered on active service, they will be carefully inspected by the G. O. C. the district or station, with a view to ascertain their general efficiency and the state of their equipments ; all deficiencies in the equipment required for field service to be at once made good. They will also be inspected by a M. O., and all unfit for the work of a campaign should be forthwith sent to their regimental depot. The P. M. O. should also inspect them as near the date of embarkation as possible. All very old horses, those of delicate constitutions,

and those deemed unfit for hard work, either sent to the depot or cast. All horse equipment, harness, and waggons, &c., to be minutely inspected by the local G. O. C., who should be held responsible if upon landing any of the field equipment is found to be defective in any way whatever. Embarkation can, I think, be most conveniently considered under two headings, remembering always that the operation is merely the preliminary to the still more serious operation of a disembarkation with a view to immediate active service against an enemy, and that consequently every arrangement made for embarkation should be made with this object in view :—

1. Embarking when there is no chance of being interrupted by the enemy.
2. When an attack by the enemy is possible, or the embarkation is to take place in his presence.

1. EMBARKING WITHOUT ANY CHANCE OF INTERRUPTION.—When a large force has to be embarked, the greater the number of ports made use of the easier will be the operation, and the more quickly it will be effected. If the transports can be brought alongside quays or wharfs, the work is greatly facilitated. The more numerous the wharfs or embarking places made use of the better, and it is an advantage that there should be at least 200 yards between each. They should be numbered from right to left, and the number of each should be painted in large figures on a sign-board to mark its position, and to prevent troops intended for say No. 3, going to No. 5 wharf, &c. When embarking from an open beach, posts, or other signs, should be erected, each, as in the case of wharfs, being numbered, to distinguish them. The nature of the locality will indicate which should be used for stores, cavalry, infantry, and R. A. If there is time, a few stages should be run out into sufficiently deep water for the boats to come alongside ; this is all the more essential if there is a surf.

If there are no quays or wharfs, the troops must be taken out to the ships in boats ; small steamers, such as gunboats, are very useful for this purpose. If the embarkation is to be in a bay or harbour where the sea is calm, long piers formed with pontoons, casks, or boats, are most useful, and facilitate the embarkation immensely. We used them to great advantage at Balaklava, when the army embarked in 1856. Horses can, in this manner, be walked out to the ship's side, and slung thence on board. These piers can be shifted about with great ease from one vessel to another. In drawing up the orders for embarkation, the following points must receive attention, and instructions be issued regarding them :—

The name of the S.O. who is to attend, the hour each corps is to be drawn up, how formed, the route it is to follow in marching to the place of embarkation, care being taken that the several corps do not cross one another in doing so : the number of the wharf or quay where they are

to embark, and the name and number of the transport in which each is to embark ; the dress to be worn, whether rations, and what sort, are to be issued on shore, amount of ammunition and camp equipment to be taken on board with each regiment, the amount of baggage, the order in which the men embark, entering into special directions about how the men go into the boats and get out of them, if boats are to be used. The hour of the tide's ebb and flow must be considered. The nature of the service upon which the troops are to be employed, and the climate in which operations are to be carried on, must greatly influence these matters ; as also, whether they are to land in a friendly country or a hostile one, and if the latter, whether the landing is likely to be opposed or not. It should be remembered that whatever it is desirable to land first, should be embarked last ; and that, in fine, the result of the subsequent disembarkation, if it is to be effected in the presence of an enemy, or where an action will be fought immediately, will in a great measure depend upon the manner in which troops have been provided with the required means for landing quickly. If boats are used in embarking, the men should take off their valises on getting into them ; they must be warned to remain perfectly quiet, and the strictest silence must be enforced, the officers and N.C. Os. being duly distributed throughout them. When a regiment or detachment proceeds on active service in the field, the embarkation of soldiers' wives is altogether forbidden.

If possible, the C.O., adjutant, and Q.M. of each corps should go on board the transport about half-an-hour before the men. The exact position of each company can thus be marked in chalk on the mess-tables, so that according as the men come alongside, they can be marched down to their places at once, where they are to sit down, holding their valises and rifles, and remain there until ordered to move, the strictest silence to be maintained. The men to be told off by the O.C. the corps to be embarked into messes before leaving the shore, according to the size of the tables ; 8 men to each mess is the almost universal number. The rifles should then be passed along a line of men, and put into the racks by companies, barrels inwards, and the valises placed by the men in the battens over their mess places ; if the ammunition is to be left in the pouches, they must be sent below and stored in a magazine, but it is generally better to take out the ammunition and put it there, hanging the pouches over the mess place. A label should be pasted on the side of the butt of each rifle, showing the owner's name and number, and another on the heel of the butt with the number of his company. The sea-kit bags to be stowed in the racks provided for that purpose. The mess utensils will be placed on the tables before the men go on board. When a separate galley for the exclusive use of the troops is provided, the cooking must be done by the men ; otherwise it will be done by the ship's cook, assisted by the men. The cabins will be

allotted to the officers to be embarked by the S.O. superintending the embarkation, according to seniority of army or relative rank.

Embarkation of horses.—HORSES require great attention *at the time of embarkation*, and while they are on board ship; and every officer of mounted corps has a most important duty to perform on these occasions, on which depend, in fact, the means of his being usefully employed in the field, when he reaches his destination. Horses should be kept in a cool state before embarking, and should be put on board ship rather low in flesh than in too high condition: in which latter state they are more disposed to be fractious and to kick, and are, moreover, more liable to inflammation.

Long, slow, steady work is to be given to horses previously to their embarkation. They are to be kept fasting and without water for some hours before being put on board, as slinging them is more likely to prove injurious when their bellies are distended with feed; and they will sooner become reconciled to their change of quarters, and take to their feed on board, when these measures have been adopted. As a rule it is not advisable to remove the shoes, indeed if the horses are to be used immediately when landed, it would be impossible to take their shoes off.

Horses to be embarked should be drawn up by troops as near the point of embarkation as possible, their saddles or harness taken off and packed in vats or large sacks (the corn sack does very well), the ship head-collars being put on; the farrier sergeants will inspect the horses' feet and shoes. The men having stripped their horses, &c., the Right Files, leaving their horses in charge of Left Files, will go on board if the vessel is alongside, and put their arms, &c., in the places assigned for them, returning to shore in fatigue dress. The Left Files will then do the same. If there are many dismounted men, they can be used as horse holders, whilst the others go on board to stow away their things. If the horses have to walk on board by a floating wharf or brough, the planking should be strewn with straw or grass, and the quietest horses always led in first.

Before commencing to ship the horses, the slings should be examined, to see that they are strong and in good order; 5 men are required to sling a horse quickly and well; one man holds the head-guy, which is made fast to the ship's head-collar; 2 men, one on each side of him, one of whom holds the sling, and passes the band under his belly to the other man; both men then hold up the ends over his back passing the long loop through the shorter one, and hooking on to the lifting tackle to it, both hold up the sling until the horse's legs leave the ground; another man stands at the breast and fastens the breast-strap, and the fifth man stands at his rump and fastens the breaching; the officer superintending gives the word 'hoist away.' The first man slacks away at the guy-rope, just keeping it sufficiently taut to keep his head steady.

He is to be run up from the ground at a rapid rate; and, after attaining the necessary height, be carefully and steadily lowered down the hatchway. An officer and 6 active and resolute men must be on the horse-deck to receive the animals, and if they are to be sent down to a lower deck, men must be stationed at the hatchways on each deck to see that his head, legs, and tail are not injured in descending to the deck where he is to be stabled, and where a soft bed of straw must be provided for him to alight upon. As soon as his legs feel the deck the sling is to be removed: on first feeling his legs, unless firmly handled, he is apt to plunge and kick violently. He is to be at once placed in his stall, the far ends of the ranges of stalls being filled up first, care being taken to place the horses as far as possible in the order they have been accustomed to stand in stables. Kickers should be placed in end stalls, and the kicking boards put up at once.

When the transports cannot come alongside a wharf, the horses must be embarked in boats or flat-bottomed scows made for the purpose. The dragoon should accompany his horse, his kit being in the scow also. Whilst there he should be in his shirt-sleeves if the weather permits, but under no circumstances should he be encumbered by his accoutrements. If embarked from a wharf, they should be walked on board by means of a brough or good gang-boards, the quietest being always embarked first. If the gang-boards have to be placed at a great slope, good battens should be secured at distances of 18 in. along them. These broughs should have planked sides 3 ft. high. Stubborn horses must be blindfolded and led with their heads up to the brough, when by means of a plank placed behind their haunches, and held on each side by a man, they can be forced forward without hurting them. When the size of the hatches permits, it is desirable to provide sloping gang-boards, similarly fitted with battens, down which the horses can be led from the upper to the lower decks.

In embarking artillery or land transport, care must be taken that each unit of the organisation is complete on board the same ship, and that under no circumstances shall a gun or a waggon be on board one ship, whilst the horses for it are in another. The guns and waggons should be put on board before the horses. The harness should, if possible, be packed in large vats and kept in a dry place on board. Tags specifying the No. of the waggon for each set of harness to be attached to the vats; the wheels will be taken off before embarkation, the linch-pins and washers to be carefully put away by the N.C.Os. of each division or sub-division. All small gear to be carefully collected, tied together, labelled and stowed in the store-room provided for it. As a rule, transport waggons need not be taken to pieces, and when practicable, they should be hoisted on board, loaded.

In embarking horses into boats from an open beach, every effort should be made to construct some sort of stage. If the water is shallow for 50 or 100 yds. out, these stages should be erected where the boats, when laden,

will float, the horse being walked through the water to the stages and thence into the boats.

The men should stand to their horses' heads whilst in boats, or if they admit of the horses being placed athwartships, heads and tails alternately, the men should sit on the gunwale, holding their horses by their head-collars.

Embarkation Returns.—As soon as all men, guns, &c., to be embarked in any ship are on board, a detailed return of them is to be made out by the O.C. on board, and given in duplicate to the S.O. superintending the embarkation, by whom it will be verified with the least possible loss of time, and sent on to the C. of the S.

THE VOYAGE.—There is no situation in which the troops more urgently require the personal superintendence and care of their officers, or in which the strictest conformity to regulation is more necessary, than on board ship.

The command of the troops on board ship is vested in the senior combatant officer doing duty with the troops, to whatever arm of the service he may belong. He is equally bound to exercise that command, and equally responsible for any breach of discipline which may occur, whether the officers and men embarked with him belong to the same regiment with himself or not. On board any of H.M.'s ships the senior military officer is, in regard to the command and discipline of the officers and troops under his orders, subject to the authority of the captain of the ship, according to the Naval Discipline Act, 1866, and H.M.'s Order in Council, dated 12th December, 1873 On board of hired ships the O.C., while taking care that discipline is observed by the troops, is to remember that the master of the ship has lawful authority to maintain good order amongst all on board, and in all matters necessary to ensure the safety of his ship, for which he is entirely responsible. It is most important that the master, the C.O., and the M.O. in charge should carry out their respective duties in harmony, in order that what is necessary for the maintenance of discipline and the comfort of those on board may be arranged without undue interference with the duties of the ship. The C.O. is to pay attention to every requisition, consistent with the good of the service, made to him by the master. In case of fire or other emergency, the C.O. must specially remember the responsibility of the master, and render him every assistance, without attempting to take the command out of his hands.

Immediately after embarkation a guard is to be appointed to furnish sentries, orderlies, special duty men and police. The number of these, and consequently the strength of the guard, will vary with the number of men embarked, but must be settled by the C.O. in consultation with the master and the embarking S.O. When a large number of troops are embarked, the following are necessary; but the numbers will be modified as circumstances may require:– 1 officer of the day, and 1 sentry in each of the following places: on each side of the forecastle, on the quarter-deck, over each latrine and washhouse, on each entry port and gangway

(when in port only), and over baggage room. The number of orderlies, cooks, bakers, sergts. in charge of troop deck, lamp trimmers, hammock-stowers, of swabbers to clean the troop latrines, officers' W.Cs. and troop decks, will be fixed as found necessary.

A trustworthy sergeant and a sufficient number of men, according to the numbers embarked, must be told off as "police." Their principal duties are to see that there is no smoking except on the upper deck, and that "lights" are put out at the proper time. They are also to see generally that the routine is carried out, and that there are no irregularities.

In hot weather the bedding is to be aired as frequently as possible.

The troop decks are to be cleared of all persons from 7.45 A.M. to 11 A.M., except those detailed for the purpose of cleaning it.

The cowls and other arrangements used for the thorough ventilation of the ship are to be carefully attended to. Wind-sails, especially in hot climates, are to be kept hoisted and trimmed, and care taken that the ends of them below deck are not tied up by the men. In ships fitted with Edmonds' system of ventilation, strict attention is to be paid to the "Directions," and while the troops are embarked, the steam is to be turned on for a quarter of an hour during every hour in the first and middle watches, and at such other times as may seem desirable, according to circumstances. The sergeants of troop decks are responsible for the general good order and cleanliness of those portions of the deck and the messes under their charge.

ROUTINE FOR TROOPS, BUGLE CALLS, &c.—The regular morning parade is 10 A.M. On Sundays the troops are to be ready for Divine Service by 10.15 A.M. Smoking is allowed on the upper deck only, and is strictly prohibited between decks. Spittoons will be provided, and spitting on the deck or over the side is forbidden. All tobacco pipes are to have wire covers to guard against risk of fire through loose particles of burning tobacco flying about. In bad weather and when practicable awnings will be sloped to shelter officers and men while smoking.

GENERAL CALLS.

Ha'lt	Silence—Every one to remain still.
Advance	Carry on—that is, continue your business.
Retire	Every one off upper deck but the watch of troops.
4 G's	Sweepers.
4 G's and double	Swabbers.
Alert, followed by halt . . .	Man overboard.
Cease firing	Leave off smoking.
Commence firing	Permission to smoke.

FIRE CALLS.

Alarm (prepare for Cavalry) .	Fire.
Commence firing	Heave round the pumps.
Cease firing	Avast heaving the pumps.

Time.	Bugle Calls.	Meaning.
A.M.		
6·0	Reveille	Turn out and stow hammocks; bedding for airing taken on deck.
6·30	Ration	Cooks draw breakfast.
7·0	Breakfast	Sit down to breakfast.
7·30	Rise	The day watch will go on deck clean. The watches below will clean their messes and troop decks, and then themselves, after which all but the mess orderlies and troop deck swabbers go on deck, and remain there till after the inspection.
8·0	Fall in, followed by one, two, or three G's	Day watch of troops fall in. This watch will be on duty till 8 P.M.
10·0	Assembly	Parade. All the troops, except the cooks and mess orderlies, fall in on upper deck for inspection. The military officers of the day inspect troop decks and messes to see they are clean and in order.
10·30	.. .. ..	Aired bedding to be rolled up and stowed.
11 30	Ration	Cooks draw dinner. Up porter.
NOON.	Dinner	Sit down to dinner.
P.M.		
0·30	Grog	Issue of porter under superintendence of officer of day.
1·0	Four G's	Sweep-out messes, and take all dirt to ash-shoot in waist. Sweepers fall in and sweep all decks.
1·30	Rise, and then fall in, followed by one, two, or three G's	Troop decks to be cleared for sweeping. Watch to fall in. When troop decks are cleared up, bugle will sound, and all but the watch on deck can go below.
4·0	Ration	Cooks draw tea.
4·30	Supper	Sit down to supper.
5·0	Rise	Clear troop decks of all but swabbers and mess orderlies, who will sweep out the messes and decks.
5·30	Quick	Take down hammocks.
8·0	Close	Clear up decks for the night.
8·0	Fall in, followed by one, two, or three G's	Night watch of troops fall in. This watch will be on duty till 8 A.M.
8 15	Lie down	Lights out. Every man to be in or on his hammock.
8·30	——	Rounds by the officer of the day and police.
9 0	Retire	Every one below but the watch of troops and sentries.
11·0	——	Lights out in saloon.

Horses on board Ship.—The hammocks should always be kept round the horses, but just clear of them: the ropes will be securely fastened, so that if the horses lose their footing, they might be saved from falling down; but the weight of the horses should not be put on the hammocks with the intention of resting them except in very fine weather. For the first few days on board ship, food is to be rather sparingly given, and bran is to form the larger portion of the horse's food; but after he becomes reconciled to his altered circumstances, and as his appetite increases, he is to be more liberally fed. Horses should be watered three times a day. One feed a day of 2½ lbs. of carrots is invaluable for sick horses. The head-collar supplied by the ship is the only safe fastening on board, and there should be two shanks to each collar. The horse's head should be tied rather short than otherwise, and there should be several spare collars on board. When mules are embarked, chain collar shanks instead of rope should be used. In rough weather, if the vessel should labour very much, it will be found necessary to have all the men who can be spared to stand to their horse's heads, as the horses will be less disposed to be frightened when the men are near them. Fine cinders should also be sprinkled under each horse to give him firm hold. Too much attention cannot be paid to the constant trimming of the wind-sails, which must be kept full to the wind. Sickness amongst the horses is invariably greatest where there is most motion, as in the fore and after part of the ship; for the same reasons horses suffer most in rough weather. A high temperature is not necessarily injurious, provided the atmosphere is pure, and the horses are not exposed to direct draughts of cold air; but they suffer most when exposed to rapid changes of temperature. Care is to be taken to throw a stream of fresh air down the fore hatchway by means of the wind-sails, the lower ends of which are to be carried to within about a foot of the flooring. Nothing is to be permitted to be on the decks which is likely to interfere with the thorough passage of the air, or choke up the apertures to the ventilators. Air scoops are provided for each scuttle for use in hot weather. It is impossible to pay too much attention to cleanliness. No dung or urine is to be allowed to remain in the stalls or decks. The dung should be at once carried in the baskets to the nearest appointed place for throwing it overboard. The urine, when it does not flow overboard, is led down into the bilge in the engine-room, and pumped out by steam. When not steaming, the donkey-engine will pump it out. When the urine is led into tanks, it is necessary to pump out the tanks every four hours. Great care must be taken to prevent the scuppers being choked; if it does happen the master should be informed, and he will have them cleared by means with which he is provided. The horses should be shifted daily from stall to stall by means of the spare stalls, and the platforms lifted up, and the deck cleaned underneath them. The horses themselves should be well groomed and rubbed. Vinegar is provided for sponging their nostrils, &c.

In many cases it is possible to bring the horses out on the decks, coir mats, provided for that purpose, being first laid down. This is very beneficial to them. Loose boxes are provided for sick horses, and there are portable boxes on board fitted with slings, by means of which horses can be sent on deck for an airing, or shifted about

as required for their health. On these occasions the boxes should be placed "athwart ship." Veterinary slings are also provided for sick horses.

The arrangements for watering are from pumps fitted on each stable deck. A large tub is provided for each pump: this tub to be filled, and the iron buckets dipped into it and the water carried round to the horses. These tubs are also to be used for bran mashing. The pumps are to be kept locked, and to be only used for watering the horses. A stable guard to be told off as soon as the men are embarked. The decks are lit up all night.

STABLE DUTIES. *Morning Stables.* Rake the stalls well out to the rear, sweep up the passage behind the horses, and sprinkle disinfectants, water the horses, sponge nostrils, eyes, &c. Feed with hay, after watering, and then with oats or bran as ordered.

Mid-day Stables. Shift horses into spare stalls, and out on to the deck when practicable, pick out and wash the feet, examine the shoes, any loose shoes to be fastened at once, and slight injuries attended to, thoroughly groom the body, brush, and hand rub the legs, brush out the mane and tail, and sponge nostrils and face. Each stall to be thoroughly cleaned, platform raised and cleaned. Deck underneath dried, and disinfectants freely used. When the horses are clean, water, and then feed with oats or bran as ordered. After dinner the horses are to be fed with hay for an hour.

Evening Stables. Rake the stalls well out, sweep up, sponge nostrils, &c., as in morning stables. Water and then feed with oats or bran as ordered. Stablemen to feed horses with remaining portion of hay.

IN THE SECOND CASE, WHEN THE EMBARKATION HAS TO BE EFFECTED IN THE PRESENCE OF AN ENEMY, as the English had to do at Corunna, the sick, all stores, carriages, horses, and other material, are to be placed on board first. Circumstances must decide the order in which the guns and men are to be embarked. The possession of a small land fort, which prevents an enemy from approaching the point of embarkation, is of great value in such an operation.

It is a most trying one, under any circumstances; but the fire from the fleet (which it is taken for granted will be at hand) ought to keep the enemy at a distance. For this reason a low, flat, open beach is the best suited for the purpose; one with high cliffs which cannot be seen over would prevent the fleet from protecting the flanks or sweeping the front of the embarking army.

Disembarkations.—In all disembarkations, the S. O. who has to make the arrangements, must state, in his memorandum of instructions, the manner in which it is to be carried out, the hours the several corps are to leave the ships, in what order, and by what means, &c.; the clothing to be worn, the rations cooked or uncooked, the ammunition, camp equipment, stores, &c., &c,, to be taken by the men, or put ashore with them for their

use. The nature of the service on which they are to be employed will enable the G. O. C. to settle all these important matters. The senior naval officer on the spot must be consulted, and all arrangements made with him regarding boats, &c. The general plan of the Disembarkation must be well thought out when that for the embarkation is being arranged, as the success or otherwise of the former will very much depend upon the manner in which the latter has been carried out. The latter is, however, much the easier operation of the two, if the anding has to be effected in an enemy's country, for the whole force must be thrown ashore in the same neighbourhood, whereas, generally, many ports or several localities at a distance one from the other can be made use of to embark the several Divisions or even Brigades at. With any considerable force intended for the invasion of an enemy's country, especially if that country be sparsely populated and should possess but few harbours or good landing places, ample materials should be taken for the construction of temporary wharves, piers, broughs, &c. It is obvious that the greater the number of ports or other points that can be used the more rapidly and more easily will the operation be effected. When the landing takes place from boats, it is very desirable to leave a large beach party of seamen under the command of a naval officer selected for his energy and power of organization ; their assistance in clearing the boats, &c,, will always be found of very great value. This party should always have a semaphore with it for the purpose of communicating with the Admiral in command of the fleet: the seamen should take 2 or 3 days' provisions ashore with them. Troops should always breakfast before leaving their ships, and if fighting or a long march is in prospect upon landing, this breakfast should be a very substantial meal.

Deficiency of Stores.—When troops are embarked in any of H.M.'s troopships, the captain will be of course provided with a copy of the Regulations on this subject ; so I need not enter upon it in detail. On board hired ships the hammocks and blankets will be returned to the master before landing, any loss in any stores issued for use of troops on board to be charged against them, the list of which, prepared by the master of the ship, if found correct, will be signed by the C.O.

Before disembarking from a hired ship, the military C.O. is to prepare and hand to the master the following returns and certificates upon Admiralty Forms, which will be supplied to him by the master for that purpose :—

Disembarkation return in duplicate.
Mess certificate.
Ration and forage certificate.
Freight certificate.
Certificate of the number of invalids (if any) conveyed under medical charge of the ship's surgeon.

The C.O. of the troops and another military officer are, before quitting the ship, to sign a certificate in the following form, and to deliver it to the captain of the ship, or if a hired ship to the master, viz. :—

Form of Certificate.

"This is to certify that I have been round the ship with , and that no baggage, arms, nor accoutrements of any description, are left on board belonging to the troops.

Military Officer."

"I have made full inquiry respecting the baggage, &c., of the disembarked from this ship, and find no complaints, and that there was always a sentry over the same during the time it was on board." (To be signed and dated.)

Disembarkations must be considered under two heads: 1st, When made without any chance of interruption from an enemy; 2nd, when made in presence of an enemy, or where an attack is possible.

1st. THE DISEMBARKATION OF MEN, HORSES, AND STORES, is merely the reverse of what is done in putting them on board.

The men, when landed, must be marched off at least 500 yards clear of the beach, which is to be kept clear for those to land subsequently. If possible, it is advisable to march them at once to the spot where they are to encamp or bivouac, so that arms may be piled, cooking places, &c., made by a portion of the men, whilst the others return on fatigue to assist in landing stores, &c. The arrangements to be made must depend upon the mode in which the disembarkation is to be effected, whether by going alongside wharfs, or by boats, or small steamers. Every exertion should be made to erect some rough wharfs, the shallow part with trestles, that in deeper water being made with boats, ending with a barge and strongly-built schooner or vessel of that class. It may be sometimes advisable to sacrifice a ship for this purpose, and by scuttling her, sink her in such a depth of water as to have her upper deck three or four feet above high water. With a sandy or a muddy bottom, a ship might be sunk by loading her down with weights until she was resting firmly on the bottom. If the weather is calm she will suffer no great injury, and can be floated off when no longer required.

Brigades and divisions should be landed without being mixed up: each division, with its guns, horses, camp equipment, &c., should be complete on shore before another commences to leave the ships.

The hour of the tide's ebb and flow will generally influence the arrangements.

2nd. WHEN AN ARMY HAS TO LAND IN A HOSTILE COUNTRY, and in

presence of a formidable enemy, as we did in Egypt in 1801, and in China in 1860, or at a place where it is possible we may be attacked before the disembarkation is completed, as at Eupatoria in 1854, the operation is a troublesome one, but not so appalling as it is generally considered to be, provided the troops have in the first instance been embarked in a creditable manner, and the exigencies of the service upon which they are sent have been well provided for.

If we are at war with a nation capable of hurting us at sea, the transport fleet must, in the first instance, rendezvous at some home port under charge of a naval squadron sufficient for its protection, and by which it must be escorted to its final destination, and guarded whilst the disembarkation is being effected. If the landing is to be made on the shores of Europe or of the Mediterranean, the fleet will of course sail under sealed orders for its destination, which must be kept a profound secret under all circumstances, known only to the G.O.C. and to the Admiral. If the voyage is to be a very long one—to China, for example—it is of the utmost consequence that the expeditionary force should rendezvous at some place not more than a few days' steaming from the shore where the landing is to be effected. The force should be finally organised there, the horses and men being landed if necessary for that purpose. This is very essential both for man and beast after a long voyage, but particularly for the latter; for, after a few weeks on board ship their joints become stiff, and they require rest and gentle exercise to fit them for a campaign.

Selection of a landing place.—The first thing to be decided upon is the place where the final landing is to be effected. Many local circumstances will influence this consideration, independent of the character of the coast and the physical nature of the country itself. Political matters—which enter into all great questions—and the distribution and nature of the enemy's land and sea forces, may force you to disembark an army in a locality, which, in itself, is not favourable for such an operation. These are subjects for the G.O.C. The duty of the C. of the S. is to make a close reconnaissance of the coast in company with a responsible naval officer: for, no matter what may be the advantages offered on shore, unless there is good anchorage and deep water near shore, no place can be deemed a good one for the disembarkation of an army. Of course, all objections must give way to necessity; as, for instance, in China, the best place for landing our army was on a mud bank commanded by a fort, which we believed at the time to have been heavily armed, and to which we knew no large vessel could get nearer than 9 miles. Ironclads having an average draught of 27 ft. can safely, in fairly moderate weather, approach the shore as long as they have 6 ft. good of water under their keels; vessels drawing only 8 ft. or 10 ft. in a similar way require 3 ft. of water under their keels. [See paragraph on Coasts under the head of "RECONNAISSANCES."]

Even assuming that the enemy is your equal, or is even somewhat your superior in force, he cannot be everywhere to guard all his coasts; if he learns that a disembarkation in force is being attempted at some distance from his main body, he must march to the threatened locality, and a march of 20 or 30 miles is a fatiguing affair to him, whilst in your ships, if you find the spot you had selected for your landing held strongly by troops aided by great, prepared field works, you can, without any fatigue to your men whatever, move 40 or 50 miles farther up or down the coast as you may decide, there to carry out your disembarkation unmolested. If the shores be low and open, enabling the guns of your fleet to assist, your operation will be greatly facilitated in the event of the enemy endeavouring to interrupt it. If the landing be opposed, the disembarkation should be effected upon the broadest front compatible with securing the mutual support of the brigades, &c. If the landing has to be made under fire, the broader this front the less will be your loss. In selecting the spot for your disembarkation, the necessity therefore of having a broad width of beach to land upon must not be overlooked. This point decided upon by the G.O.C. and the Admiral, it should be kept a secret until the last moment. It may be advisable to make a demonstration upon a totally different point from what has been determined upon, and it is always a good thing that a swift armed vessel with a small party should make descents upon the coasts at all points where the telegraph wires are near the shore, for the purpose of cutting them, and carrying off a few intelligent men as prisoners to give the G.O.C. information upon local matters.

The Landing.—The use of steam launches, and generally of small tugs, gunboats, &c., has greatly reduced the difficulties even of landing in the face of an enemy, and the use of collapsible boats, which can be carried now to any extent by all ships, enables the invader, if necessary, to throw an entire army corps ashore at any selected point in one trip of the boats between the transports and the shore. We hear a vast deal of nonsense talked as to the great extent which steam has increased England's power to resist invasion; this cry is invented by politicians who do not wish to see proper defensive measures undertaken, because such would swell the annual budget, but all soldiers, who understand the question better than politicians, know this to be the greatest of fallacies; 24 hours of calm weather would now enable an enemy to throw ashore on our coasts an army amply large enough to destroy any military force we could oppose to him, and to secure the possession of London. Without the aid of steam this operation would have been a very serious one indeed, which, in common with all who have studied the question, I deplore it would not be at present. Circumstances may prevent you from throwing on shore an entire army corps in one trip of the boats, and the landing may have to be made by divisions successively. If

the fire of the fleet cannot keep the enemy's fire under, it may be advisable to restrict your first trip to boats carrying infantry only, or to infantry with some field batteries unaccompanied by any horses at all. It is very desirable to expose horse boats to fire as little as possible, for although it is most desirable to have a few batteries of R.H.A., and a few squadrons of cavalry on shore as early as possible in the operation, yet, if in landing they are to be exposed to a heavy fire, it would be generally better to pospone landing them until the infantry had first secured a position ashore, and had been able, with the assistance of the fire of the fleet and with that of the dismounted batteries sent with it, either partially or entirely to silence the fire the enemy had at first brought to bear upon the landing places.

The transports carrying each division should anchor in lines in the order in which they are to land. The distance between these lines is a purely naval matter, as in fact the arrangements for actually carrying the men ashore. In all the boats employed there should be an ample supply of fresh water, so that there should be no want of it on the beach. A medical staff with stretchers and bearers, but without ambulances, should land with the first division sent ashore ; the ambulances, &c., to be landed immediately after the cavalry and artillery have all been disembarked.

The lines of boats being towed in as near the shore as the depth of water will allow, the boats will have to pull in the rest of the way. Each line of boats must be led by a light boat, which should be provided with sounding poles. The spot where these boats reach the shore marks where the right of the battalion, brigade, &c., is to rest.

If the landing is to be effected by divisions, the first division being put ashore, the boats will return for the other divisions in succession. The men will get into the boats in the order in which they stand in line, so that when the boats ground the men getting quietly out from each side can form up at once on shore in line or column according to the orders. The men must sit quiet when in the boats, and the strictest silence must be enforced. Under no circumstances should the men load until they are on land. The colonel should be in the leading boat, and he should be the first man of the battalion to land as the captain should be the first man of the company to do so. The former will point out to the captain where to form up. The latter will, in the first instance, form up his company exactly where it lands, and then march it as a formed body to the position ordered by his C.O.

If camp equipment is to be used by the expeditionary force, it should not be landed until the whole force is ashore, a small party under an officer being left in each ship to take charge of it, and bring it ashore when ordered to do so after the landing had been safely effected. A steamer should go round the fleet and collect all men unable from sickness to land. Vessels having sick men on board should hoist some preconcerted flag, so that the steamer

should only visit them. By this means all the sick can be collected on one or more hospital ships; and if there are none, then on board the best ventilated transports, arrangements to be made for them by the P.M.O. It is advisable, in case of accidents, that the men should land with three days' cooked rations, and officers are clearly to understand that they are to do so also.

If the force is landed by divisions, the first division ashore will act as if it were an advanced guard, and cover the landing of the rest of the army. For this purpose it should take up any strong position as near the beach as possible, taking care to do so in such a manner thar the fire from the fleet or gun-boats told off to protect the landing may also protect its flanks. If the landing is opposed, the primary object should be to silence any artillery bearing upon the beach.

As soon as this is effected, and some cavalry have been landed, parties of it should be at once despatched to the neighbouring villages, to seize the post and cut the telegraph wires, if there are any. It would be a good plan to send a telegraphic message in the name of the mayor, telegraph operator, or other functionary, to the military or civil authorities (as the case may be) in the neighbouring cities, saying, "I have just returned from the coast. All is quiet. No enemy or ships to be seen anywhere. The fishermen (or John Smith, &c.), tell me they saw the smoke of a great fleet going north (or south) this morning at 5 A.M.," &c., &c. It is possible sometimes to send false intelligence in this manner, which, if not actually believed, will shake belief in the true news, giving rise to hesitation and delay. Circumstances such as the proximity of the enemy, and the nature of the position, must determine when the cavalry are to land; but the sooner it is landed the better, for, without it, all the transport and cattle will be driven away beyond reach of the infantry.

The nature of the expedition, its objects and the character of the country invaded, will determine the order in which provisions and other stores are to be landed. It is of the utmost consequence that a harbour or a sheltered roadstead should be secured as a base of operations where the material and supplies can be landed securely and leisurely. To depend upon an open beach subject to bad weather to land the supplies required by an army in the field, is indeed a very dangerous arrangement, and may lead to disaster.

IN DISEMBARKING HORSES, the same precautions are necessary as when embarking them. For some days after a long voyage they should be led by hand at a gentle pace (not out of a walk), and no weight put on their backs. This rule, of course, has to give way to necessity. I have ridden and been carried fairly by a horse just landed from a ship, on board of which he had been for a month; but as in all these expeditions a rendezvous, such

as Varna in 1854, and Talienwan Bay in 1860, will be generally established where the horses can be landed and got into condition after their long voyage, they need seldom be more than a few days on board immediately previous to beginning active service.

The disembarkation of horses by swimming is more easily effected than their embarkation by the same method, as their instinct assists in bringing them ashore. The horse should be lowered in the sling over the side without fastening the breast rope or breeching. When the tackle is unhooked the sling opens and is at once slipped from under.

It is of great consequence that a number of horses should be kept on the shore to which the others are to swim, as horses in the water will always swim towards others on the nearest shore. This plan of dropping horses out of slings into the water is said to injure their pluck, and make them for ever afterwards averse to fording rivers or entering water at all. It should only be resorted to in emergencies, and then care should be taken that the horses are cool before being put into the water.

All corps must send in to the S.O. of their division, as soon as possible after they have landed, a disembarkation return, showing the numbers actually landed, and accounting for every one included in the return of those actually embarked.

SELECTING A SITE FOR CAMPS OR BIVOUAC.—In deciding upon the site for any camp or bivouac, whether large or small, for occupation for a night or for a lengthened time, two great considerations enter into the question, viz. the *Military* and the *Sanitary*. When they clash—as they may frequently—the point must be settled according to their relative importance in each particular case. If a great battle is impending, everything must give way to the strategical or tactical exigencies of the moment, and troops may have to bivouac for many nights in positions that may be objectionable in a purely sanitary point of view. It may, however, be accepted as a general rule that, when beyond two days' march of the enemy, sanitary considerations are as a rule to be considered first.

The selection of positions for offensive or defensive purposes is treated as a separate subject, see article on "POSITIONS."

The Military considerations in selecting the site for a passing encampment or bivouac are abundance of wood and good water, and other supplies, and that it should be provided with facilities for internal communication, and that there should be easy access to the neighbouring roads. Although extension is good for sanitary reasons, yet it is very trying to men after a tiring march to have long distances to go for their rations, water, &c. The first sanitary consideration is that the men should have rest; so after long

marches, in taking up positions for a single night, the camp or bivouac should be compressed ; if a longer halt is to be made, it can be opened out the following day when the men have been rested. Villages, defiles, rivers, and all other obstacles near the site selected should be in rear, so that they should not interfere with the next day's march ; for it is important to have plenty of clear space to start on, as there is more likely to be confusion then than at any other time, see article on "BIVOUACS."

Sanitary considerations in selecting Sites for Encampment.

The sanitary, or some M.O. named for that purpose, should accompany the S.O. sent to select the site. He will make a report in writing for the C. of the S.'s information, as to its fitness in point of salubrity, and will indicate the precautions required for improving its sanitary condition ; he will report upon the quality of the water, and upon the precautions he considers necessary for purifying it.

There are many places which at certain seasons of the year may with safety be occupied for a few days, where at other times it would be madness to encamp.

There are rules which must not, under any circumstances, be neglected if the camp is to be permanent, and indeed the extent to which they can be disregarded at any time is to be measured by the exigencies of the moment. If obliged to encamp in a position where you expect to accept battle in a week, or a month, pitch on ground in advance of the position you must occupy when the enemy is in your presence ; you then secure a fresh place for your men, and leave him a dirty one when he moves to attack you.

Avoid encamping or bivouacking in graveyards. Get as far to windward of them as possible.

Avoid encamping on ground that has been encamped on before, and, if obliged to camp near it, go to windward of the old site. Avoid all rivers with marshy banks and marshes of every description. If obliged to camp with a small force for a day or two near a marsh, if possible place yourself so as to have a hill, or even some rising ground or woods, between you and it.

The water should be well tested, and the inhabitants questioned about it.

A grass country with a sandy or gravelly subsoil is the best ; land with a clayey subsoil is damp and to be avoided if possible ; all brushwood should be avoided. Forests lately cut down are dangerous, particularly in hot or tropical countries. In temperate climates, if the country is well settled, and the people have a robust appearance, it is the best guarantee of the healthiness of the place.

There should be good natural drainage ; ground sloping to the east or south is to be preferred.

The banks of running rivers are good, provided their edges are not marshy.

Sites on granite, metamorphic, clay-slate, and trap rocks are good. When, however, these rocks have become disintegrated, they are supposed to be unhealthy, and this rule has certainly proved true regarding Hong Kong and Kowloom.

Limestone and magnesian limestone are also healthy when there are not marshes, which are common in these formations; water there is good, but hard.

Chalk is good when unmixed with clay; water is pleasant and good. When the chalk is so mixed with marl as to become impermeable, it is damp, and likely to prove unhealthy. The permeable sandstones are very healthy.

In reporting on proposed sites for encampments, note especially these points, viz.: supply of water, quantity and quality; supply of wood and provisions; roads leading to, and means of lateral communication; nature of cultivation, of soil and subsoil; shape of ground and strength or otherwise as a military position. Furnish your suggestions as to best form for camp, &c.

Marching into Camp.—The position for the army to encamp in should when practicable, be selected either the day before, or as many hours before the arrival of the troops as possible.

It is advisable that a S.O. and the F.O. of the day from each Brigade, a mounted officer from each battalion, and an officer and the Q.M. Sergt. from each cavalry regiment and battery, should gallop on with the S.O. of each division when within a few miles of the ground for the purpose of having the exact position that each is to occupy pointed out to them. Each of these officers should know the number of paces required for his regiment when in line. When they have marked where their right and left is to rest, any N.C.Os., or orderlies that may have accompanied them being left on the ground, they should return to their brigades or corps, noting in their minds as they do, the best roads or paths by which to conduct them to the position allotted to them.

As the troops approach their camping ground, they should form column; when halted—generally in *mass of columns*—on the ground they are to occupy, they will pile arms, take off packs, and if it is safe to do so, take off their accoutrements also.

B.Ms. having notified the C.Os. of the numbers required for piquets, and the places they are to go to, they will at once be marched there.

The regimental guards to be told off and mounted by the adjutant.

The remaining men to be told off as detailed in article on "CAMPS."

In the case of an army corps marching by only one road, it is absolutely

necessary that it should encamp or bivouac in several lines, each line being, if possible, *à cheval* on the road. The depth of an army corps in column of route is so very great that, if it were attempted to encamp it in one single line, the troops in the rear of the column would not arrive at their camping ground until late in the evening. Even for a division moving by one road, it is desirable to encamp it in 2 or 3 lines, by brigades or by lines formed of the advanced guard, and the main body, &c., according to whichever may be most convenient for the order of the following day's march, or most suitable to the formation of the ground and the roads and paths over it, and the facilities for obtaining water, firewood, and forage.

Q.M.G.'s Duties when Divisions encamp or bivouac.—The C. of the S. or his deputy having pointed out to the S.O. of each division where his right and left are to rest, will tell them where the Hd. Qrs. are to be, detail the watering places generally for each division, inform them of the roads that require most watching, stating where they lead to, and the distances, &c., point out the villages or localities in front where the right piquet of each division is to rest, and state whether it is to be of cavalry or infantry.

The S.O. of the division, having pointed out to each B.M. the line that is to be the front of his brigade, will at once make the necessary arrangements as to the water supply. If the same place is to be for several divisions, an arrangement should be made between the S.Os. of each as to the guards to be mounted, and the regulations to be enforced. Each S.O. should take care that he has good open communications with the nearest main roads. The front should be cleared, or if too close with hedges, and the halt is only for the day, wide openings should be made in them, to be increased every day that the force remains stationary. The division Hd. Qrs. should be as near the centre of the division as possible, and indicated to the B.Ms. and F.O. of the day.

The Brigadiers to take up a position as near the centre of their brigades as possible for their brigade Hd. Qrs. The position of the commissariat to be pointed out to the officer in charge, also that of the Field Hospitals to the divisional P.M.O.

The C. of the S. after taking the General's orders will, in conjunction with the F.O. for the day, decide upon the number, description, and position of the piquets to be mounted. Having done so, he will inform the B.Ms. of those that are to be furnished by each, indicating as nearly as possible the spot that each is to occupy. If the F.O. for the day is to be trusted, he may be allowed to dispose of them himself, but as a rule it is better that a S.O. should go with him, and see them properly posted. The B.Ms. will, therefore, upon receiving orders on this point, detail the piquets and point out to the adjutants, as nearly as possible, the position to be taken

up by each, going out himself with that one which is the most central as regards his brigade.

Assuming that the army is well protected from surprise by the outposts of the advanced guard, as a general rule, when a division is encamped in line with others upon its flank and rear, one piquet (a company) from each brigade will be all that is required. The system of piquets being first paraded and inspected by the adjutants on their regimental parade grounds, then by the B.M. on the brigade parade ground, then marched to the general divisional parade ground, and most likely kept waiting some time at all three places, before they are finally marched to the position they are to occupy for the night, is refined cruelty, and can lead to no good; it is a piece of stupid routine that is only suited for children. Soldiers hate being "humbugged about." The piquets should be detailed and marched off from their own parades in the direction of the place they are to occupy immediately when the division halts.

It is easy to tell an officer to move upon a certain village, rock, clump of trees, and wait there until the F.O. fixes upon the exact position for the piquet.

Leaving his junior to look after the camp, the senior S.O. must ride round the front, examining the features of the country, to as great a distance as time and circumstances will admit of. The telegraph wire will generally be laid down from the divisional or corps Hd. Qrs. to some point on the main line. Arrangements must be made for communicating by signalling with the outposts, or with any detached force in the vicinity which is not in telegraph communication with the main body.

At a certain hour in the afternoon, to be fixed by the C. of the S., the senior S.O. of each division must be at his tent for orders for next day's march, or if halting, regarding the work to be done.

He will have to arrange for the transport of the sick to the nearest hospital in rear.

A staff officer from each division should visit the advance piquets and watering places of the several divisions every evening,

If halting for a day or two, a similar visit should be made at early dawn, when the piquets are being relieved. He should daily ride round the camps of the several corps to see that they are in good order, the latrines and cooking places made, &c., bringing to the notice of C.Os. and brigadiers all irregularities.

INTERNAL ARRANGEMENT OF CAMP.—The site having been chosen carefully, it is taken for granted that the natural drainage is good. Although the camp had only been pitched with the intention of remaining there a day, circumstances may convert it into a residence for months; therefore from the moment the tents are up, every exertion should be made to carry out all

the works that are required in standing camps. Those that should be attended to by each individual regiment are as follows, each being placed in this list according to its relative importance :—

1. Tents to be neatly pitched according to order.
2. Cooking places marked out, and a kitchen constructed for each company.
3. Latrines dug.
4. A trench of 4 in. deep (the width of the spade) dug round the outside of each tent.
5. If the regiment is alone, make a watering place ; if encamped as part of a division, this should be attended to by the staff.
6. The natural drainage so improved that all water flowing from the tents into the small drains round them should be led off by deeper drains into the nearest ravine or rivulet.
7. Make racks for arms in front of each company's tents.
8. Make paths with stones in front of each row of tents, &c.
9. Erect sentry boxes or shades.

1ST. TO LAY OUT THE CAMP.—In deciding upon the form of encampment, the following principles should be borne in mind :—

a. As a general rule, cavalry and infantry should encamp in column of squadrons or troops and of companies, the front of the camp covering exactly the space covered by the regiments when deployed into line (allowance being made for intervals between corps), the lines of tents being in fact on the prolongation of the squadrons or companies as they stand when in column. Artillery always encamps in line, and if possible with full intervals.

b. The camp should be formed to the reverse flank, when the line had broken into column.

c. Clear passages for guns and troops through the camps from front to rear should be provided for. The "*Intervals*" between regts. are generally sufficient for this purpose ; the interval between battalions, or regts. of cavalry is 25 yds. ; between batteries it is 28½ yds. or 34 yds, according as the guns have either 6 or 8 horses.

In marking out the front of the camp for a division, it cannot be expected that every corps should be exactly in alignment one with another, as the configuration of the ground must greatly influence it. When, therefore, it is necessary that the front of one battalion should form a salient angle with that of another, care must be taken to allow a sufficient interval between them in front, so that the regulated space shall be maintained all along the depth of both camps. When troops are encamped in two or three lines, from 200 to 500 yds. should be left clear between the rear of one line and the front of that behind it.

The space required for the encampment of a battalion of infantry on war

establishments is a frontage of 320 yds. and a depth of 266 yds,, when full distances between companies are allowed. This provides for a parade ground of 80 yds. in depth ; but when the ground is restricted, this may be dispensed with, as also the space in rear of the baggage, so that a battalion may, when necessary, be easily encamped upon a depth of 150 yds. The frontage may under similar circumstances be reduced to 120 yds., by having only 15 yds. between the rows of tents, instead of 40 yds. as shown in sketch.

The space required for a regiment of cavalry on war establishment is a frontage of 284 yds. and a depth of 436 yds. when encamped (as shown in sketch) in column of squadrons, and providing a parade ground of 80 yds. in depth. When space is an object the front can easily be reduced to 140 yds. and the depth to 336 yds., dispensing with the parade ground and closing up the baggage nearer to the officers' tents. Horses when picketed require a width of 6 ft., so when the available depth is much less than 336 yds. a cavalry regiment on war establishment should encamp in column of troops.

The space required for a Battery of Artillery is 110 yds. and a depth of 142 yds.

The B.Ms. having been pointed out by the A.Q.M.G. the line that is to be the front of their brigades, must make the necessary arrangements for any deviation from it which the nature of the ground may render essential, and will point out to the Q.Ms. of corps the exact spots where their right and left is to rest.

The regiments being formed in column, with an interval of 6 paces between the reverse flank of the strongest company or squadron and the front of the camp as marked out by the regimental Q.Ms. the tents of each company or squadron will be pitched in line with them as they stand in column.

Each company and squadron to be told off into squads of whatever may be the number of men it is intended should be in each tent. The regulation number is 15 for a bell tent, so the squads will be generally of 14 privates and 1 N.C.O. each. The 14 privates to be divided into 6 tent-men, 2 wood-men, 2 watermen, 1 cook, with 3 for duty if required.

In the infantry arms will then be piled, and packs taken off (when at a distance from the enemy, accoutrements also), and hung upon the arms. In the cavalry as soon as the horse lines are marked out, the squadrons will file off to them, the men dismount, picket their horses, loosen girths, and remove bridles, placing them with their arms in rear of their respective horses. In the artillery, the battery being formed in column of subdivisions with the waggons in rear of the guns, and at such a distance from them as will allow plenty of room for the horses at the picket ropes, the horse ropes

will be stretched between the gun limbers and waggons, the horses will be unhooked and filed off to their respective places. Kickers and vicious

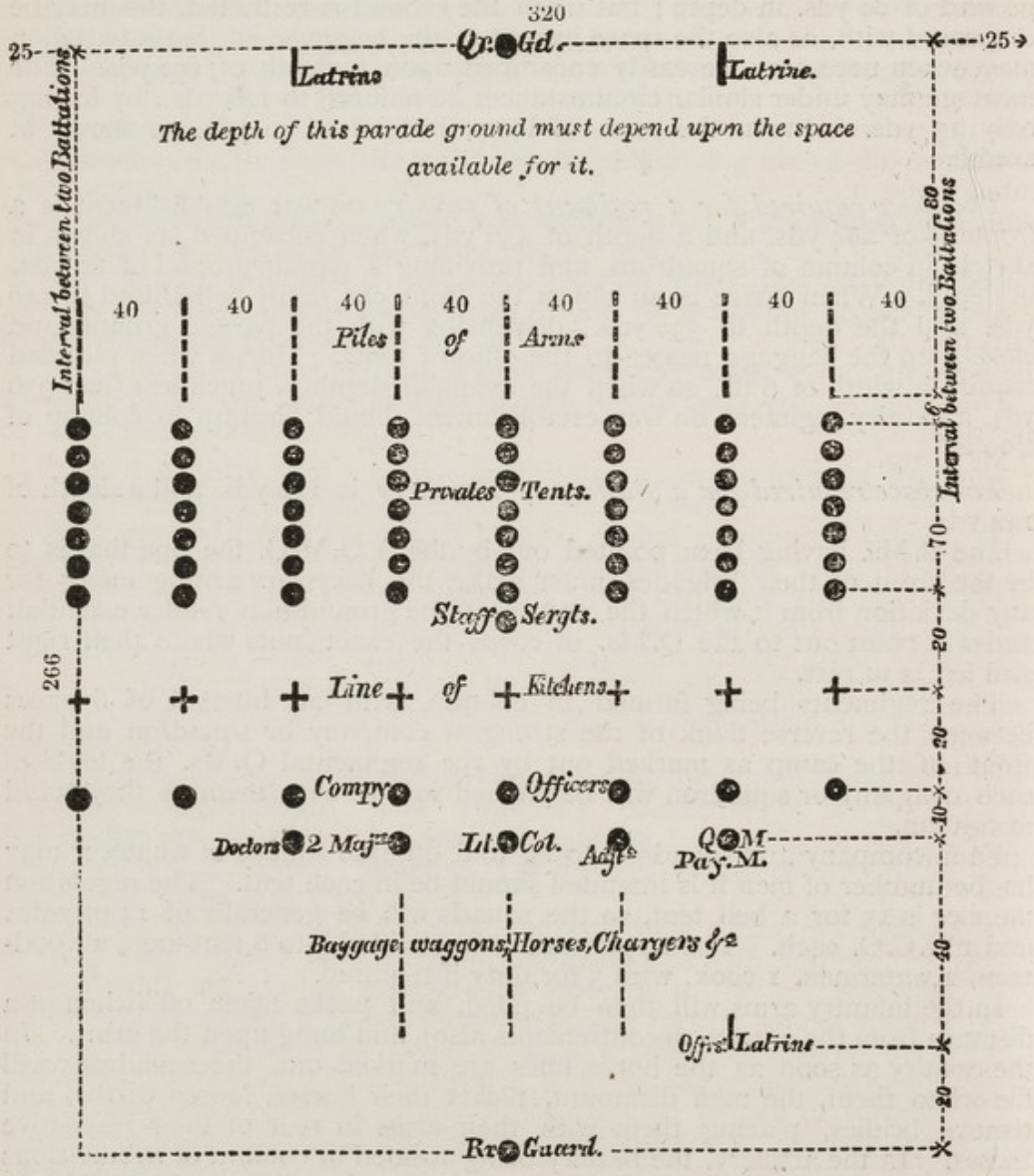


Fig. 17.—Camp of a Battalion of Infantry on War Establishment, at full intervals. Measurements given in yards.

horses should be picketed at some distance from the others, each with a heel rope. The tents of each company or squadron, as they are taken off the waggons, will either be placed on the reverse flank of the arms by the Q.M. or distributed by him to the tent-men from one general pile. It is of consequence that the same tents should always be given to the same company and same squads. The Q.M., by pacing the front and flanks of the camp, fixes the position of each row of tents. The six men to pitch each tent are numbered off by the N.C.O. of the squad from 1 to 6, their respective duties being as follows: No. 1, front-rank poleman, No. 2 rear-rank poleman, Nos. 3 and 4 pegmen, Nos. 5 and 6 packers and unpackers of the tent. The N.C.O. of the party to superintend, and see that the pole is placed on the spot marked off for it, that it is upright, that the door is properly placed, that the cords are stretched in a line with the seams of the tent, that the slides are made fast at equal distances between the tent and the pegs, and also to enforce silence.

The senior major will dress the polemen of the front row of tents from the right so that they shall stand exactly on the line marked out by the Q.M. as the front of the camp, and the captain of each company will from them dress the polemen of his squads, who whilst being so dressed will stand at attention facing the piles of arms, at the number of paces one behind the other that the tents are to be, one from the other (not less than 10 paces if possible). No. 1 will at once drive in a peg to mark where the pole is to rest: rear-rank polemen, having in the meantime joined the two pieces of the pole together, hand them to their front-rank men. The pegmen at the same time distribute the pegs where they will be at hand when required. Nos. 5 and 6 have in the meantime unpacked the tent and stretched it out flat on the ground, with the tent door hooked across and uppermost, when it will form a triangle, the base of which should be one pace away from the feet of No. 1, with the apex pointing towards the companies' tents in rear. The polemen then insert the pole, so that one end is fitted into the cap, the other end being placed between the heels of No. 1, the two pegmen get hold of the two front-angled ropes, the two packers of the two rear-angled ropes which are (marked with red to distinguish them from the others). Upon the word of command "raise tents," the poles to be at once elevated by Nos. 1 and 2, the former getting inside the tent and keeping the pole in a vertical position by putting the end of it between his feet; the 4 angle ropes to be at once pegged down, No. 2 taking care that the door is square to the front, that is, facing the same way that the men did when they stood in column, and that it is well closed; the pegmen will then peg down the other ropes, working gradually round from their left to their right, under the superintendence of the N.C.O. who will take charge of tent bag and mallets. I have thought it necessary to go into these details, because there is no regulation on the subject.

As soon as the tent is pitched, 2 men from each squad will make a trench 4 in. deep and the spade's breadth round the tent immediately outside the walls, so that both the trench and the sod or earth taken from it shall be

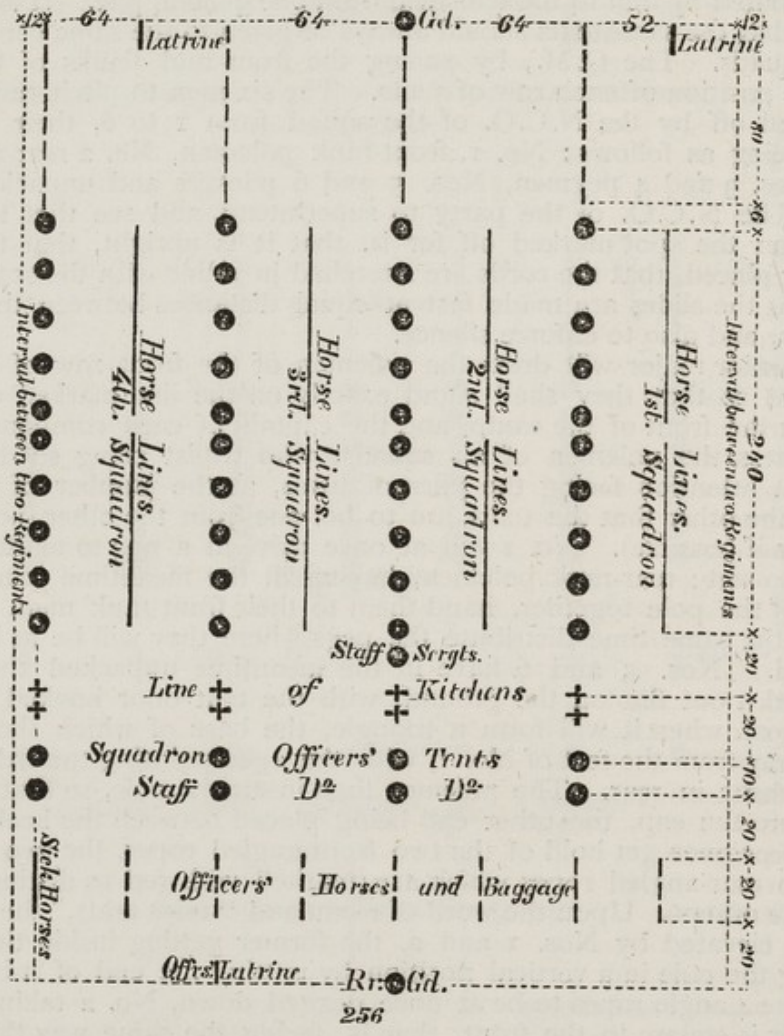


Fig. 18.—Camp of a regiment of Cavalry on War Establishment.
Measurements given in yards.

within the line of pegs. The knapsack or valises, as the case may be, will then be removed into the tents, being placed where the head of the owner

of each will rest while sleeping. If *tentes d'abri* are used instead of bell-tents, the same plan of camp is to be adhered to. Although it is more convenient to have the tent doors facing the same way that the men do when standing in column, yet it is very easy to change them if the prevailing winds or the rays of a tropical sun render that position objectionable.

In striking tents, the front-rank man gets inside the tent, No. 2 closes the door and keeps it closed until the tent is struck ; the 4 other men pull out all the pegs except those of the 4 angles. The pegs to be collected and put into their bag, the remaining 4 pegs are to be drawn, the men holding on to the ropes. At the word of command "strike tents," they are to be lowered backwards, pulled out flat and carefully folded, the ropes being rolled up round the slides, and then placed so that they do not appear when the tent is folded up.

As the woodsmen and watermen will be idle in striking camp, all the officers' tents should be struck at the same time as the others.

The encampments for cavalry, and infantry, and artillery, after the most approved manner, are shown in diagrams 17, 18, and 19. The plan of ropes stretched from gun to waggon, or from one cart to another, is the best method for securing horses in the field.

Although the Author believes that to carry tents with an army whilst marching is out of the question, and should never be attempted when near an enemy, yet, as in future operations will generally be along lines of railway, there is no reason why the bell-tents should not be always at hand for use during any prolonged halt, or during a continuance of inclement weather.

The attempts made at ventilation in our tents do well when no more than one or two live in them ; but when the number is beyond a dozen, the tiny openings for fresh air are of no practical use. The only plan is to insist on the doors being kept open when it does not rain. When it is remembered that each man requires about 4 cubic feet of air per minute, it is unnecessary to dwell upon this point.

The colour-sergeants to be always in the rear tent of each company ; the sergeant-majors of troops to be, one in the front tent, the other in the rear tent of each squadron.

The largest possible space should be covered by each corps when no military reason forbids such expansion.

The practice of closing up the tents of every two companies together should be discontinued. The distance between the lines of tents depends upon the number of files in each company or squadron in the same way as distances in column are calculated.

The length of the horse-lines of each squadron will be according to the number of horses in it, 6 ft. being allowed for each horse. If space is limited, a cavalry regiment can encamp by troops instead of by squadrons,

the regiment being formed up in open column of troops; the tents will be pitched as for infantry, the horse-lines being between the rows of tents.

In pitching the tents, disturb the ground inside and around as little as possible. Do not allow absurd notions of order and regularity to cause tents

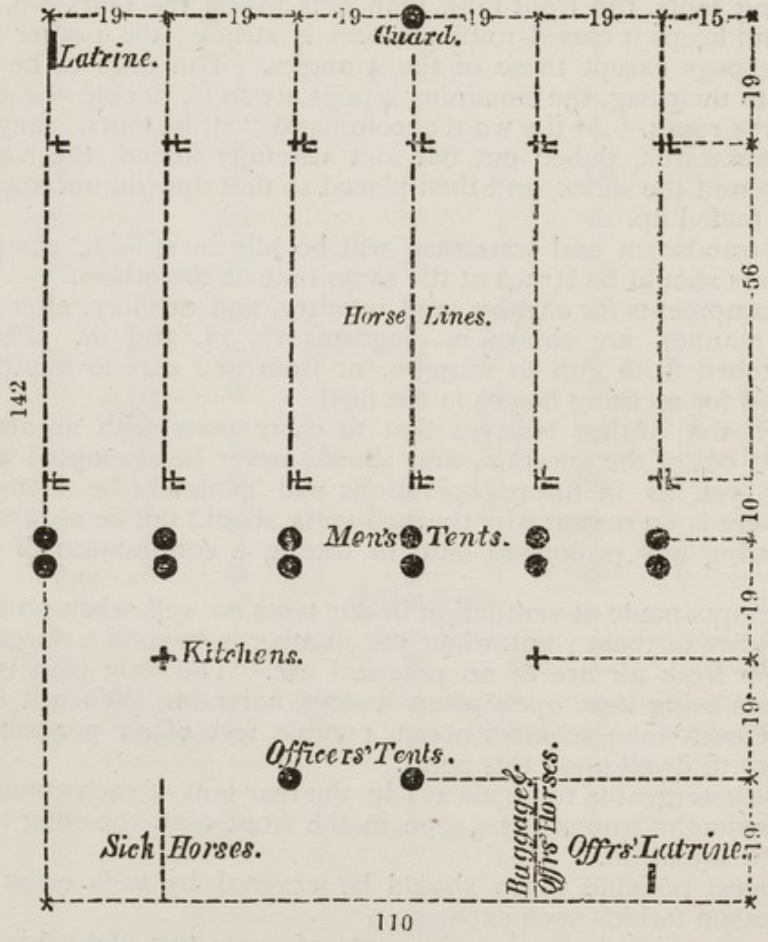


Fig. 19.—Camp of a Battery of R. A. on War Establishment. Measurements given in yards.

to be pitched in hollows which are frequently met with in the best sites, when by moving the tent perhaps a few feet one way or another, a good position for it might be found.

In camps of position where tents and not huts are used, it is advisable to supply planking for the men to lie on, these planks to be removed and aired every fine day. If boards cannot be had, use any sort of tarpaulin or waterproof sheet that can be obtained.

If straw is plentiful, issue enough to make good thick mats for the men to lie on; they are easily made, and most comfortable; they should be hung up to dry every day. They should be 3 in. or 4 in. thick, 6 ft. long, and 2 ft. 3 in. wide at top, curved outwards to fit the tent, and tapering gradually down to a point.

Every morning, except when it rains, have the sides of tents rolled up all round, and in fine weather strike tents frequently; it is good practice for the men; they should regularly pack them up as if for the march. This is also advisable as a sanitary measure, for the ground where the tent usually stands can be well dried by the sun.

Do not permit grass or green leaves to be used for beds in tents, but serve out straw when it is possible, to be used as already stated.

The Circular Tent is the one used in our army.

During the Crimean war numbers of officers dug out the interior of their tents, leaving a small pillar of earth under the tent-pole of about a foot at top, and 18 in. at bottom. When it was possible to obtain a good stout spar of the desired length, the pole in two pieces was discarded, and the pillar cut away, placing the foot of the spar (the new pole) on the bottom of the excavation. A ledge about 9 in. all round the inside of the tent was also left, which served as a shelf, so that the excavation was only about 11 ft. in diameter; the interior superficial space was consequently very much reduced, although the cubic contents were greatly increased, as also the general comfort. There is an art in pitching a tent, which camp life soon imparts to soldiers. They should, however, go through an annual course of instruction in tent-pitching, when the matter should be explained to them. In sandy places it is difficult to keep tents standing in a high wind, as the pegs draw. Large stones, pack-saddles, &c., should be used to fasten the ropes to; bushes buried in the sand, the branches pointing towards the tent, with one left sticking up over the sand to fasten the rope to, form the most secure means of keeping tents erect, as they form a species of anchor; a flat stone or piece of wood should also be placed under the tent-pole, to prevent it from sinking into the ground.

We have now in our military stores a bad imitation of the French *tente d'abri*, which fulfils few of the purposes for which it was originally designed; so much so that bell-tents for a force weigh about the same as our shelter tents for a similar number. They are heavy, and the buttons and holes are wrongly placed.

Previous to retiring for the night, all the tent-ropes should be slacked

off a little, as the rain or dew will tighten them enough to draw the pegs, and strain, if not tear the canvas. At night and during wet weather all the arms should be replaced in the tents, and fastened with a string round the tent-poles.

2nd. COOKING PLACES.—Each company should have its own kitchen in rear of and in line with its own row of tents. The simplest kitchen consists of a trench dug in the direction that the wind is blowing, of such width that the kettle, when placed on it, should not rest above an inch on each side ; when Flanders kettles are used, the width should be 9 in. ; its depth should be 12 in. at the end from which the wind is blowing, and continue that depth for 4 ft., decreasing then gradually to 3 in. at the opposite end, where a space must be left equal to the breadth of the trench, to serve as a chimney. For a company on war strength, two such trenches will be required each 10 ft. long. The fire is lit at the end where the trench is deep ; it should not extend beyond 3 or 4 ft. up the trench. The kettles are placed touching one another along this trench ; dry sods should be used to stop up the chinks made by the roundness of the kettles, so that the space under them may form a flue. It is advisable to pile up sods, or, with stones and earth, to erect a chimney of at least 1 ft. in height at the end away from the fire. All grass round the fire-places should be cut to prevent accidents from fire.

If the force halts for more than one day, these kitchens are susceptible of great improvement; the chimney can be made of mud or wattle and daub, and the draught may be increased by using short pieces of hoop-iron as bars, stretched across the trench to support a filling in of clay round each kettle, or in other words, to make a regular place for each kettle, into which it will fit exactly, so that its position may be frequently changed. to prevent the contents of one being cooked before the other. As the day following the wind may change to an exactly opposite direction, a similar trench must be dug in continuation of the former one, the same chimney being used. In this manner the same chimney will serve for trenches cut to suit the wind blowing from all four quarters. The openings from these trenches into the chimney must all be closed with a sod, except the one to be used when the fire is lit. In some places, where bricks or stones suitable to the purpose are to be had, it is better to construct these kitchens on the ground instead of below the surface.

In well-wooded countries like America, two logs rolled together in the direction of the wind, the fire being kindled between them, make a good kitchen. In such places fuel is no object, so the construction of chimneys can be dispensed with, and the kettles hung from a stick resting at each end on a forked upright.

Near the cooking-places, a small *filth-hole* should be dug as a receptacle

for all cooking refuse, potato peelings, &c. ; the old one to be filled up with the earth well rammed down over it, and a new hole opened every two or three days.

Firewood should be cut into lengths of 1 ft. and about 2 in. square. When nothing but gorse or brushwood is to be had, the trench must be deepened where the fire is lit. Damp or very sappy wood should be avoided. Bones can be used when other fuel is not to be had.

Field Ovens.—The simplest method of making them is as follows. Take any barrel (the more iron hoops on it the better), the head being out ; lay it on its side, having scraped away the ground a little in the centre to make a bed for it ; or if there is a bank near, excavate a place for it, taking care that the end of the barrel does not reach within 6 in. of the edge of the bank. Cover it over with a coating of about 6 or 8 in. of wet earth or thick mud, except at the open end, which is to be the mouth of the oven. Pile up some sand or earth to a thickness of about 6 in. over the mud, arranging for an opening 3 in. in diameter being left as a flue (to increase the draughts to lead from the upper side of the barrel, at the far end, through the mud and earth. This flue is only left open when the fire for heating is burning ; when the bread is put in, it should be covered over. Form an even surface of well-kneaded mud at the bottom within the barrel, to form a flooring to place the bread on. Light a fire within the barrel, and keep it up until the staves are burnt. You will then have a good oven of tough burnt clay, tied together by the iron barrel-hoops. When required for use heat it as if it were an ordinary oven ; when the ashes are drawn out and the bread put in, close the mouth with some boards or a piece of tin or iron from a case in which preserved potatoes or other perishable stores have been issued. These ovens were frequently used during the Red River expedition, and answered admirably.

3rd. LATRINES.—As soon as the place has been marked out for them by the regimental quartermasters, they should be commenced by fatigue parties. Those constructed at first should be 2 ft. wide at top and 1 ft. at bottom, 2 ft. deep, and about 12 paces long. The earth, as it is dug out, should be thrown so as to form a bank to the rear and sides, sods and any large stones on the spot being used to revet the inner faces of the bank.

If the force halts for more than one day, latrines on a larger scale must be constructed : they should be 6 ft. deep, and 1 ft. wider at top and bottom than the smaller ones. If possible, a rail or post of some sort should be erected along the edge for the men to sit on ; it should be 18 in. above the ground, and can be supported by forked posts at the ends ; another should be laid on the ground for their feet to rest on. If trees or brush are in the neighbourhood, it can be inclosed by a screen about 4 ft. high, and if time permits, roofed in also. Twice a day, about 10 A.M. and 6 P.M., the

bottom of each pit should be covered with a 3-in. layer of dry earth, not sand ; the wood ashes from the cooking-places should be spread about in the vicinity, particularly where the men's feet rest within the inclosure. If lime is to be had, it should be used in large quantities. C.Os. should hold their quartermasters strictly responsible that these duties are carried out efficiently. The work will generally be done by defaulters ; and it is advisable that the same sergeant should always have charge of them, so that he may be conversant with these duties, taking his orders daily from the quartermaster. When a latrine becomes nearly full, it should be carefully filled in with earth well trodden down, but having a small mound over the spot to mark it.

The health and comfort of every one in camp depends very much upon the manner in which these duties are conducted.

4th. DRAINS ROUND THE TENTS ; they have been described already.

5th. WATERING, WASHING AND BATHING PLACES.—If there is, or is likely to be, any scarcity of water, sentries must be posted over the wells or streams from which it is drawn, and it should be laid down as a rule, that the captain and subaltern of the day on duty in each battalion must visit during their tour of duty the sources from which water is supplied to their men, to see that no irregularities take place there. Immediately that troops reach the ground where they are to encamp or bivouac, water guards must be told off, and orders issued by the Staff for their guidance : in many places such guards should be commanded by officers.

If the supply is from a running stream, the greatest care must be exercised to prevent men from washing clothes, or bathing in it above the point where the drinking water is to be drawn.

Two points should at once be marked off : above the first, water for drinking and cooking to be drawn ; between the two, horses and cattle to be watered ; and below the second, all washing and bathing to be carried on. This is an arrangement of the first importance, both for health and comfort.

When positions are to be occupied for any length of time, these regulations are of still greater moment. In many instances the water supply is from springs, which require nice care to make them answer all purposes. Before Sebastopol our water supply was from springs and a few wells ; before we left the Crimea some of our watering places were models of their kind. Small reservoirs were made to catch and hold the supply that ran off during the night, so that every gallon of water that the spring gave was made available : from these reservoirs all the water for drinking and cooking was drawn, and the overflow passed off into a series of half barrels placed close one beside the other, with a little tin gutter connecting each, so that the overflow from each barrel filled the one next below it, the fall being just sufficient to allow for this. Say you have 25 of these half barrels

well built up with loose stones below, 50 horses can water there at a time, 25 horses at each side of the row of barrels. Horses, mules, and bullocks drink about 1½ galls. at a time, and take about 3 minutes each in doing so. The overflow of the lowest barrel is again collected in a reservoir for washing clothes, &c. An officer should invariably accompany all cavalry watering parties, and instructions should be given that each horse as soon as he has drunk should leave the water, and the party should fall in at a little distance clear of the next comers.

Such watering places must have at least one or two sentries always on duty by day and one by night, to see that the orders regarding them are strictly carried out. They should be visited every day by the majors of brigade, and by all the regular staff officers of the division, also by the field officer and provost sergeants. These barrels should be well charred inside; the more frequently the process is gone through the better. When the same watering places are used by one or more divisions, increased care is necessary, and mutual arrangements must be made on the subject by the G. Os. C. concerned. One frequently meets with springs from which the supply is small and difficult to obtain. Dig these out a few feet, and insert a cask charred inside, perforated all round with holes (half-inch), and from it the water may be drawn easily. If animals are to be watered at very shallow streams, dams should be constructed to deepen them, as animals drink more rapidly when the water is about 4 or 5 in. deep.

When wooden troughs are constructed, they should be strongly fixed in cradles or trestles backed with stone: their bottoms to be about 2½ ft. above the ground: they should have a width of 1½ ft. at top, with a depth of from 8 to 12 in.: 120 ft. is a good length for them.

FILTERS.—Two barrels, one inside the other, having a space of 4 or even 6 in. clear all round between them filled with layers of sand, gravel, and charcoal, form an excellent filter. The inside one, without a bottom, rests on three stones placed in layers of sand, charcoal, and coarse gravel: the water flowing or being poured into the space between the two, and having thus to force its way through these substances into the inner barrel, becomes purified. If the water is a small spring gushing up out of the earth, the 2 barrels may still be used, but the outer one must have the bottom well perforated with holes, and the

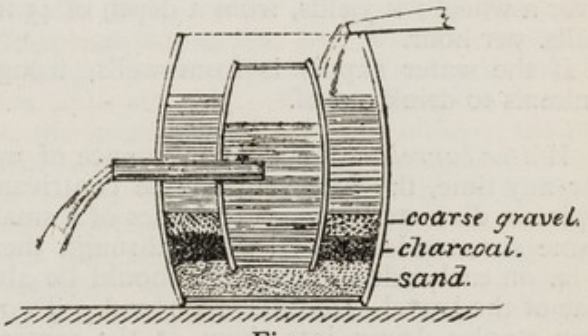


Fig. 20.

inner one having the bottom in, and being pierced with holes round its sides near the top, through which the water, having risen from the bottom of the outer barrel (by the holes pierced there) through alternate layers of gravel, charcoal, sand, and moss, passes into it clear and pure.

In both these filters the water should be drawn off by means of a pipe running through the outer into the inner barrel. For these filters animal charcoal is the best. When, after a time, it ceases to act, it should be removed and well dried. It can then be used again to advantage. It is impossible to use too much of it. Marsh water is most injurious. In India, well water should always be used in preference to that from tanks or jeels.

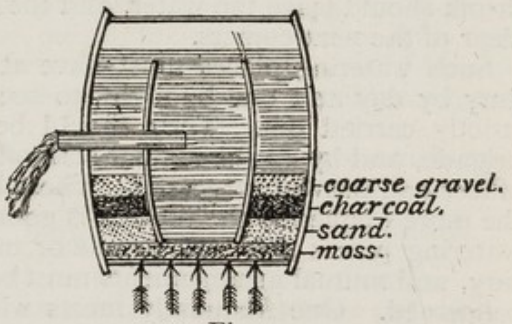


Fig. 21.

There are three kinds of pumps generally used for military purposes.

1°. A small hand, lift and force pump with flexible hose: this will draw water from 18 ft., and throw it about 16 ft., working with a lift of 18 ft. and a throw of 7 ft. (the height of an ordinary water cart); it will yield 7 galls. per minute.

2°. The Norton tube well. This consists of tubes driven into the ground with a monkey, and with a pump screwed on the top. One of these wells takes about three hours to fix. It will yield about 7 galls. per minute, and will keep three horses drinking at one time. *These pumps are very useful in searching for water.*

3°. The "Bastier Pump" is a pump with an endless chain, working over a wheel; it yields, from a depth of 45 ft. (worked with two men), 2200 galls. per hour.

If the water supply is from wells, troughs must be provided for the animals to drink out of.

Water barrels.—For the conveyance of water when troops are stationary for any time, the following simple contrivance is very useful; bore a hole 2½ in. in diameter through the sides of a small barrel, and pass a stick of the same size, made of hard wood, through them, so that it may project about 6 in. on each side. This hole should be about 6 or 8 in.—according to the size of the barrel—from its open end. Two poles about 5 ft. long, having iron staples driven into them at the centre, are used for carrying it, by passing the projecting ends of the stick through the staples. When iron staples cannot be had, a lashing of small rope or stout cord may be substi-

tuted. Two men can thus easily carry a large quantity of water about a camp. See accompanying sketch.



Fig. 22.

6th. IMPROVEMENT OF DRAINAGE.—The longer the camp remains standing the more complete ought the drains to be made. Wherever it is necessary to construct large ones, bridges must be made over them opposite the intervals between the regiments. Large flat stones can be used to make a covered-in drain, or barrels sunk, and covered over with small stones and clay well rammed in round them, answer well.

7th. RACKS FOR ARMS.—These should be made where the arms were piled as the regiment stood in open column. They are easily made by driving in two forked sticks, one at four paces from the front tent, the other at from 20 to 25 ft. from it, according to the strength of the company. They should be about a couple of feet in the ground, and just so much above it that, when joined by a bar on top, it should be 3 ft. 6 in. high. In this bar nicks should be made at intervals of 4 in., those on one side being opposite the centre of the spaces between the nicks on the other side. If wood is plentiful, lay a rail on the ground at each side at 1 ft. 6 in. from the uprights, cutting nicks to correspond with those on the top bar. These rails should be picketed down to insure them from slipping. Upon them the butts of the rifles are placed in the nicks, the muzzles resting in the nicks of the top bar. Stones neatly arranged will do well to rest the butts against where wood is scarce. Forked sticks, 6 or 8 ft. long, connected by a top bar, should be placed in front of the tents, to hang wet clothes on, to dry blankets, &c. In countries where pine or spruce is to be had, young trees should be cut down, and the branches lopped off to within about 6 in. of the stem. About 6 ft. of such a tree, sunk near each tent door, forms the best possible rack to hang belts on.

8th. STONE PATHS.—These add greatly to the comfort of troops in camp, especially in wet weather, and lend an air of neatness and cleanliness

to the place which is very desirable. Stones should be collected by defaulters. Any old wine cases, old barrels or bags, or a hurdle, will supply the place of hand-barrows. Paths should be made in front of each row of tents, in front of the camp, round each flank to the latrines, along the kitchens, &c. ; fascines or hurdles, or corduroy work (see Article on "CORDUROY ROADS") can be used advantageously when stones are not to be had.

Defaulters should be employed upon the conservancy of the camp. All refuse matter from the kitchens and all dirt near the tents must be collected, and either burnt or buried in places to be especially marked off for that purpose.

9th. SENTRIES' BOXES OR SHADES should be constructed in all standing camps, to shelter sentries from sun and rain. They are easily constructed with hurdles ; or if shade from the sun only is required, a few branches, interlaced and fastened to a pole driven into the ground, forms an umbrella-like protection that will answer the purpose well.

When encamped for several days in any one spot, it is very necessary that all the *rubbish and dirt* from the camp should be carried daily to a spot selected for the purpose, and there burnt ; defaulters should be employed upon this duty.

DAILY ROUTINE OF DUTIES IN CAMP.—The officers for daily duty in camp, in addition to those in charge of guards, are to be a general or generals of the day, according to circumstances and the strength of the camp. In large camps there is to be a lieutenant-general of the day, and a major-general of each wing, or one major-general of cavalry, and one of infantry, and M. O. B.s in the same proportion, a F. O. per brigade, a captain and subaltern of the day per regiment, and an adjutant and Q. M. of the day per brigade.

The general of the day is to superintend the regularity and discipline of the camp in every particular ; he is to visit the guards, and the outposts (unless the latter have been placed under the command of some particular officer) ; he is to call out and inspect the inlying piquets as often, and at such times, as he thinks proper ; he is to receive all reports from guards and outposts, and make immediate communication of any unusual occurrences to the G. O. C.

The F. O. of the day has the general superintendence of the camp of the brigade ; he is to be present at the mounting of all the brigade guards, which he is to visit by day and by night. The inlying piquets are always to be considered under his command ; he is to call them out, to inspect them, to order such patrols from them as he may judge necessary to insure the regularity and order of the camp, and, in the event of their being ordered out of camp on any duty, he is to accompany them.

The captain of the day is to superintend the cleanliness and regularity of the camp of his own regiment; to attend the parading of all regimental guards; to visit them by day and night; and to report everything extraordinary to the C. O.

The subaltern of the day assists the captain in his various duties, and reports to him any irregularity which may come to his knowledge.

The brigade adjutant of the day is to assist the B.M. in the various details of it, and in the absence of the B.M. is to receive and execute all orders; it may frequently be necessary for him likewise to attend for orders at headquarters.

It is the duty of the brigade Q.M. of the day to attend to the cleanliness of the camp, and take care that all broken glass and filth of every kind are removed, for which the Q.M. of each regiment is responsible as far as the camp of his regiment is concerned.

The officers on duty and those in waiting as next for duty, who are always to be named in orders, must never be absent from camp. No officer, without special permission from his G.O.C., must sleep out of his camp.

On the arrival of a division or brigade on the ground destined for its camp, the quarter and rear-guards of the respective regiments are to be mounted immediately, and the advanced piquets, if circumstances require them, posted. The grand guards of cavalry are next to be formed, and the horses picketed. The tents are then to be pitched; and until this duty is completed, the officers are on no account to quit their troops or companies, or to employ any soldier for their own convenience.

G.Os.C. are not to leave their brigades until the tents are pitched and the guards are posted. They are to encamp with their brigades, unless quarters can be procured for them in the immediate vicinity.

Camp followers and retainers of an army in the field are subject, equally with soldiers, to the provisions of the Mutiny Act and Articles of War.

Every encouragement is to be given to the people of the country occupied to supply the camp markets; and any soldier ill-using, molesting, or attempting to defraud them, or to exact anything for their free passage to and from the camp, is to be summarily punished in the most exemplary manner.

All foraging parties, and those employed in carrying water, or collecting fuel or straw, are to be attended by a N.C.O. from each troop or company. If a party exceeds 20 men, and is to march any considerable distance from camp, it is to be under the command of a subaltern officer.

The troops of every branch of the service are at all times to be kept in readiness to turn out at the shortest notice. It is expected that in half an hour from the time the troops receive the order to march, either by day or night, the army shall stand formed at the head of its encampment, with baggage packed, and the whole force prepared to move. This state of preparation is equally essential in cantonments and in camp; and in both the troops are to be accustomed to march without any previous notice.

Regiments encamped near villages are to send frequent patrols into them to appre-

hend any soldiers who may be there without passes, or who, having passes, may behave improperly.

Plundering and marauding are, and ever have been, considered highly disgraceful to soldiers, and unworthy of civilised troops. These offences are, therefore, at all times, and in all places, to be promptly and rigorously repressed, and it is to be considered an imperative duty on the part of all officers and N.C.Os. to interfere, and endeavour to the best of their ability to put a stop to any proceeding of the kind.

All G.Os.C. are, as soon as possible, to make themselves acquainted with the nature of the country in the vicinity of the camp, with the roads, passes, bridges, and defiles, &c., and particularly with the outposts; so that in the event of the general officers being ordered suddenly to support or defend any post, they may be able to march without waiting for guides, and be competent to form the best disposition for the service. They are to instruct their As.D.C. in these particulars, and always to require their attendance when they visit the outposts.

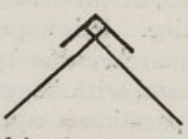
An intimate knowledge of the theatre of action, and its neighbourhood, must be of the greatest advantage to every officer, but more particularly so to general officers, and others in important commands. By maps, acquired local information, and unremitting activity and observation, they will attain this important knowledge, which will enable them to act with decided advantage against an enemy. Guides may be of service in the common operations of marches; but near the enemy the eye and intelligence of the principal officers must determine the movement of troops, and enable them to seize and improve every advantage.

Huts.—In positions intended for permanent occupation, or at bases or temporary bases, the men ought to be hutted.

In a sanitary point of view, the ground should never be excavated, nor earth piled up against the sides of the huts.

Arrange the flooring so that there shall be a current of air under it, and, if possible, have it fastened down with screws, so that it can be removed frequently. This is a most essential point if the huts are intended for lengthened occupation, and are laid on the ground without much previous preparation.

If no planks can be had for flooring, it is a good plan to pave the portion not covered with beds, so that it can be swept several times a day. If this cannot be done, then remove about 2 in. deep of the earth every four or five days, putting down dry earth or sand in its place. Ashes from wood fires are a good substance to use.

Arrange for ridge ventilation thus:  If the men suffer from cold, issue extra blankets and other clothing, which it is taken for granted can always be done where troops are hutted, but keep open the ventilators.

That known as the Gloucester hut, made to hold twenty-four men, and heated by a stove, is about the easiest to put up with unskilled labour. It is 28 ft. long, 16 ft. wide, 6 ft. high at the eaves, and 16 ft. at the ridge. It can always be made in England, and sent out with printed instructions as to the manner of putting it together. To make the roofs water-tight, good tarpaulins, or the coarsest description of calico well tarred over, lasts much better than felt, which latter was issued in the Crimea and was a failure.

These huts are the best, without doubt, if they are intended for a hospital in rear of an army; but if it is intended to hut for the winter an army actually in the field, or to hut an army of occupation, it is perhaps better to send out material and allow the men to hut themselves. If this is done, the best plan of hut is that 32 ft. long, 16 ft. wide, and 6 ft. high, from sleeper to wall-plate, to hold 28 men. Two huts should be put end on one to the other, a gable between them being built of brick or stone, with one chimney serving for the two fire-places, which latter should be large. For these huts the doors with hinges and the windows should be sent out ready made. The material should be scantling, of two sizes: 1st, 2 in. × 3½ in. thick and 16 ft. long, for sleepers, wall-plates, uprights and joists; 2nd, 1½ in. × 3 in. thick and 11 ft. long, for rafters, ridge-poles and braces. Rafters of that length will give the roof a good pitch. Such a hut would require, for two sides and one end and gable, 40¾-in. planks 16 ft. long and 11 in. wide; this would allow for their lapping 1½ in. one over the other. For the roof, 48½-in. planks 11 ft. long. The nails required would be 2½ in. for the sides, 2 in. for the roof, and clout nails for the tarpaulins on roofs. The cubic space in huts should be 400 cubic ft. per man.

Previously to erecting these huts, the ground should be levelled. Place the sills, when possible, on a foundation of small stones. Except in the tropics, the doors should, as nearly as possible, face the mid-day sun. In cold climates the door should not be on the side exposed to the prevailing wind.

Most comfortable huts were made by many of our officers in the Crimea and by the Sardinians for their men, according to the following plan. A space the size of the intended hut was dug out 2½ ft. deep. Gables were then built of mud or stone, or made of boards or wattle and daub; a door in one, and in the other a window formed by a wooden packing case, with the bottom knocked out of it. The gables should be 2 ft. wider than the excavation, so that when the roof is put on a ledge will be left all round to serve as a shelf. The fire-place was either made of brick or mud, or sometimes was merely cut out of the face of the earth, forming one of the side walls, a flue being bored from it in a slanting direction, so as to come up out of the ground clear of where the roof rested on it, and was there provided with a chimney about 2 ft. high. The huts made after this plan by the Sardi-

nians, to contain 6 infantry soldiers, were 14 ft. 3 in. long. and 7 ft. 1 in. wide in the clear. The roofs were made of strong rough rafters, supporting hurdles covered with a layer of about 6 in. of mud well mixed up with dry grass or straw. If the mud is well tempered in this manner, it resists heavy rain for a long time. The Tartars roof their houses so, and indeed it is common throughout the north of China. These huts can be greatly improved by adding a wall of 2 ft. all round, taking care to leave a space of 1 ft. between it and the edge of the excavation. If brushwood is very plentiful, the walls may be made of wattle, the uprights being 18 in. apart.

The pitch of roof in all roughly constructed huts should be at an angle of 45°.

Our troops made good shelter for themselves in the Peninsula by half cutting through a long branch of a cork tree, so that its ends reached the ground; by placing other branches cut for the purpose against it, and interlacing them with others, a good wigwam was soon made.

Log Huts.—In woody countries like America, good huts to last for years are quickly made of logs placed one over the other, being notched half their respective thickness at the angles, so as to fit one into the other. Moss is driven into the interstices. A roof is put on of split logs gouged out in the centre, so that each is like a long curved gutter. A layer of these is placed side by side, with the hollow side uppermost, one end resting on the ridge pole, the other on the walls. A second layer is put over them, with the hollow side down. A large split log, well hollowed out, is used as a ridge piece. Bark taken in long strips from a tree makes good roofing on sides for a wigwam.

Cow-dung is an invaluable material for huts in the field. If mixed with water, and well plastered over mud walls or floors, it renders them hard, tough, and less subject to injury from weather. A thin coating of this applied every day to the earthen floors of huts adds much to the look of cleanliness which is so essential to comfort. Those who have served in India know how largely it is used by the natives there for cleansing their earthen floors and cooking places.

In all standing camps it must be remembered that the surface ground round the huts or tents quickly becomes saturated with filth. It should be scraped once a week, and the ashes from the kitchens, or some sand or clay, spread in its place. The surface earth thus scraped off should be buried.

HUT STABLES.—Rough sheds with clap-boarded roofs are the best; with the litter and some wet earth, good walls can soon be constructed round the

shed ; these walls should be vertical on the inside, but with a good slope towards the outside. Sheds made 30 ft. wide can accommodate two rows of horses, their heads being turned towards one another. Plenty of openings must be left for doors by which to remove the horses quickly in case of fire, and drainage must be well attended to. The stalls, or standing space per horse, should be 5 ft. wide and 9 ft. long.

Billets.—In future wars against civilised nations, our troops must either bivouac or be billeted in towns and villages, as they were in fact during our campaigns in Spain and France at the beginning of the century. Infantry should be billeted in the villages nearest the road being marched over, the R.A. in those next further off, whilst the cavalry, having the greatest power of locomotion can be billeted in the distant villages with least inconvenience. It is often difficult to obtain suitable billets in large towns for cavalry or R.A. Villages suit them best, but if they must be billeted in a large town, accommodation should be provided for them in the suburbs if possible. In estimating the amount of accommodation afforded by any building or town, the following rules may be safely followed.

"*Accommodation*," implies the occupation of a town, village, or house for a period of some weeks in time of war ; it should, therefore, be stated what is the *maximum* number of men who can be accommodated consistently with good sanitary arrangements.

The regulation for permanent accommodation in barracks at home is at the rate of 600 cub. ft. of air per man in barracks, and 400 per man in huts. This allowance of space may, however, be regarded as unnecessarily large for a time of emergency. The following is a rough method for calculating the number of men who can be accommodated in a room ; it will generally be found sufficiently accurate for practical purposes :—

For rooms 15 ft. wide or under, one man to every yard in length.

For rooms over 15 ft. in width, but under 25 ft., 2 men for every yard of length.

For rooms 25 ft. wide, 3 men for every yard of length.

As it will be impossible for an officer to visit every house in a town or village, the best plan to adopt will be to divide the houses into classes as far as possible, and by carefully examining a house of each class and estimating the number of men which it would accommodate, arrive at a fair estimate of the accommodation afforded by the total number of houses.

A certain number of rooms (usually those on the upper storey) must be left for the inhabitants, and provision must be made for cooking.

If any calculation be made, based upon the actual number of inhabitants,

it must be borne in mind that the houses of country gentlemen or large farmers will usually afford proportionately a much larger amount of accommodation than the houses of the poorer classes.

As regards horse accommodation, in all good stables a horse is allowed from 1200 to 1400 cub. ft. of space, but this allowance may be considered excessive for a time of emergency ; when stalls exist, the number of stalls may be taken to represent the number of horses which can be accommodated. In the case of barns or large outhouses, about 5 ft. of their length should be allotted to each horse.

The Germans estimate the available accommodation of a village or town by the number of fireplaces they contain, and if this number is unknown, they assume it to be $\frac{1}{4}$ or $\frac{1}{2}$ of the number of inhabitants. If the troops are to remain long in a village, the number of men quartered upon each house is at the rate of 1 man of infantry, $\frac{1}{2}$ man of cavalry or R.H.A., or $\frac{2}{3}$ man of a Fd. Battery to each fireplace. For one night, from 18 to 20 infantry men per fireplace, provided the men have their own rations and have not to depend upon the villagers for food. When the troops are to stay 14 days, from 3 to 6 men and from 1 to 2 horses, and for a week, from 10 to 14 men per fireplace. During the autumn manœuvres, they allow 3 to 4 infantry, or from 1 to 2 cavalry per fireplace. When on the march, or if the troops are to stay a night in their billets, 2 to 3 foot or 1 to $1\frac{1}{2}$ mounted soldiers.

If more than one division is to be billeted in a town, the particular locality that each is to have should be told off to it by a S.O. belonging to army Hd. Qrs. It is a good plan to have a main street for the demarcation between the two, as it prevents disputes. The senior S.O. of each division should again divide his portion into two, for his two brigades, to be subdivided again for each corps and department. The guns and their waggons should be parked in some open square, their horses being stabled as near them as possible. Cavalry had better be near the outskirts. Generals, brigadiers, and C.Os. of all sorts should, as nearly as possible, have their quarters in the centre of their command, and it is to be clearly understood by all, that under no circumstances will individuals, of any rank whatsoever, be allowed to take possession of quarters unless they have been duly given over to them. The commissariat should be established in a suburb, or on the outskirts, so that their waggons and animals can be parked outside in the nearest fields. This holds good with siege and every other other description of trains. It is essential that all these allotments be made before the troops march into the town, for which purpose a S.O., with an officer from each department and from the personal staff of each G.O.C., should precede the troops on the march by at least two or three hours.

The officer charged with this duty, upon arriving at the city or town in which the force is to be billeted, will at once call upon the mayor or chief

magistrate, for the purpose of making the necessary arrangements with him, to be enforced by his authority and the local police.

It is advisable to do this, even in an enemy's town, as long as any recognised magistrate remains in it.

If a plan of the town is to be had from him, it will facilitate matters greatly.

Each officer employed upon this duty should have a piece of chalk, and mark with it, upon the doors of the buildings, the name or number of the corps to which it has been apportioned.

The street or quarter told off for each battalion, &c., must then be subdivided into portions for each company, &c., by the officer of it who accompanied the S.O. in advance, and notes made in his pocket-book describing the locality, so that he can find it again easily. If the town has been abandoned by its inhabitants, the streets, squares, and principal houses should be named, their names being affixed to them in a legible manner as soon as possible.

Finger-posts, pointing to the Hd. Qrs., general hospital, commissariat, &c., should be erected. The main guard should be as near the centre of the town as possible ; other guards must be posted at the several main exits. The provost establishment will be at the main guard, and all the police duties carried out under the immediate orders of the P.M., with whom no one shall interfere.

Alarm posts must be assigned to each corps, where they will be halted upon first arrival, and where they will parade daily during their stay in the place.

The S.Os. must see to the general *conservancy* of the town, making corps keep clean their own particular localities.

They will also see to opening out communications, so that when the force marches it may have numerous exits, and that troops and trains billeted in rear of the place, or in the suburbs, should be able to get upon the main line of advance, without going through the city.

Bivouac.—Napoleon preferred the bivouac to tents for men, and there can be no doubt that it is more healthy in fine weather, particularly if operating in a wooded country where fires can be maintained easily. No tents being used adds greatly to the mobility of an army. Englishmen rather shudder at the notion of life without any protection from wind, rain, and dews, because they naturally take a gloomy view of the weather, but after the first few days' experience, most soldiers like it. In Europe it is quite certain that armies when moving cannot have tents, they must either be billeted in the towns and villages or must bivouac.

In selecting a site for a bivouac, wood and water are, as for camps, the great requisites, but a good supply of the former is more essential for the bivouac than for the camp, as it is robbed of half its enjoyment, unless the men can have large fires to sleep near. This is all the more essential if the nights are cold. In cold weather, woods are the warmest place for a bivouac. In tropical climates it is pleasanter at night to bivouac in the open. The sanitary principles that apply to the selection of camps, hold good in choosing the site for a bivouac ; dry and sheltered positions should be selected. When camping or bivouacing in a hilly or undulating country, remember that the actual cold is greater in the valley than on the side of the hill ; half way up a slope is generally the best site for comfort as well as for military reasons, for to obtain the shelter of the hill to screen you from the wind as well as from the enemy's observation, and you avoid the cold below. Cavalry and artillery should not take up a position immediately behind a wood, which, in case of attack, would prevent them acting; they should have clear ground in front of them. Narrow belts of wood in front form a good screen for infantry, both from wind and from the enemy's observation ; woods, especially pine woods, afford good sites for an infantry bivouac ; they are warm at night and cool during the day in very hot weather. When possible, advantage should be taken of walls, banks, &c., to afford shelter.

Cavalry should wheel into open column of squadrons, picket their horses, and each man sleep in front of his own horse. Infantry having wheeled into column should pile arms, and sleep as they then stand in the ranks, the officers in both instances sleeping on the reverse flank. The artillery having picketed their horses and placed the guns, waggons, &c., as if for a camp, should, like the cavalry, sleep opposite to their horses. Artillery should always bivouac in line. If the enemy is at such a distance as to preclude the possibility of a night attack, all horses should be unsaddled and unharnessed, the saddlery, harness, arms, helmets, accoutrements and kits of mounted corps being placed in front of each horse as he stands at the picket ropes: the infantry should hang their helmets and accoutrements on their rifles as they stand piled, but each man should retain his water bottle, haversack, and valise. When troops bivouac in the immediate presence of an enemy, and a night attack is possible, or when it is necessary to begin your attack very early next morning, the men must remain accoutred, the horses saddled and harnessed. The men with horses must sleep as best they can, taking it in turns to lie down whilst the comrade holds the two horses. At times it is even necessary to keep the gun horses hooked-to all night, when the men must sleep by turns. As a rule the form of bivouac should as nearly as possible be that of a camp.

A few logs of wood, sods of grass or turf, or stones piled up to windward, afford good protection, and add greatly to comfort. If there is time and material at hand, shelter, after the backwoodman's fashion, should be made

by driving into the ground forked sticks, 4 or 6 ft. long, and resting a pole between them: branches should then be laid against it to the windward side at an angle of 45°, bark or smaller branches being laid over them again until a good shelter is obtained. In doing this, remember that the thicker ends should always be placed uppermost, the leaves being, as it were, upside down; they will throw off the rain better in this manner. Little pent houses made so are most comfortable when slept under with a good fire at one's feet. If sufficient straw or leaves cannot be found, a hollow should invariably be scraped away for the hip to rest in. The small boughs of the American hemlock, laid with the stalks down, form a luxurious bed.

Circles of about 18 ft. in diameter, made with a bank about 3 ft. high form a comfortable bivouac; the earth, sods, &c., for the bank to be taken from without the circle, the ground within which should be disturbed as little as possible. The entrance should be on the leeward side; a fire in the middle of the circle adds greatly to comfort. A lean-to can be very easily made with the bank if any good material is at hand. These circles should be made for companies on the prolongation of the piles of arms; each circle would hold 25 men. Cooking places in same line with piles of arms, but in rear of these circles; the officers would be most conveniently placed immediately in rear of piles of arms and in front of the circles made for the men, officer's latrines in front, the men's in rear.

Men sleeping together should always club their blankets, so as to have one to sleep on, the other being over them. Too much attention cannot be paid to making the sleeping place comfortable. Unless men get good refreshing sleep they cannot sustain continued work. The company officers should be most energetic in this matter, for a little trouble bestowed in collecting dry grass, shavings, &c., may prevent your awakening some two hours before daybreak, chilled with cold, so that you cannot get to sleep. The author has frequently made use of his sword-hilt, a log of wood, or a stone, and slept most soundly.

When one wakes in the morning, the limbs feel a little stiff; take a smart run, and the blood will soon begin to circulate quickly, whereas they who crouch down over their fires feel cold a long time.

Campaigning.—A great object with officers should be to keep those committed to their charge in good health. Without it nothing can be accomplished. There are precautions to be taken, and rules to be attended to—the result of experience—which it is now disgraceful in an officer to be ignorant of. Were the C.O. of a regiment in any future war to order his men to dig large holes and pitch their tents in them, as was done by a genius before Sebastopol, a C.M. would be justified in finding him guilty of the murder of those who died in consequence.

Under the heads of Camps and Positions I have noted down the sanitary points that should be attended to. I shall now merely state a few general rules.

Change the positions of camps as frequently as possible. When at a distance from the enemy, scatter divisions, regiments, and even individual tents as much as possible.

The mind and the body must both be attended to: each reacts upon the other. If the man is not well fed, well clothed and housed, the privations must soon tell upon his disposition and his temper. The result can only be sickness and uselessness. See that your officers and men have something to eat and drink before they begin their work, no matter how early. A cup of hot coffee and a biscuit is a good morning meal before the regular breakfast.

You cannot pay too much attention to cooking: try to get the men's rations varied as much as possible, and see that no opportunity is lost of buying vegetables for them. Never hesitate to report at once any improvement that strikes you as feasible and advantageous. If you find that the meat ration is not sufficient, report it at once.

Get your men hot meals when possible. If preserved or cooked rations have been served out, and there is time, they should be warmed or made into soup or bouilli before being eaten. This is of great consequence after a long march, or a day of hard fighting. Save your men when you can, as you would your horse; they will be all the more fit for a great effort when you require them to make it. Reduce the number of your sentries as much as possible. The most ignorant man knows the advantage of creature comforts to the efficiency of the soldier; but we are prone to regard our soldiers as machines, merely requiring a certain amount of bread and beef, washed down by a gill of rum, to keep them not only in motion, but in perfect order. We are only now awakening to the necessity of developing their moral qualities. A man without hope makes an indifferent soldier: but one without good spirits and cheerfulness is worse than useless. Strive then, by all possible means, to develop—to create, if necessary—the high moral qualities of human nature in those serving with you.

The powers of a weak man, endowed with hope and lofty courage, are always of greater service to the State than those of a great strong fellow who is discontented and desponding.

Employ officers to superintend all large fatigues, and associate them with the men in all their work. Often have I blushed for my profession, when I have seen officers sitting down under some shelter reading a book, whilst their men were working, or rather, I should say, supposed to be working; for after a little time, when the men see that their officers do not take an interest in what is going on, they soon follow suit.

C.Os. of regiments and brigades cannot be too strict in such matters, and

any S.O. who fails to report or take notice of such irregularities is unfit for his position.

Care should be taken that each soldier has a housewife ; and when time permits, attempts should be made to have them instructed in the art of mending their clothes, and even their boots.

In the field no man's hair should exceed half an inch in length ; this is essential for the well-being and cleanliness of soldiers. It can only be carried out successfully when the officers of regiments and departments set the example. None except those who have worn their hair after such a fashion can appreciate the luxury it confers on service. No man can have that smart bearing, which is the outward mark of a soldier, who allows his hair to be so long that he can part it. A well-cropped head is the first great step towards cleanliness. The beard and whiskers should be cut close about once a week. Hair is the glory of a woman, but the shame of a man. Want of cleanliness is a sure source of disease at all times, but especially so when a large number of men are living together in crowded tents.

If a camp is stationary for even a week in any one locality, endeavours should be made to provide a washing place for the men, where there shall be abundance of water : they should be encouraged to wash themselves all over in cold water, whenever opportunities offer for doing so. It is of the utmost consequence that the feet should be washed frequently.

Bathing should be encouraged as much as possible on service ; it is a cleanly habit, and is very invigorating ; it should be avoided soon after meals, or when the man is very fatigued, or in a profuse perspiration ; if the body is merely warm and perspiring after a smart walk, it will do no harm.

It is difficult to wash clothes during a campaign, but it can really be dispensed with for a long time without injury to health : linen or cotton shirts should not be used in the field : two good flannel shirts of a greyish colour are ample for all ranks, if worn day about ; when the shirt is taken off, it should be hung up, stretched out, and exposed to the sun and wind. It should be shaken and beaten with a small stick, or well brushed. The same rule applies to trousers and to drawers, when these latter are worn. Washing flannel or any woollen material soon ruins it.

Never allow your men to be idle except when they require rest, but let them see that the work they are employed on is for their own or the general benefit. At once give up the pipeclay humbug of the barrack square, and its aimless exercises. Practise your men in marching. The army that can march best, is the best army, and the regiment that can march best in an army, is the best in that army.

As for drill, in respect to the battalion and brigade evolutions required during an action, the worst militia regiment could do enough for all practical purposes, but at the same time, it must be remembered that with our short service army, drill s more necessary than ever in order to discipline the

soldier, both physically and morally. We have now less time to do this than formerly; we must therefore endeavour to compress more instruction into the week and month than was usually done under the long service system. One of the great objects of careful drilling has always been to discipline the soldier thereby, and this can be effected quite as effectively by imparting useful information to him, and by practising him daily in exercises corresponding as nearly as possible with the work to be done when engaged with the enemy, as by the constant repetition of the showy parade movements described in our Drill books.

The running drill has been a glorious innovation. What really fatigues and disgusts soldiers is the time that is dawdled away in parades. If the division at any of our camps at home is to go through a field day, think of the time that elapses between the fall in being sounded on regimental parades, and when the division is called to attention by the G.O.C.

C.Os. new to war try to carry out the routine of home service in the field; it requires a man of good judgment to select those rules that can never be relaxed, and for negligence of which men should always be punished, from the others that should not be enforced.

If men have good regular hot meals, and are comfortably warm at night, they never become discontented by hard work. See article on "CAMPS," for details of the work to be done. Two days in every week at least regiments should march from five to ten miles, attention being paid to the advice laid down under the article on "MARCHES." Regular work and good food will get Englishmen into training, so that they can do anything.

There can be no doubt that all the diseases of cholera, dysentery, diarrhœa, scurvy, typhus, and malarious fevers, which have been the scourge of armies from the earliest days to this time, have arisen from bad or insufficient food, impure air, bad water, overcrowding in tents or huts, and the misery and depression of spirits ensuing from these evils.

The men's boots and socks to be frequently inspected, so as to be certain that they are always in a fit state for a march. If these points are carefully attended to, your men will go into action fit for work.

Once there, and having been taught the truth of the distich 'fire low, fire slow,' the English officer may confidently count upon victory.

Cooking.—In permanent camps it is desirable to establish regular coppers or boilers for cooking. When possible, 3 pots should be provided for each company: one for meat or soup, to hold 1 quart per man; one for vegetables, to hold 3 pints per man; and one for tea, to hold 1 pint per man. When only one cooking vessel is available, its minimum capacity should be 3 pints per man.

Calculating losses for cutting up, bones, cooking, &c., the soldier does not get more than half the weight of his meat ration to eat.

BOILING meat entails a loss in weight of about 30 per cent. The water should never be higher than 160°, if hotter, the meat becomes hard and shrunken; the lower the temperature the better are the nutritive juices kept in. The larger the piece of meat the better. Put the meat into boiling water, let it boil for 5 minutes, and then reduce the temperature of the water, either by pouring in cold water, or by reducing the fire until it is about 160° Fahr., that is, as hot as the finger can be put into without scalding. Allow a quarter of an hour for every pound the meat weighs.

ROASTING.—The loss is a little less than in boiling. The meat should be exposed at first to a great heat, for the purpose of keeping in the juice. Allow a quarter of an hour a pound.

RECEIPTS FOR COOKING.

Meat Soup.

16½ lbs. meat.	¼ oz. pepper.
1 lb. onions.	5 oz. sugar.
1 lb. flour.	Small faggot of herbs.
5 oz. salt.	3⅓ gallons of water.

Separate the *large* bone from the meat, also the gristle, cut the meat into pieces of about 4 oz., take 8 oz. of the fat, and chop it up, slice the onions, put the fat in the boiler; when melted, add the onions, stir them well, so that they do not get brown; in five minutes add the meat, which keep stirring and turning over for five minutes longer: the meat ought to be warm through; then add the boiling water by degrees, let it simmer gently for one hour, mix the flour with cold water very smooth, add it to the soup, with the salt, pepper, sugar, and herbs; simmer gently for thirty minutes, keep stirring it to prevent the flour from settling at the bottom.

The great error commonly committed in making soup is doing it too rapidly, which renders the meat hard and tasteless. Bones and scraps of meat should be collected after every meal, and put down to simmer for next day's soup.

Irish Stew.

16½ lbs. meat.	6 oz. salt.
16 lbs. potatoes.	1 oz. pepper.
4 lbs. onions.	½ lb. flour.

Cut the meat away from the bone, and then into pieces of ¼ lb. each, the loin and neck of mutton into chops, disjoint the shoulder, and cut the blade-bone into four pieces (if the leg, cut into slices) ¾-inch thick, rub them with the salt, pepper, and flour, and place the meat in the boiler with some fat, brown it on both sides, then add the onions whole, and then the potatoes, and enough water to cover the potatoes; stew gently for two hours, keep the fire down and well covered during the cooking.

Beef and Mutton Pudding.

16½ lbs. meat.	½ oz. pepper.
6 lbs. flour.	Sweet herbs.
1 lb. onions.	Water.
2 oz. salt.	

Cut the meat from the bone and sinews, take away 1½ lb. fat for the paste. Cut the meat into pieces of ½-inch thick, and rub it with half the salt, pepper, chopped onions, and herbs; place it in a large dish, or five small basins, with a little water. Then make the paste as follows:—Place on the table the flour, make a hole with the hand in the centre, then place in it the chopped fat, salt, and pepper, then put some water in the hole, gradually stir the flour into it until all the flour is moistened, and it forms a stiff paste; work and roll it well for two minutes, let it remain as a ball for ten minutes, roll it out to the thickness required, put a piece of paste round the inside of the dish or basin, and cover it with the paste, taking care that the edges are properly joined together, or the gravy will boil out. Steam the large puddings for two and a half hours, and the basins for two hours.

How to soak and plain boil the rations of Salt Meat.—To each pound of meat allow half a pint of water, or a pint if handy; do not let the pieces weigh more than 3 or 4 lbs. each. Let them soak about eight hours, or all night if possible. Wash each piece with your hand to extract as much salt as possible; it is then ready for cooking. If less time is allowed, cut the pieces smaller, or parboil the meat for twenty minutes in the above quantity of water, which throw off and add more. Simmer gently for three hours, and serve. Vegetables or dumplings can be boiled with it.

Salt Meat, to prepare hurriedly.—Warm it slightly on both sides—this makes the salt draw to the outside—then rinse it well in a pannikin of water. This process is found to extract a great deal of salt, and to leave the meat in a fit state for cooking.

How to stew Fresh Beef, Pork, Mutton, and Veal.—Cut or chop 2 lbs. of fresh beef into 10 or 12 pieces; put these into a saucepan with 1½ teaspoonful of salt, 1½ teaspoonful of sugar, ½ teaspoonful of pepper, 2 middle-sized onions sliced, ½ pint of water. Set on the fire for ten minutes until forming a thick gravy. Add a good tablespoonful of flour, stir on the fire a few minutes; add a quart and a half of water; let the whole simmer until the meat is tender. Beef will take from two hours and a half to three hours; mutton and pork about two hours; veal one hour and a quarter to one hour and a half; onions, sugar, and pepper, if not to be had, must be omitted; it will even then make a good dish: ½ lb. sliced potatoes, or 2 oz. of preserved potatoes; ration vegetables may be added, also a small dumpling.

For a hurried dinner, cut your rations into pieces about the size of a penny, but three or four times thicker. Skewer them on a piece of iron wire, or hard stick: a few minutes will cook them if hung before the fire.

Vegetables must be carefully washed and cleaned from insects. Green vegetables should be boiled fast in plenty of water, and drained at once

when done. They sink when sufficiently cooked. *Potatoes* take from 20 to 30 minutes boiling; they show signs of breaking when they are done, which can be ascertained by sticking a fork into them. *Carrots and parsnips* take from 20 to 45 minutes boiling. Young nettles, sweet docks, turnip-tops, or the young leaves of mangel-wurzel, make good green food. A little pepper and salt should be added to season them. Dandelion leaves, especially when young, make a most agreeable salad. *Dried and compressed vegetables* of all kinds should be soaked from 4 to 6 hours in pure water, and then boiled slowly: if there is any bad taste from putrefaction having commenced, a little chloride of lime will remove it. The '*mixed compressed vegetables*' should be boiled in a little water for about half an hour; *the cabbage* to be boiled in sufficient water for half an hour, the *carrots and turnips* to be boiled for about 15 minutes, potatoes to be boiled in sufficient water for half an hour. Rice should be washed and soaked, and then boiled in plenty of water, *without salt*, for 20 or 25 minutes, then some salt should be thrown in, and the water drained off. Each grain will then be separate.

To make Tea.—If possible, it should be made in a vessel used solely for that purpose; on service this is generally impossible, but it renders great care on the part of the cook all the more essential. Before the tea is made the kettle must be well washed, and heated with a little hot water and well rinsed. The water for the tea should then be put in, and boiled before the tea is put in; care to be taken that the water is boiling fast when this is done. If possible, the boiling water should be poured from one kettle into another containing the dry tea. The lid should then be put on, and the pot placed beside (but not on) the fire for 4 or 5 minutes before serving it out. Much depends upon the softness of the water; if the water is hard, add when possible a small teaspoonful of soda, to the camp kettle full (for 5 men each).

To make Coffee.—The same rules apply, as regards cleanliness and the description of water, as in making tea. Sometimes there is only time to prepare it by boiling; but if possible, it is better to heat the coffee in the lid of the kettle, then put it in a kettle, and pour the boiling water on it, leaving it to stand near the fire for 5 minutes, when it will be fit for use. When there is time to do so, it should be strained through a cloth of some sort. When made, the dregs should be collected and well boiled; if this decoction is poured over fresh coffee, the result of the second making will be found strong and aromatic. To clear coffee some cold water should be poured in from a height. The cold water sinks through the coffee, and carries down the suspended particles.

Plum Pudding.—Put into a basin 1 lb. of flour, ¾ lb. of raisins (stoned, if time be allowed), ¾ lb. of the fat of salt pork (well washed, cut into small dies, or chopped);

two tablespoonfuls of sugar or treacle; add a half pint of water, mix all together; put into a cloth tied tightly; boil for four hours and serve. If time will not admit, boil only two hours, though four are preferable.

Plum Rice Pudding, in which no eggs or milk are required.—Put on the fire 12 pints of water in a moderate-sized saucepan; add to it, when boiling, 1 lb. of rice, or 16 tablespoonfuls: 4 oz. of brown sugar, or 4 tablespoonfuls; 1 large teaspoonful of salt; the rind of a lemon thinly peeled: boil gently for half an hour; strain the water from the rice, keeping the rice rather dry.

The rice-water is then ready for drinking either warm or cold. The juice of the lemon may be introduced, which would make it more palatable and refreshing.

Add to the rice 3 oz. of sugar, 4 tablespoonfuls of flour, and half a teaspoonful of pounded cinnamon; stir on the fire carefully for 5 or 6 minutes; put it in a tin or a pie-dish, and bake.

By boiling the rice a quarter of an hour longer it will be very good to eat without baking.

This will produce 5 lbs. of pudding, 6 pints of most wholesome beverage. The lemon and cinnamon may be omitted and it will still make palatable pudding and good beverage; the latter is admirable for sick men, particularly for those suffering from diarrhœa.

Lemonade.—Peel thinly the third part of the rind of a lemon, put it into a basin with two tablespoonfuls of sugar; cut the lemon in two, lengthways, and squeeze out the juice over all; stir round for a minute to form a syrup; pour in a pint of water, mix well, remove the pips, and it is ready for use. If you can strain it through a clean cloth, so much the better; 1½ tablespoonful of lime juice may be used instead of the lemon.

Diet.—To be considered here under two conditions; when on the march, i.e. marching five or six days in the week; and when halting temporarily in camp.

When marching continuously, the men reach camp very hungry, and consequently hurry on their cooking as much as possible; the result is that their dinners are generally indifferent, as there is not time to make good soup. Regiments would do well to have all bones and scraps of meat remaining after the men have had their dinners collected and put down to simmer together, with some small portion of the ration reserved for that purpose, so that all should have a good basin of soup at about 4 or 5 in the afternoon. The ration of meat might, in fact, be increased a quarter of a pound with great advantage, whilst the men are doing hard work; the best fleshy parts used at dinner, and the bony portion reserved for the evening soup.

Diet is now a science, and the recent discoveries in it have had the effect of removing the old, stupid, and I may say, cruel notions regarding the

system for training either men or horses. The appetite of men taken from quarters, placed under canvas, and marched daily, increases considerably for the first few days; meat that would be indigestible from toughness whilst living in barracks, is eaten with appetite in the field; 1½ lb. of fresh meat (bone included) is by no means a large ration for men whilst marching continuously. A man of average size and activity will, "under ordinary conditions of moderate work, take in 24 hours from $\frac{1}{26}$th to $\frac{1}{20}$th of his own weight in solid and liquid food," "the solid being to the liquid as 1 to 2." The daily ration should be varied as often as possible, for men tire of the same food day after day; the greatest possible variety ought also to be made in the mode of cooking it.

Give your men as little spirits as possible; tea and coffee are much more sustaining and more portable. If in countries where light wines are plentiful, induce your men to drink them (nothing beyond 15 per cent. alcohol being used); they are good anti-scorbutics, and scurvy is the one great disease to guard against in war.

The old superstition that "grog," is a good thing for men before, during, or after a march, has been proved by the scientific men of all nations to be a fallacy, and is only still maintained by men who mistake the cravings arising solely from habit for the promptings of Nature herself. It is the commonest thing to see men, even when travelling at home, taking brandy "to keep them warm." It is an ascertained fact that alcohol of any sort reduces instead of increases the temperature of the body.

The use of spirits in cold weather has been well tested during the various polar expeditions, the medical officers of which all condemn it as a preventive against cold.

No men require greater endurance than the trappers of British North America, and none do a greater amount of hard physical work than the voyageurs and lumbermen there; none of them drink spirits when in the woods; tea being their constant beverage. Our armies in Kaffraria had no spirit issued to them as a rule, and no army in the field was ever more healthy (if any other ever was as free from sickness). Our experience in the Indian mutiny also carries out this theory; for months in some places our men were entirely cut off from all liquor, and they were healthier than when subsequently it was issued to them as a ration. By increasing the allowance of tea, and abolishing that of rum, you diminish the supplies to be carried to a great extent, whilst you add to the health and efficiency of your men; their discipline will improve as their moral tone is raised, engendering a manly cheerfulness that spirit-drinking armies know nothing of. No men have ever done harder work than was performed by the troops employed upon the Red River expedition; no spirits of any sort were issued to them, but they had practically as much of good tea as they could drink; illness was, I may say, unknown amongst them. The use of rum has been so long

the custom in our armies, that it is difficult now to discontinue it. It can only be effected by a cheerful co-operation on the part of the officers. If the men do not receive rum, and have not the power of buying it, the use of wine in camp by officers should be given up. It is humbug for an officer to lecture men about drinking, advising them against the use of spirits, and then go to his tent to be merry over a bottle of sherry. Wine with the officer holds the place of rum with the private ; and although the bottle of wine may do the former no harm, he ought cheerfully to go without his luxury, when he compels those under his orders to forego theirs ; feeling that his conduct is for the good of the service should amply compensate him for the privation. As the allowance of baggage to which officers are entitled has now been reduced to a minimum, they will not have power to carry about luxuries such as wine with them.

Dr. Parkes recommends that after the evening meal, the tea-leaves should be heated again in sufficient quantity of water to enable the men to fill their water bottles for the next morning's march.

Officers in command of companies should impress upon their men the danger to which they expose themselves in drinking bad water. Poisonous matter of many descriptions may be taken into the stomach with it. In Algeria, leeches have in this manner been frequently taken into the body, causing dangerous internal bleeding.

There can be no doubt as to the injurious effect upon the health produced by impure water. Dysentery and diarrhœa ensue from drinking it, and in the opinion of the best army surgeons, it is one of the chief causes of those fearful diseases which have devastated armies in so many wars. It has lately been proved that if bad water does not produce cholera, its use predisposes the body to take it when it is prevalent.

Bread should always be issued, when possible, in preference to biscuit.

We are too fond of issuing salt meat to our men. Doing so saves the commissariat trouble, so that department is in consequence always desirous of serving it out. Except under peculiar circumstances, it should not be issued during marches, as it creates thirst. It is much easier to drive live cattle than to carry great hogsheads of salt pork on waggons.

It is to be regretted that, during peace, salt provisions are not served out once a week to our men all over the world, in order to accustom them to cooking and eating them.

Medical and Surgical Hints.—On all outpost and detached duties hours, if not days, may elapse before the services of a doctor can be procured : the following hints may therefore be useful.

Bleeding from Wounds is from a vein or artery ; from the former it is seldom of much consequence ; it is distinguished by the dark colour of the

blood ; it requires merely the application of cold water and the slight pressure of a bandage either over the wound itself or between it and the extremity of the injured limb ; the limb should also be raised to a higher level than the body. In all cases of bleeding the first consideration is to put the wounded man in a recumbent position : this is imperatively necessary in all serious cases. A man unconscious from loss of blood will often revive at once when placed on his back with his head on a level with his body. The clothes round his neck should be opened, and a little stimulant may be given.

Bleeding from an Artery is known by the bright red colour of the blood and by its spirting out in jets corresponding with the beats of the pulse. Unless stopped at once, the wounded man must die. To do so it should be remembered that it is only necessary to compress the injured artery against the bone between the wound and the body. Having placed the man as described above, feel for the pulsating artery on the inside of the limb above the wound, and when found keep up a steady pressure with the tips of the fingers, which will control the bleeding ; two men, one relieving the other every few minutes, can stay it for a long time in this manner. The pressure should be in towards the bone. If a tourniquet is to be had, apply it just above where the pressure of the fingers is found to control the bleeding. A silk or cotton handkerchief twisted tight by means of a stick passed through the slack, is a good substitute, a bullet or round stone being placed over the artery.

The inside seam of the coat or jacket follows the general course of the arteries in the arm. If the wound is in the leg the artery can be easiest found in the groin, whence it passes down inside of the thigh, winding round underneath to the hollow behind the knee. If wounds are below the elbow or knee, the pressure should be applied above those joints. If you cannot find the artery, fill up the wound with some cotton or linen, and bandage as tightly as you possibly can directly over the wound. Bleeding from gunshot wounds is generally slight at first. I have seen limbs cut off by round shot, when there was really no bleeding at all ; still precautions are always necessary, and a man with an artery cut should never be left for a moment without some one by him. The edges of sabre wounds should be brought together and sewn, or well secured with sticking plaster. *In removing the wounded from the field*, or to carry them on the march when you have no ambulance or stretchers, construct a framework with two poles 8 ft. long, leaving 6 in. at each end as handles : lash 3 short pieces across, so as to keep the poles 2½ feet apart, one piece to come just behind the man's head, one at his feet, and one in the centre ; to this a blanket is securely fastened at each corner, and along the sides, if there is time to do so. A wounded man can be carried very comfortably in this manner.

If a leg is fractured, place the man on his other side and place the injured leg exactly over the other, with any soft material that may be at hand between them, and then bandage both legs firmly together ; thick wisps of straw with thin sticks or twigs added to increase the support, placed lengthways along the broken limb, and bandaged tightly to it, is a good plan with either broken arms or legs. Two splints should be used, one on the inside of the leg, the other on the outside. A rifle with the stock towards the hip and the muzzle towards the ankle bound to the outside of the broken limb, is a good temporary substitute for a splint, if it is not to be had.

Broken arms—if splints are not to be had—should be encased between two pieces of board (2 bayonet scabbards will do), and supported in slings. A man with a fractured limb should have these precautions taken for him before he is removed. Stimulants must be given diluted with plenty of water : taken pure they are dangerous.

Broken collarbone.—Insert a thick, wedge-shaped pad in the arm-pit, with the large end upwards ; the arm to be placed in a sling, and the upper part of the arm to be bandaged to the body.

Fevers—In malarious countries, 3 or 4 or even 5 grains of quinine taken early each morning is a good preservative against fever. All English soldiers were given a daily ration of quinine in Ashantee.

Emetics.—A charge of gunpowder dissolved in water is a good and safe emetic, or two tablespoonfuls of mustard in half a pint of warm water followed by large quantities of the latter. The strongest emetic is 10 grains of bluestone (sulphate of copper), or 20 grains of sulphate of zinc in water, followed by copious draughts of warm water.

Burns and Scalds should be at once covered with cotton wool, or plenty of lint, to keep them from the air, oil being first freely applied to the injured part ; blisters should be punctured.

Rheumatism.—Equal quantities of ammonia, or spirit of turpentine, and sweet oil well rubbed on with the hand, is good. If the following ingredients are to be had, mix up in equal quantities (say half of an ounce), sulphur, nitre, flour of mustard, Turkey rhubarb, and gum guaiacum : take a teaspoonful in a wine-glassful of water every alternate night.

Faintness from over-exertion.—Open the clothes round the neck : place in a recumbent position, the head on a level with the feet : dash cold water in the face, if hartshorn or ammonia are to be had, pass them under the nose ; give a little spirits and water when able to swallow.

Sore feet from marching should be bathed at night in tepid water, having a few lumps of alum dissolved in it: if there are blisters, they should be pricked with a needle or sharp knife, but the skin must not be torn off. Previous to beginning the next day's march the tender places should have soft soap applied to them, or if it is not to be had, any sort of grease. Whisky or rum and water applied to the feet is the best preventive against blisters.

Sunstrokes.—In countries where such are to be feared, never allow the men to become exhausted, let them eat and drink frequently in small quantities. Let the hat be thick, and covered with white. In the tropics nothing but large turbans can be safely relied on as a protection against the sun. In cases of sunstroke raise the head, open the coat and everything bearing on the throat and chest; if plenty of water is to be had, keep up a stream of it on the head and upper part of the chest, until consciousness has been restored.

Frost bites.—Rub the part affected with snow or any kind of soft fur, and later on, with cold water until circulation be restored: a fire or a heated room is to be avoided.

POISONS.—Cases of poisoning in the army are generally caused by strong irritants, such as nitric, sulphuric, muriatic, or oxalic acids, corrosive sublimate, and caustic (nitrate of silver), or by sedatives or narcotics, such as morphia, opium, Indian hemp (bang), prussic acid, &c., or by arsenic or strychnine. The following remedies should be adopted in the absence of a medical officer: the chance of recovery depends mainly on the promptitude with which the remedies are applied.

Nitric, Muriatic and Oxalic acids.—Give at once lime water, or chalk, magnesia, or carbonate of magnesia in water. In the absence of all these, scrape the walls, if white-washed, or mix up some plaster from the ceiling with water and give it at once. Soapsuds is also good if other means are not at hand. Then give a spoonful of sweet oil: give barley water and gruel, avoiding solid food for 24 hours. Avoid emetics.

Sulphuric acid (*vitriol*).—Give carbonate of magnesia in water or milk. Lime water or simple magnesia unless in small quantities are not advisable. Same treatment afterwards as for nitric acid.

Corrosive Sublimate, Copperas or Blue Vitriol.—Give at once raw eggs, yolk and white mixed. Flour and water if eggs are not to be had. Avoid emetics.

Caustic (*nitrate of silver*).—Give common salt and water, sea-water, milk

or yolk of egg in water, in large quantities until vomiting is produced. Barley water, gruel and oatmeal porridge.

Opium, Morphia, Indian Hemp, Prussic Acid, and all other narcotic poisons, give emetics at once. Use every endeavour to keep the patient from going to sleep. Give strong coffee or tea ; keep him walking about, dash cold water in face, pour buckets of water over his head, apply ammonia (smelling salts), or burnt feathers to nostrils. In poisoning from prussic acid cold water poured over the head is especially called for : a few grains of carbonate of ammonia dissolved in water should be given.

Arsenic or phosphorus.—Give the strongest emetics at once.

Strychnine.—Emetics as for arsenic.

In all cases of poisoning the first thought should be, 'What was the agent used?' A careful observation will generally enable the most inexperienced to recognise the effects of narcotic poisons, by the patient being in a deep sleep, breathing heavily, and probably snoring, with skin cold and pulse weak : the smell of the breath will generally indicate if he is suffering from the effects of spirituous liquors, in which case give emetics and pour water over the head, for fatal results frequently ensue, if nothing is done to rouse men from the comatose state arising from excessive drinking.

Poisonous snake bites.—A ligature of cord should be at once placed round the limb, between the bite and body, and kept if possible until the arrival of a surgeon. If no doctor is to be found, then the flesh round the bite should be at once cut out with a knife, sucked, bathed in warm water to encourage bleeding, burnt with caustic, and have liquor ammonia applied freely. One or all of these external means may be resorted to. The strength should be supported and stimulants given freely. Liquor ammonia may be given in doses of 10 drops in a wine-glass of water every quarter of an hour for 1 or 1½ hours if the patient does not rally. If this is not at hand, apply strong rum or brandy, and make him drunk by giving the same internally.

Bites from Scorpions, Centipedes, Wasps, etc., should be treated externally with liquor ammonia : if there is depression of spirits, give it in doses of 10 drops in a wine-glass of water at a time, or if none is at hand, use strong spirits internally and externally.

To restore a half-drowned man.—Do not remove him into a house, but try your remedies 'on the spot, in the open air, exposing the chest and face to the breeze.' 'Place him gently on his face with his wrist under the forehead ;' this will clear the throat : observe him keenly for some seconds, to see if he breathes, if not, turn him well and instantly on his side ; 'excite the

nostrils with snuff, the throat with a feather, &c., dash cold water on the face previously rubbed warm:' if this is unsuccessful, replace him 'on his face, raising and supporting the chest well on a folded coat: turn him very gently on the side, and a little beyond, and then briskly on the face alternately, repeating these measures deliberately and perseveringly 15 times in a minute, occasionally varying the side.' Each time that he is on his face 'make equable but sufficient pressure, with brisk movement along the back of the chest; removing it immediately before rotation on the side.' If not too late the result will be respiration. Whilst this is being done, others should have removed his boots, putting his feet against their own stomachs next the skin: if warm bricks or warm water are to be had, his extremities may be warmed by them; hot bricks, or stones, or pieces of any metal may be advantageously placed over his groins, and under his arm-pits. 'His limbs to be rubbed upwards, with firm grasping pressure, and with energy, using handkerchiefs, &c.' This induces circulation; as he revives, dry and warm his limbs, and when dry clothe him plentifully.

Officers before starting on detached duties where they will be for days or weeks without medical assistance, should carry a small store of simple medical remedies, the quantity of which must depend upon the number going with them, and the probable length of their absence. The diseases prevailing at the theatre of operations will influence the nature of the remedies to be taken: a local doctor should be consulted on this point. The following should always be taken: a linen bandage to be served out to each man, the sergeant to have a tourniquet. The officer to carry a small supply of sticking plaister, lint, and a little oil silk, a pair of scissors, a pair of forceps to pull out thorns, a couple of needles and some silk to sew up sword cuts, a small sharp knife, a small piece of nitrate of silver in holder. A supply of quinine in powder, pills for diarrhœa, &c. When a field companion is to be had, it should invariably be taken instead of the above detail of medicine, as it contains an assorted collection.

The weather.—The weather has the greatest influence upon military operations. It is needless to recount the many instances where the most accurately calculated operations have been brought to nought, and perhaps turned to disaster, by such little trifles as a shower of rain, &c. Officers of all ranks should endeavour to be 'weatherwise.' In other words, they should by a constant study of the heavenly phenomena, learn to know what sort of sky precedes a storm, rain, &c., &c.

From the moment you enter the country that is to be the theatre of war, the small aneroid barometer should be observed, and its height remarked three times a day—upon rising in the morning, at noon, and just before lying down to sleep at night. 'No attention whatever should be paid to the words 'fair,' 'rain,' &c., noted on the dial, for they are apt to mislead. An

aneroid falls sometimes from wind, and rises at the approach of severe frost. The local effect of high wind with and without rain, of rain alone, of frost, &c., upon it should be noted. The changes of the moon have great influence upon the weather.

A halo round the moon indicates approaching wet weather, the larger the circle the nearer the rain. There is an old rhyme to the following effect regarding the changes of the barometer, "Long foretold, long last; short notice, soon past: First rise after low, foretells stronger blow." The following table is of use :—

If the new moon, the first quarter, the full moon, or the last quarter happens:	IN SUMMER.	IN WINTER.
Between midnight and 2 A.M.	Fair	Hard frost, unless the wind be S. or W.
—— 2 and 4 morning	Cold, frequent showers	Snow and stormy.
—— 4 ,, 6 ,,	Rain	Rain.
—— 6 ,, 8 ,,	Wind and rain	Stormy.
—— 8 ,, 10 ,,	Changeable	Cold rain, if wind be W.; snow, if E.
—— 10 ,, 12 ,,	Frequent showers	Cold and high wind.
At 12 o'clock at noon & 2 P.M.	Very rainy	Snow or rain.
Between 2 and 4 P.M.	Changeable	Fair and mild.
—— 4 ,, 6 ,,	Fair	Fair.
—— 6 ,, 8 ,,	Fair, if wind N.W. Rainy, if S. or S.W.	Fair and frosty, if wind N. or N.E. Rain or snow, if S. or S.W.
—— 8 ,, 10 ,,	Ditto	Ditto.
—— 10 ,, midnight	Fair	Fair and frosty.

Observations.—The nearer the time of the Moon's change to noon or midnight, the more nearly will the result accord with the prediction.

It is also said that less dependence is to be placed on the table in winter than in summer.

The moon is new when the points are towards your left hand as you look at it; when they point in the opposite direction, it is a waning moon. The full moon is due E. at 6 P.M., due S. at midnight, and due W. at 6 A.M.; the first quarter is due S. at 6 P.M., and due W. at midnight; the last quarter is due E. at midnight, and due S. at 6 A.M. It completes its changes in about 29½ days.

It has been stated as the result of long and careful observations, "that the third day before the new moon regulates the weather on each quarter-

day of that lunation, and also characterises the general aspect of the whole period. Thus, if the new moon happened on the 26th of May, the term day was the 24th : the weather of that day was to be that of the 26th and the 3rd, 11th, and 19th of June, the quarter days respectively. The almanack carried in the pocket-book should show the changes of the moon. The old farmers' predictions of fine or rough weather, deduced from observing the flight of birds, are really based upon truth, and can be explained scientifically. When swallows fly high, expect fine weather ; when they fly low, the reverse.

Sea-gulls flying inland or collected there in large numbers are forerunners of bad stormy weather.

Admiral Fitzroy says, whether clear or cloudy, a rosy sky at sunset presages fine weather ; a red sky in the morning, bad weather or much wind (perhaps rain) ; a grey sky in the morning, fine weather ; a high dawn, wind ; a low dawn, fair weather. Soft-looking or delicate clouds foretell fine weather, with moderate or light breezes ; hard-edged oily-looking clouds, wind. A dark, gloomy blue sky is windy ; but a light, bright blue sky indicates fine weather. Generally, the softer the clouds look, the less wind (but perhaps more rain) may be expected ; and the harder, more "greasy," rolled, tufted or ragged, the stronger the coming wind will prove. Also a bright yellow sky at sunset presages wind ; a pale yellow, wet ; and thus, by the prevalence of red, yellow, or grey tints, the coming weather may be foretold very nearly ; indeed, if aided by instruments, almost exactly. Small inky-looking clouds foretell rain ; light scud-clouds driving across heavy masses show wind and rain ; but, if alone, may indicate wind only. High upper clouds crossing the sun, moon, or stars, in a direction different from that of the lower clouds, or the wind then felt below, foretell a change of wind. When sea birds fly out early and far to seaward, moderate wind and fair weather may be expected ; when they hang about the land, or over it, sometimes flying inland, expect a strong wind with stormy weather. When birds of long flight—rooks, swallows, or others—hang about home, or fly up and down or low, rain or wind may be expected. When animals seek sheltered places, instead of spreading over their usual range ; when pigs carry straw to their sties ; when smoke from chimneys does not ascend readily (or straight upwards during calm), an unfavourable change is probable. Dew is an indication of fine weather ; so is fog. Neither occurs under an overcast sky, or when there is much wind.

PART III.

Outposts.—The most arduous, while at the same time the most important, duties that devolve upon soldiers on service, are those of outposts. C.Os. should lay great stress upon that importance in their conversations with those serving under them, and they should take every opportunity of instructing both officers and men in such duties. All concerned should feel that the safety of the army and the honour of the country depend upon their untiring vigilance and activity. F.Os. of the day should be most strict in enforcing the rules of the service as regards outposts. With an army their duty is to protect it from surprise; with detachments to do so also, and to enable them to retreat in time without being cut off. They are also used for the purpose of gaining and transmitting intelligence of the enemy's position and movements.

They should act as the feelers of an army, guarding it from every danger, and keeping it constantly informed of everything that can add to its safety, or assist its movements. They are also often employed as a screen to the movements of the main army in their rear, and to prevent any intelligence of those movements from coming to the knowledge of the enemy.

The army is protected from surprise by detachments, called in our army outlying piquets posted in advance, on the flanks, and when necessary in the rear of it. Information of the enemy's position, &c., is obtained by means of patrols varying in strength according to circumstances.

The hand with the fingers well opened describes the outpost system, the nails being the outlying piquets, the middle joints of the fingers the supports, the knuckles the reserve, and the wrist the troops or camp to be protected from surprise.

Like advanced guards, all outposts should be as far in advance of the force they are thrown out from as they can be with safety; that is, without exposing them to be cut off or overpowered, before assistance can reach them. As a general rule $\frac{5}{8}$ths of a force should be able to rest in peace and quiet, whilst to the remaining $\frac{1}{8}$th is allotted the outpost work.

It is essential that they should be sufficiently far to the front, to enable the C. in C. when he receives the report from them that the enemy is advancing in force, to make up his mind whether he will or will not fight, and if he

decides upon fighting, to enable him to occupy the position he had previously selected to fight in, before the enemy could disturb him in the movements necessary for that purpose.

The general distribution of troops for outpost duty is as follows :—

1. Piquets, including vedettes, sentries, patrols, and detached posts.
2. Supports to the piquets.
3. Reserve of the outposts.

Every body of troops, of whatever size, will have its outposts disposed more or less after this system, though it may not always be necessary to carry it out in a complete form. Thus, a considerable force of cavalry, such as a division of brigade, will have a complete system of outposts, including piquets, supports, and reserve. A smaller body, such as a regiment, may dispense with a special reserve, and will itself become the reserve to the outposts ; while a still smaller body, such as a squadron, will only have a piquet or guard sufficient to supply the necessary sentries and vedettes.

As a rule in a mixed force of cavalry and infantry, the outpost duty by day will be performed by the cavalry and by night by the infantry.

With us, unfortunately, it is too much the custom to regard outpost duty from a more or less defensive point of view ; our regulations define it as if the object was almost exclusively to guard against surprise. If this duty was classed more as an active than as a passive one, that is, if it was ruled that the primary object to be attained was to obtain information of the enemy's doings, whereabouts, and intentions, the result would be twofold, for not only would the army be protected from surprise, but the G.O.C. would be supplied with most valuable information. The more constantly your patrols and scouts are in contact with the enemy, feeling his outposts, picking up stray prisoners, &c., &c., the more efficiently will you be protected against surprise, and screened from the inquisitiveness of your enemy. The farther you can push forward your advanced parties and their attendant scouts without compromising their safety, the greater will be their opportunities for fulfilling this object. Those parties should cling to the enemy, never losing "touch" of him for a moment. You will lose some men in this work, but their loss will be amply compensated if you are kept daily informed of your enemy's movements. Whenever mounted infantry is introduced into our service, and its employment properly understood, these outpost duties will devolve to a very considerable extent upon it. It is because the two objects to be attained, viz., security from surprise, and the possession of constant information of the enemy's whereabouts and doings, are so very closely united, the former being in fact provided for if the latter object be realised, that it is so very desirable that cavalry and infantry should work together, hand in hand as it were, in outpost duty. The infantry posts on the roads guard them strictly, and their advanced parties prevent the enemy's patrols or reconnoitring detach-

ments from approaching the main body, whilst the cavalry in front and on the flanks by constant patrols clings to the enemy, probing his armour at all points, and so learning not only his doings, but, if the work be well and intelligently done, his very intentions also. It is the nature of the country that should determine the arms of the service to be employed, and to what extent they can both be used together to advantage. I have often seen a couple of H.A. guns used with advantage with a strong outpost on the main line which led directly to the enemy's position.

Unless the country is very close, the moving screen of cavalry which should cover the front and flanks of an advancing force, will usually form a line of outposts at night, and so protect the main body, not only from surprise, but from the prying inquisitiveness of the enemy. Behind it, however, the infantry of the advanced guard must form a line of strong outposts, especially guarding all the roads and other possible lines of approach from the enemy's direction.

The distance at which cavalry outposts should act in front of the army which they protect, must depend upon the position and nearness of the enemy; but if possible, and especially in a friendly country, they should be many miles in advance of the main body; when in contact with the outposts of the enemy, they should watch, feel, and never quit them. Clever outpost officers will nearly always divine the movements of the enemy from the conduct of his advanced parties.

The outposts should form a continuous chain, and should considerably overlap on both flanks the line or lines of operation of the main army; but the conditions under which outpost duty has to be performed are so varied as to preclude the possibility of laying down rigid rules on the subject.

Officers employed upon outpost duty will take care before starting that their men have the proper quantity of ammunition, their rations for at least 24 hours (cooked if possible), and their water-bottles full; they themselves having their rations also with them, Forage, &c., for all horses to be taken with them. Every officer so employed should have with him a field glass, compass, watch, metallic pocket-book, and above all things a map of he country; if possible, sergeants should be similarly provided. The name of every one composing the piquet should be entered in the officers' pocket-book.

In front of each army corps—which is, say, marching by two or more roads—there would always be an advanced guard of about 4000 or 5000 men (its composition depending upon the nature of the country) (*see article on* ADVANCED GUARDS), which would always be in advance of the main body either a short day's march, or some 4 or 5 miles at least, according to the proximity of the enemy. The security of the army from surprise will chiefly depend upon the manner in which these advanced guards do their duty in

covering the front well with a chain of outposts, in patrolling in all directions, and in reconnoitring and watching the enemy's movements.

The outposts required on the flanks and rear of an army should be furnished by the troops detached in those directions to guard it from surprise during its movements.

It is advisable that piquet duty should be done by whole battalions of infantry or regiments of cavalry; all their baggage, except their entrenching tools and a proportion of their reserve ammunition, remaining in rear with the main body. These units to be divided into two equal portions, one to be the reserve, the other to furnish the outlying piquets and their supports.

When infantry are used, there should be with every piquet one or two dragoons to be used for carrying information to the rear.

If there is no superior officer in charge of the outposts, the O.C. a corps sent out to cover a certain portion of the country will, in the absence of specific orders, decide on the positions the piquets are to occupy, covering his front while doing so by a line of skirmishers; and in the case of cavalry, by a number of patrols sent on in advance to reconnoitre the neighbouring villages and discover the enemy's whereabouts. If after a battle, the outpost arrangement should be made generally close in rear of the troops who are in actual contact with the enemy, who will retire slowly through the line of sentries, when the piquets have been established. The Os.C. corps on outpost duty should communicate personally with the corps on their flanks, learning the positions occupied by the reserves, &c., communicating with them from time to time, should any important information regarding the enemy's movements be obtained.

A battalion of infantry whilst so employed will therefore be distributed as follows:—In reserve, 4 companies, and on outlying piquet, 4 companies; each of these latter 4 companies to be divided into two equal portions, one to act as support, the other divided into two or more piquets of about equal strength (of about from 30 to 40 men each); they again being divided into three equal parts, one furnishing the N.C.O. for the reliefs, patrols, &c., and the privates for patrolling; the other two furnishing 3 reliefs for the double sentries in advance, and for the single one over the arms.

A battalion would, therefore, cover from 2000 to 3000 yds. according as the country was close or open. As cavalry can watch a far greater extent than infantry, and by their power of patrolling to long distances in advance can more easily obtain information of the enemy's doings, a regiment of cavalry would cover about the same extent of front, it being remembered that cavalry are used in a more open country than that where infantry outposts are employed.

The distances these several parts into which a battalion is to be divided should be from one another must greatly depend upon the nature of the

country and the arm of the service furnishing the outposts ; but the arrangement must be of such a nature, that under no circumstances whatever, nor by any possibility, shall it be feasible for an enemy to reach the main body until it has had ample time to turn out.

In some cases it may be advisable to have a couple of H.A. guns (their waggons being with the main body) with the reserve. The Os.C. these reserves will send out strong reconnoitring parties from it towards evening, and especially towards daybreak, to obtain information of the enemy's whereabouts. Any important news so obtained to be communicated at once to the general, the authority for its correctness being stated.

On ordinary ground when infantry is used the reserve may be about 800 yds. in advance of the main body, the supports about 400 yds. in advance of them, the piquets about 300 or 400 beyond them, with double sentries thrown forward about the same distance ; when cavalry is used these distances may be doubled, and in some instances trebled with safety.

In rear of all these will be the main body of the force detached to the front of the army to protect it, which whilst on the move will form its advanced guard. The outpost duties should be carried on by a larger force, with increased vigilance, and at a greater distance from the main body, when an army is merely halted for the night in some chance position of no strength, than when it occupies one carefully selected for defence.

Under all circumstances it may be assumed that no matter what may be the strength or composition of the force, the advanced guard, upon the completion of the day's march, will, whilst the force is stationary, whether it be only for one night or for any number of days, continue to protect it from surprise by so covering the country with outposts and patrols as to render it impossible for an enemy to approach the main body unseen. When the force is a small one, and the bulk of the advanced guard is not more than about a mile in advance of it, if it has been very much harassed during the march, it may be deemed advisable to push forward fresh troops from the main body to form the outposts for the night. As a rule, however, when operating with a small force in the vicinity of an enemy, it is better to make the advanced guard do this duty, detailing it to form the rear guard for the following day's march. The men who had been hard worked the day before, and on the alert all night on outpost duty, would have a good long rest the following morning, as they would not naturally have to move off for some hours after the newly-detailed advanced guard had marched through their line of piquets. With small operating columns this system would secure to every Regt. or Brigade in succession its turn of the interesting work attendant upon these advanced duties, and its fair share of the dreary and very hard work which invariably falls to the lot of the rear guard. With large forces in the field, when the bulk of the

advanced guards would be from 5 miles to a day's march ahead of the main columns, these large advanced guards could not be thus daily relieved, but the advanced guards which they themselves would invariably have in their front could be so dealt with very conveniently.

In a retreating force, the outpost duty should be performed, if it can possibly be so arranged, by troops which have not been before engaged. These will have more confidence, and be better able to meet an assault, than men who have already fought and been forced to retire before the enemy.

An Officer commanding a Company or Troop will march upon the positions to be occupied by the supports with all the precautions of an advanced guard, examining the country he passes over, and selecting positions for disputing the ground, in case of being driven back by the enemy. Having decided upon the position for the support, he will then move forward his two piquets, sending an officer with each; he will in the first instance go forward himself with one of them and post it, indicating roughly where the other is to advance to, and subsequently correcting the position taken up by it, should he consider it necessary to do so.

No shouting or other noise should be permitted at outposts, nor should the men be allowed to straggle, or show themselves to the enemy. The strictest discipline to be maintained, and the inhabitants treated with every civility and consideration.

Outposts should always keep defiles, bridges, and causeways between them and the enemy. It may be necessary, however, sometimes to have vedettes or sentries thrown beyond them.

If a piquet occupies a wood, the sentries should be posted along its edges, whilst the piquet itself should be 100 or 200 yds. behind them. If the orders are for piquets to hold their ground as long as possible in case of attack, they should in such positions advance, and make their stand along the line of sentries.

When a river is to be watched by a line of piquets, the important places to guard are bridges, fords, and where it forms re-entering angles towards the enemy, as crossings will seldom be attempted where it forms a salient angle towards him: localities where there are wooded islands dividing the river into several channels, should also be carefully watched.

As soon as an O. C. an outpost, or advanced piquet (whether of cavalry or infantry), arrives on his ground, he is to endeavour to make himself master of his situation, by carefully examining not only the space he actually occupies, but the heights within musket shot, the roads and paths leading to or near the post, ascertaining their breadth and practicability for cavalry and cannon; to ensure a ready and constant communication with the adjoining posts and vedettes, in the day by signals, in the

night by patrols. He is to examine the hollow ways that cover the approach of an enemy, and consider all the points from which he is most likely to be attacked. He will by these means be enabled to take measures to prevent surprise; and should he be attacked during the night, from the previous knowledge he has obtained of the ground he will at once form a just estimate of the nature of the attack, and make his arrangements for defence with promptitude and decision.

Sentries and Vedettes.—In selecting the line for the chain of sentries, care must be taken not to extend it too much,—to post the men in the most advantageous situations for observing the roads and country in front, and to keep them as much concealed from the view of the enemy as the nature of their duty will admit. It is very desirable that every elevated spot which overlooks the communications in the rear, shall be taken within the chain of sentries; but if this cannot be effected without extending the sentries too far, a party must be sent to occupy the height during the day, and care must be taken to support and ensure the retreat of this party if attacked. Sentries must be so placed, moreover, as to secure one another from being cut off, and at such distances as to prevent any enemy from passing unperceived between them during the night. Sentries should never be posted near any copse or cover from which a sudden rush might be made upon them; but all woods, ravines, &c., in the neighbourhood of the post must be watched, and occasionally visited by patrols, to prevent the enemy from assembling a body of troops unobserved in the vicinity. The fewest possible number of sentries should be employed; with which object impracticable ground, such as ponds, marshes, and precipices. should be embraced in the line of sentries, so as to shorten the extent of front to be guarded.

Sentries and vedettes should always be double. The officers and N.C.Os. with the piquets should visit them frequently during the day, and between every relief during the night and foggy weather. This is all the more essential towards morning. If there is a house or church near the piquet, an intelligent man with a telescope should be posted on the top during daylight.

At night sentries should be on low ground, keeping the high land between them and the enemy, so that any one passing over it should stand out against the sky, and so be easily seen.

In most countries but few vedettes or sentries are required by day. Bayonets should never be fixed by sentries during the day, or on bright moonlight nights: in thick weather, and on moonless nights they should always be fixed. By day they should have in view those on both sides of them, and at night they must take it in turns to patrol to their right until they meet the next sentry there. However, in clear nights, the less motion there is the better. Smoking should be strictly forbidden to sentries, and they should not converse above a whisper. Sentries by night should be relieved every hour. It is most desirable to have piquets divided into 4 reliefs for nightwork, but there should never be less than three.

At night, when the officer or N.C.O. visits the sentries, he should patrol with one of them from 30 to 40 yards to the front, according to the nature of the ground. Sentries are frequently posted in positions which are of such difficult access, or at such a distance from the piquet, that it is advisable to detail a party with a N.C.O. of just sufficient strength to furnish the sentries. The line of sentries should be to the enemy an impenetrable veil, behind which one can move, where it is required, without the enemy being able to discover the movement, whilst at the same time they should be the eyes of the army, always peering forward to watch and report what the enemy is doing. Every road and byway should be carefully watched by them.

Both by day and by night sentries should only allow one person at a time to approach their post until they are satisfied that they are friends. If strangers by night, they must be forced to halt until the next relief comes round, when they should be taken before the O.C. the nearest party in the rear, who will, if necessary, send them to the F.O. If by day, a signal to be made to the sentry at the piquet (or the connecting one, if the former should be far away). An officer from the piquet should at once proceed to the spot. No matter who the intruders may be—deserters, spies, or an officer with a flag of truce—the least possible conversation is to be held with them. It is a good plan to allow the line of sentries to be passed at only one point along the front occupied by the piquets of each regiment or brigade, such point to be where it is crossed by a main road. A sergeant's party should be posted there, to examine all who attempt to pass, and to see that no one does so unless duly authorised.

If it is a flag of truce an officer remains with the bearers until an answer is received from Hd. Qrs. He should not allow them to proceed more than a few yds. inside the line of sentries; nor must he allow them to talk to others. He must be careful that advantage is not taken of the situation for the examination of our position. He will therefore detain them in such a place that they can only see well in the direction of their own camp. See par. on FLAGS OF TRUCE.

In the case of deserters, spies, or others coming from the enemy's lines, they should be ordered to throw down their arms and to move some paces from them before the sentries or vedettes whom they approach allow them to come near. Os.C. piquets should be careful that no questions be put to them by their men. If questioned by many, they weary of answering, and become unwilling to give information subsequently, when examined at head-quarters by those whose duty it is to do so.

They should be at once sent to the F.O. of the day, who will dispose of them according to the orders on the subject existing in the army at the time. Sentries should be instructed that they must at once give the alarm by firing at any body of the enemy approaching their posts, or the line

of sentries from any point that may come under their view. They must continue to fire quickly as long as the enemy advances, and until they are driven in. They should retire as slowly as possible, one man being always loaded, as in skirmishing, and only falling back step by step, so as to avoid being taken prisoners. In the event of an accident happening to prevent their rifles going off, they must shout as loudly as they can, and if by day wave their caps to attract attention. Should a man desert from the piquet or be taken prisoner, it must be at once reported to the F.O. and to the piquets on your right and left.

Officers should carefully select their men for sentry and vedette duty, putting the best men on the most exposed and important posts. In every company there are many near-sighted men, who cannot safely be used as advanced sentries. They should be used for patrol duties, sentries over the arms, fatigue duties, &c.

Flanks to be protected.—The flanks of a line of piquet sentries should be thrown a little back, and if not protected by the nature of the country, a detached party under the command of an officer should be posted in the most favourable position to prevent the flank from being turned.

Connecting Sentries.—Communication should be kept up by means of single sentries between the front line of sentries and the piquets, also between the piquets, the supports, and the reserve.

The same men should always be mounted on the same posts, when it comes to their turn to go more than once on sentry. No man to go beyond 20 yds. from his piquet without leave.

Single sentries must be always posted over the arms of the piquets, supports, and reserves, the arms being placed so that the sun shall not shine on them. For these and the connecting sentries it is most useful to have a rail or a long rod, supported at each end by a forked stick, pointing in the direction of the sentry in advance, upon whom their attention is most particularly to be directed. Officers, particularly those on the staff, should study the general habits and customs of the enemy with reference to their outposts, their hours of *reveille*, their practice in relieving outposts, sentries, &c. By day, the glittering of the sun upon the arms of troops in motion indicates the direction of the march. If the rays are perpendicular, they are moving directly towards you: if slanting from left to right, downwards, they are moving towards your right, and *vice versâ*. If the rays are intermittent and varied, they are moving away from you. When facing the sun, objects seem nearer than when the back is to it. The neighing of horses, barking of dogs, rumbling of carriages, or clouds of dust, are indications of movements that must not be neglected.

Os.C. piquets in close proximity to those of the enemy must be careful

to avoid coming into useless collision with them. Sentries firing at one another, and attempts to carry off detached posts, sentries, &c., unless with some special object in view, are to be avoided, as they lead to nothing, give rise to reprisals, and tend to the general annoyance of all supports, reserves, and even the main body. At the same time, all attempts on the part of the enemy's piquets or patrols to approach our sentries must be stopped. It is wonderful how soon light troops opposed to one another learn mutual respect and forbearance, and come to a sort of tacit understanding upon such matters.

An Officer to strengthen his Post.—An officer ought to strengthen his post, when practicable, by constructing abattis, breastworks, &c. : where the defence of a bridge or ford is intrusted to him, he ought never to omit throwing up something of the kind to protect his men, and impede the advance of the enemy. An officer ought not, however, without permission, to block up a main road with other materials than such as are easily removed. A tree felled with judgment, brushwood cut to a certain distance, pointed stakes about breast high, placed on the point most assailable by the enemy, may be attended with the greatest advantages, and can be effected with the common hatchets or billhooks with which the soldiers are provided for the purpose of cutting firewood.

He should ask himself what he would do if attacked from different directions. His plan should be prepared as soon as he has examined his position. Though by nature he be slow of thought, he has nothing to fear, provided he has made up his mind beforehand as to what he will do when attacked. This is particularly the case as regards night attacks.

Nothing checks the ardour of troops more than an unexpected obstacle within a moderate distance of the place attacked ; this must not be overlooked by an officer who defends, and no impediment he can throw in the enemy's way, at that distance from his post, must be deemed unworthy his attention.

He should open up good communications to the rear, by which to retire in case of need. He must remember that, in case of attack, the longer he disputes every inch of ground, and the more he forces the enemy to deploy in order to drive him in, the more efficiently is he performing his duty.

An Outpost must not shut itself up without Orders.—An outpost ought not to shut itself up in a house, or an enclosure, with the intention of defending itself to the last extremity, unless particularly ordered to do so, or that circumstances may render it necessary at the moment, for the preservation of the party, in the expectation of support.

Under what circumstances a Piquet should retire.—A piquet may with safety

defend its front as long as its flanks are not attacked; but as soon as the enemy attempts to surround the post, the piquet must begin to retire.

If the piquet on either flank is forced back, you must throw back your line of sentries in that direction, and watch for an opportunity of falling on the enemy's flank as he advances.

Precautions to be taken when fires are allowed.—No fire should ever be lit by piquets; when a support is permitted to have a fire, it should always be as much as possible concealed from observation; and the alarm post, in the event of an attack at night, should invariably be fixed at a short distance in the rear of the fire, so as to prevent the support from being seen, when drawn up, and to compel the enemy to expose himself while passing the fire, should he advance. All cooking for the piquets should, if possible, be done with the supports or reserves. Under all circumstances, at least ⅔ of the outpost should always be on the alert and ready for action. Horses should never be permanently unsaddled, although they may be shifted a few at a time, to examine the panels, &c. The horses should be fed and watered ⅓ at a time, the bits being only removed whilst they are being fed or watered.

The officers should take it by turns to sleep for an hour or two; but one must always be on the alert.

In bad weather it is advisable that piquets should have *tentes d'abri*, care being taken that they are placed in positions where they cannot be seen from the front.

Outposts to be under Arms an Hour before Daylight.—Outposts will get under arms in the morning an hour before daylight; and if everything appears quiet in front, the officer will, as soon as he can discern objects distinctly, proceed to occupy the same post that he held the day before; but he must previously send forward patrols to feel his way, and should any change be remarked in the enemy's posts or position, he will report it immediately to the field officer of the day.

When advanced Piquets should be relieved.—As attacks are most commonly made about daybreak, a desirable accession of force will be always obtained by relieving the piquets at that hour.

Arrival of the Relief.—When the new piquet has arrived, the O.C. it will accompany the officer of the old piquet along the chain of posts, and this officer will point out the situation and strength of all the enemy's posts, and afford every other information in his power to the relieving officer.

Duty of the Officer of the old Piquet.—When the sentries are relieved, and the weather is sufficiently clear to ascertain that there is no indication of an attack, the officer who has been relieved will forward a written report to the F.O. of the day,

fall back upon the reserve piquet, and march to camp in the same order as when he advanced; but if the advanced piquets should be attacked before he arrives in camp, he will consider it his duty to face about instantly, and march to their support.

When Piquets are attacked.—When piquets are attacked, the same rule will be observed as in all other skirmishing, and the detached officers' parties will not run in on the main body, but support the skirmishers; and when compelled to retire, they will, if possible, retreat on the flank of the main body, and thereby afford mutual support to each other. If forced back at night, they should keep up a heavy fire, so as to alarm those in rear.

The principal Object of Piquets in case of Attack.—In the event of an attack, the O.C. a piquet must ever bear in mind that the great object of his efforts is to gain sufficient time to enable the main body in his rear to get under arms and prepare for action. The points he is to dispute in falling back having been previously selected, few cases can occur in which it will be impossible to attain that end, without endangering the safety of his piquet; but even in an extreme case, he must remember that it is his duty to sacrifice himself, rather than be driven in upon the main body before it has had time to form.

Outposts pay no Compliments.—Outposts pay no compliments, but when approached by a general officer, the F.O. of the day, or by any armed party, they will fall in and stand to their arms.

Sentries on outpost duty pay no compliments.

PATROLLING.—One of the most necessary and effectual methods of preventing surprise and of gaining information remains to be noticed, viz., patrolling, without which, however active and alert the sentries and vedettes may be, the service of the outposts never can be properly done. The mode of conducting these patrols, their strength, and the distance to which they may be sent, are all necessarily dependent on the ever varying local circumstances in which piquets may be placed; but it may be laid down as a good general rule, that, when near the enemy, a patrol should be sent out once between every relief during the night.

Vigilance, Silence, and Circumspection indispensable in Patrolling.—Vigilance, silence, and circumspection, must be strictly enjoined upon all patrols: no noise must on any account be made, and when anything is to be communicated, it should be done in a whisper.

It is not possible to lay down exact rules for conducting patrols in every case that may occur on service, but one or two of the most usual modes of carrying on this important duty may be briefly adverted to.

Patrolling in front of the Line of Sentries.—The patrol, on leaving the piquet, should when practicable, communicate in the first instance with the next post upon the right (or left), and patrol cautiously along the whole front of the line of sentries, just near enough to see them, and communicating with the next post upon the left

(or right), return again to the piquet by the rear of the chain. The sentries must not be thrown off their guard by the frequent appearance of these patrols, but be taught to expect an enemy in all who approach them: some preconcerted signal, or interchange of countersign in a low tone, should be used, and which should be changed at every relief.

Patrolling when the Enemy's Posts are distant.—Patrols must also be sent along the roads in the direction of the enemy's posts, to such distance as may be deemed expedient. These patrols must be preceded by feelers, quick intelligent men selected for that duty, whom no sound will escape, and whose experienced ears will detect the approach of danger long before it reaches them. A patrol must, above all things, avoid unnecessary firing, or, in other words, false alarms; on hearing the approach of footsteps, the feelers should instantly fall back to the patrol; and should the sounds indicate an advance of a larger body than a patrol, one or two men should be sent back with all haste to inform the officer of the piquet, who will make immediate preparations for defence. The patrol will retire steadily and unobserved, if possible, upon the piquet; but if perceived and overtaken by the enemy, an incessant fire must be maintained, in order to apprise the camp that the enemy is coming on in force. Although it may safely be inferred, that if the piquets know their duty, and are judiciously drawn up for the defence of the roads, it will be extremely difficult for an enemy, however strong, having failed in his plan for taking the advanced posts by surprise, to make head, under all the disadvantages of a night attack, against men who know the ground, and whose plans have been previously concerted for disputing those points in their line of retreat, and where the disparity of numbers must, in the dark, be in a great measure neutralised.

Patrol to avoid exchanging Shots with the Enemy.—In falling in with an enemy's patrol in advance of the chain of sentries, it will always be most prudent to retire at once without exchanging shots, which can only tend to harass and disturb the troops in their rear.

A strong Patrol to be sent out just before Daylight.—A strong patrol will always be sent some distance on towards the enemy's posts just before daylight, and this patrol, above all others, must proceed with redoubled caution, for fear of falling in with the enemy's columns, waiting for daylight to attack. Their object is to keep the enemy's reconnoitring patrols at a distance, or to dislodge or capture some of his advanced parties, and to learn what is going on behind them. These patrols should be furnished from the reserves or main body. (See Articles on "SCOUTING" and "RECONNAISSANCES.")

Flags of Truce.—When it is necessary to communicate with your enemy under a flag of truce, select a fine, soldierlike looking officer, having a good address, and possessing great tact, to carry your message. He should be a good horseman, very well mounted, and thoroughly conversant with the enemy's language. If the mission is an important one, a S.O. should be

employed. The trumpeter to accompany him should be selected for somewhat similar characteristics, and for his sobriety. He should be warned, on no account whatever to accept any wine or intoxicating drink whilst in the enemy's lines. The officer should be provided with a large white flag, and should approach the enemy's position in the most open manner, selecting the most open ground in doing so, taking care that his white flag is clearly visible, and making the trumpeter sound frequently to attract attention. If sent out from a fortified post, or from a line of troops in action, or sent to communicate with a post or fortress held by the enemy, all firing should cease suddenly in a marked manner on your side on that particular part of the ground or in the immediate locality where the flag of truce is moving. If the enemy is determined not to receive it, the party will be fired upon—a chivalrous enemy will content himself by firing over their heads. The officer with the flag should not, however, take a few shots fired at him as a positive no ; for private soldiers are often very ignorant regarding the conventionalities of war. When, however, after repeated efforts to approach the enemy's position under the protection of his flag he is convinced that, having seen it, and understood his wish to communicate, they will not receive him, he must retire. If prepared to admit him, the enemy will most probably send an officer, also carrying a white flag, to receive him or his message. If admitted within their lines, he should, as far as he is allowed, be all eyes and ears, being at the same time most guarded in what he says himself, but without appearing to be so. He should be most voluble and gay in his manner, wearing the air of a man who felt himself to be without any doubt whatever in his own mind on the winning side, and therefore with nothing to conceal from his enemy. Happiness, contentment, and lightheartedness should be written on every feature of his face, taking care in conversation to impart to the enemy in a roundabout way whatever impression it may have been previously decided it was desirable to convey, and concealing, under an air of extreme soldierlike frankness and volubility all that it is desired to conceal. If the enemy insist on blindfolding him, of course he must submit to it.

Having carried out his mission, he should return to the general by whom he was sent with the least possible delay, unless indeed one of the objects aimed at from his mission was to gain time—say during an action to allow of reinforcements arriving—when, of course, the longer he can postpone the resumption of hostilities by dawdling over his duty, dismounting to look for imaginary stones in his horse's feet, &c., &c., the better. If the contending armies are in presence, it is a good plan to leave the trumpeter—if the enemy will allow it—between the opposing forces at the spot where the flag was met by an officer sent out for that purpose by the enemy : this marks the spot to which the flag is to be reconducted on its return to its own side. In riding from thence to the General under whose orders he is acting, it is

advisable he should not make straight for him, lest the commander's position should thus become known to the enemy.

On the other hand, if the circumstances are reversed, and you suspect the enemy of endeavouring under the cover of a flag of truce to gain time, you should not receive it, or should your suspicions be only excited after its reception, you should, in dismissing the bearer, inform him that you will allow him so many minutes to get back to his lines, after which firing will be immediately resumed. Much nonsense is frequently written about the barbarity of refusing to receive a flag of truce; it is the undoubted privilege of G. O. C. the side to which it is sent to exercise his own discretion on this point, and should he conceive it would be in the least to his disadvantage to receive it, he should not for a moment allow any absurd and false ideas of humanity or sentimental notions about chivalry, to influence his decision. Never for one moment suspend any movement or operation you may be engaged in, because the enemy has sent you a flag of truce; his object may be to gain time for the arrival of reinforcements or for the execution of some flank or turning operation. If an enemy's flag of truce is seen, the question of its reception or rejection is for the superior officer on the spot, *i.e.* the general in immediate command of the troops in front of which the flag is shown, without whose orders the firing is on no account to cease. When a flag of truce is seen, the circumstance must, with the least possible delay, be reported to the general, who, if a subordinate, will use his own discretion whether to receive it or not, or to await the decision of the G. O. C. the army or army corps.

If it is not to be admitted, a musketry or artillery fire should be kept up on the ground in its vicinity, firing over it, but always taking care not to hurt the bearer or his trumpeter; this fire to be maintained until the flag is withdrawn. The firing and operations on all other parts of the line to go on as if no flag of truce had been seen at all. If it is to be received, a staff officer with one or two well mounted dragoons, one carrying a large white flag, should go out to meet it; the farther from your lines it is met the better. If the message is merely a letter, it should be taken and a receipt given for it, the bearer dismissed at once with civility and determination, and told to gallop in returning to his own position; if the messenger is to be allowed into your lines, he and his trumpeter should be carefully blindfolded, and conducted by a roundabout route to Hd. Qrs., the officer and his trumpeter being separated, so as to be unable to converse together. The latter should be given plenty to drink if he likes to have it, in the hope of being able to extract news from him when liquor has untied his tongue; note the regt. to which he belongs. If you are in a besieged town or work, take care that both the officer and his trumpeter have plenty to eat; let them see abundance on the table, no matter how short you may be of provisions; you cannot be too circumspect in their presence, lest they should gather

indirectly any information that could be useful to the enemy, or learn anything as to your real condition.

There are circumstances under which it is quite allowable to temporarily detain the bearers of a flag of truce, as for instance when they have, under cover of their flag, approached your lines sufficiently near to ascertain you were engaged in executing some movement that you considered it most desirable to conceal from the enemy. When there is no need to keep them any longer—the movement having been completed, &c., &c.—they should be sent back with many excuses for their detention, carrying a letter of apology and explanation to their general-in-chief.

An officer sent to treat with an enemy, whilst enlarging upon the strength and fitness of his own troops, should refer in a decided tone to the supposed well-known weakness and demoralisation of his opponents. Never allow any high-minded, chivalrous feelings to carry you away and grant really favourable terms to a well-beaten enemy, although you may give him their shadow, in returning the officers their swords if they have fought bravely, or in according them other equally empty honours.

An armistice is sometimes determined upon for the purpose of burying the dead, collecting the wounded, &c., or whilst terms of peace are being definitively arranged. It is usual to define certain limits to each army, so that between the advanced sentries or vedettes of both sides a neutral zone should be left, into which the troops of neither side should penetrate, except perhaps small unarmed parties seeking for dead or wounded comrades. Streams or rivers are the best boundaries to select for this neutral zone. At Sebastopol, this neutral zone was sometimes not more than about 50 yds. in breadth, and it must always be more or less restricted during a siege. If the armistice is intended to allow time for arranging the terms of peace, it is desirable that its exact duration should be most precisely stated in the simplest words in the paper drawn up by the officers deputed by both sides to arrange it. You must omit no precaution for the security of your army during an armistice, as the opportunity might be used disloyally by the enemy.

If your object is to gain time, the officer deputed to arrange the terms of an armistice or capitulation can always do so by refusing to agree to the enemy's proposals without a further reference to his own Hd. Qrs. It is an understood thing that no terms agreed upon by the negotiating officers are really binding until approved of by the commanders of the respective armies.

Defence of Posts.—The object to be attained by an officer directed to defend any village, house, garden, &c., is first to render it in a rough manner as like in outline as possible to a regular fortification, the guiding

principles of which, it is taken for granted, all know. It is assumed that the garrison is sufficient for the extent to be defended; in other words, about one file to every running yard of hedge, wall, &c., that represents the parapet. If the post is of any extent, there should be about one-fourth more as a reserve.

When guns are used in the defence of redoubts or fortified villages, they should be kept out of sight until the moment arrives for them to pitch into the enemy's assaulting columns. They should not engage artillery except under very peculiar circumstances, and when so used, they should be withdrawn as soon as the enemy's artillery begins to overpower them. For these reasons they should be served *en barbette* instead of through embrasures, about 20 or 30 filled sandbags being kept with each gun, to form a rough temporary protection for the gunners from the enemy's marksmen.

An officer desired to occupy and defend any such place should examine it before occupying it with his men, and will determine upon the exterior line that he will defend. He will then distribute his men along it as they are to stand, giving each company or section a certain space to prepare for defence. The place should be scarched for tools, if there is any scarcity of them.

The first thing to be done by each officer is to obtain cover for his men whilst he enables them to deliver their fire with effect; secondly, to strengthen his portion of the work, so as to prevent an enemy from entering it; thirdly, to render the approach to it as difficult as possible, and to clear away all cover from his immediate front. The reserve in the meantime to open out communications, and strengthen any church or other central building selected as a citadel. To it, or some other building near it, all the wounded are to be carried during the action. Household furniture is of great value in forming breast-works. Boxes, barrels, and bags filled with earth make good parapets, and assist greatly in making loopholes. The glass in all windows of houses to be defended, to be broken. If the roof is of thatch it should be removed. Buckets or barrels of water should be placed in every room. The garrison must prepare for a heavy artillery fire being brought to bear upon it. As all armies are now provided with rifled field-guns, it is impossible in hasty intrenchments to obtain complete protection from their fire, and the plan of banking up walls with earth, unless there is time to construct very thick parapets, is labour thrown away. When time permits, effective cover from artillery can, however, be obtained by digging trenches behind the palings and hedges it is intended to hold. The reserve should be as much as possible screened from fire, so that it may be ready to charge the enemy in any direction where he may have forced an entrance. Everything will depend upon the officers. If they remain cool and jolly, their men will follow suit. The

slightest sign of any one being ready to look over their shoulder to the rear is fatal. An officer in command who abandons the defence of a post as long as one-third of his garrison remains effective, should be shot. Let every one remember the defence of Hougomont.

In selecting officers to command them, the greatest care and discrimination is necessary. Never allow an officer to be placed in such a position unless you know enough of him to have perfect reliance in him. To give a man command solely because he is senior officer is not only a folly, but a crime.

Reconnaissances.—The most reliable method of obtaining information as to the enemy's movements is by reconnaissances, which may be divided into four classes.

1st. Reconnaissances in force.

2nd. Those made by a detachment of all arms, of sufficient strength to protect themselves and secure their retreat.

3rd. Those made by staff officers, accompanied by small cavalry detachments.

4th. Those made continually by individual officers from the outposts.

The first is an affair for the C-in-C. and must never be undertaken except by his special orders. It has frequently been adopted by generals previous to an action, for the purpose of ascertaining the enemy's strength and dispositions. It should not be attempted until late in the day, when approaching night will inevitably put a stop to all fighting. It should be conducted in a manner similar to beginning an action. When driving in the enemy's piquets, it is advisable to make as many prisoners as possible from different parts of the lines. This must be accomplished by a sudden dash of cavalry to cut off sentries, videttes, &c. Having driven in the enemy's outposts, approach his lines at all points by swarms of skirmishers; bring your batteries into play from all commanding points, taking care that the waggons are left well in the rear, and that only just sufficient men and horses to work the guns are made use of. By this display of your artillery you will most probably force him to show where his guns are placed. During these operations every available S. O. must be in front among the skirmishers, taking advantage of all high ground or trees to observe the enemy's position. They should make sketches, both of the features of the ground and of its general outline, as if they were taking landscape pictures, noting carefully all prominent objects which catch the eye, such as a large tree, a peculiar rock, farmhouse, &c.

It is advisable that, previous to starting, each should make in his pocket-book an enlarged plan of the enemy's position, upon a scale of 4 or 6 in. to the mile. Although doing so from a plan upon the small scale of three or four miles to the inch will not give you any idea of the ground, beyond the fact of there being hills at certain places, and the position of the roads and

villages, yet if 20 or 30 S. Os. dispersed among the skirmishers along the front of a position, are provided with skeleton sketches of this nature, they can easily fill in enough of what they see in front of them (using their telescopes and prismatic compasses) to make a most invaluable plan when all have been collated. The position of several points in rear, that may be visible for miles in all directions round, should be accurately fixed, so that the reconnoitring officers can fix their own positions at all times by them, Each prisoner taken should be asked the following questions :—What corps, division, regiment, and battalion he belongs to ; the names of the Os. C. the above ; where his battalion is encamped ; what battalions and regiments are on the right and left ; what number of divisions or *corps d'armée* are there present ; whether they are under canvas or bivouacking ; how long his battalion has been there. If it has been there some days, have any, and what, troops marched into position since then. Where did his battalion march from ; with how many other battalions, or with what divisions did it march ; frequently a soldier will not know the name of the village or place marched from that morning, but he will always know the hour at which he started, and this will enable you to ascertain the number of miles he had marched before he was taken, and so help you to guess where he had come from. What was the length of the marches, the general hour of starting in the morning, and the hour of halting for the night ; did many fall out sick during the march, and are there many sick now in camp ; have any large hospitals been established near the positions ; what are the daily rations ; are they good and efficient ; is there plenty of forage ; what are the camp rumours ; what was in orders lately ; have any intrenchments been constructed, and where are they ; are they open or closed in the rear ; what is the depth of their ditches ; where are the cavalry ; are the horses in good condition ; is the G. O. C. popular ; have they a high opinion of him ; who is considered the ablest man in the army ; where are the batteries of his division, and how many are there ; are there many heavy guns ; is there a siege train or a bridge equipment, and where is each situated ; where is army Hd. Qrs. ?

In questioning soldiers it is advisable to begin by talking to them about their colonel, whose name you should know from your pocket-book ; the more knowledge you can show a man you possess about him and his surroundings the more information you are likely to obtain from him, and as he sees you already know so much he will be chary of telling you untruths.

If a few prisoners are taken from along the front of an enemy's position, and they are carefully questioned as to the positions of their own battalions, a S. O. can easily mark on his plan where each division is placed, by referring to the organisation and distribution of the enemy's army into brigades, corps, &c.

Reconnaissances of this nature are sometimes carried out by a single

division, forming the advanced guard of an army marching to attack an enemy in position, of whom it is necessary to obtain the most accurate information previous to the arrival of the main body. This is a more delicate operation than that already described, and must be carried out with the utmost caution. The enemy's outposts must be driven in, and his position approached by a line of skirmishers, who will try to push back his, and force him to display his strength. Such operation should not be attempted till within a couple of hours of night, and great care should be taken to watch the flanks well by patrols, to prevent the enemy passing in force between the attacking division and the main body. The reconnaissances of fortresses that it is intended to besiege are made in this manner by the investing force.

THE SECOND CLASS OF RECONNAISSANCES is generally made by a detachment of all arms ; its object is to obtain information by approaching the enemy's position, taking a few stray prisoners, engaging, perhaps, in a very partial skirmish, and then retiring. The extent to which it should engage must depend upon its strength, and its strength upon the distance to which it has been sent away from support.

It is a dangerous operation at all times and under all circumstances, for, if the enemy discovers your weakness, he will annihilate you ; it is a good plan, when it can be done, to precede such operations by rumours that you mean to make a general attack : he will consequently be more likely to show you his strength, and more chary in pouncing down upon you.

If the detachment is composed, say, of 1 battalion, 6 squadrons, and 4 H. A. guns, it would be well in some instances to leave the battalion and 2 of the guns in some strong position about 1 or 2 miles short of the enemy's outposts, whilst the rest advanced as a line of skirmishers with supports and a small reserve. If the infantry is not left thus behind, it should form the reserve, keeping about 1,000 yards in rear of the supports. If such a force, by marching upon bye-roads, succeeds in keeping its movements unknown to the enemy, so as suddenly to appear some two hours before dark in front of his outposts, a great deal may be learnt without any great risk ; the cavalry can always, in case of need, fall back rapidly behind the battalion of infantry, and thus being well beyond the influence of the enemy's infantry, with night coming on, it has but little to fear. The officer in command of such detachments should be a staff officer of rank and ability ; he will have to display all that he knows of war and its science to conduct it with credit to himself and advantage to the service. It is so difficult to do enough without doing too much ; unless the enemy's outposts are driven in, nothing can be learnt, and the act of driving them in may lead to a fight, which, once commenced, it is difficult to withdraw from.

3rd CLASS.—There are no occasions in life when officers have such oppor-

tunities for displaying coolness and intrepid bravery, joined to extreme caution, as when sent out with a troop of cavalry or a few well-mounted men to reconnoitre. This is a duty that cavalry officers, above all, should strive to make themselves perfect in ; it is much to be regretted that so few of them in our army can survey, or even put on paper the roughest sketch of the roads and ground they pass over. The consequence is, that S.Os. have generally to take charge of the reconnoitring parties. Their object is to examine certain districts of country, and report upon its roads, rivers, general features, and resources ; sometimes to find out the enemy's whereabouts, when they come under the head of patrols. It is taken for granted that the officer sent on such duty knows as much of the country as it is possible to do from maps and plans ; that its principal roads, mountains, forests, villages, rivers, and the bridges over them, are familiar to him by name. In carrying out his reconnaissance, he will take all the same precautions as indicated for a patrol ; when within reach of the enemy's patrols, he will march as much as possible along by-roads, and under no circumstances must he ever take up his quarters for the night in a village. If the weather is bad, he may avail himself of large open barns to shelter his men in. He should be most careful to spare his men and horses all unnecessary fatigue. Whilst far from the enemy, he may unsaddle all horses except those of his guard. As he may have at any time to depend upon the endurance and speed of his horses, he should watch their condition, wants, &c., carefully. If, before starting, the exact positions of all neighbouring villages, churches, hills, and prominent features have been determined, he can have but little difficulty in fixing his position from all the commanding points on his line of route, as described in article on "SURVEYING." The art of conducting such a reconnaissance is intimately connected in all its details with surveying, so that the article on that subject should be carefully studied. Reconnoitring parties of this nature will be sent on all the roads that can be made available for the advance of the army ; they should consist entirely of mounted men, from 10 to 50 in number, depending upon how many days the party is to be absent, the nature of the country, and the proximity of the enemy. The best possible guides should be obtained before starting (for whom horses must be provided) ; they should be well treated, and paid liberally by the officer in command, who for this purpose must be prepared with money (to be subsequently recovered upon travelling bills). If there is any probability of the guide attempting to escape, his legs should be tied to his stirrup leathers, to prevent him from jumping off when passing through any close portion of the country. (See Article on "SCOUTING.") If the O. C. does not speak the language of the country, he should be accompanied by an interpreter, and if he is not, it is a good thing to have the following questions in the language of the country, printed on a sheet of paper, which, upon entering a village, he can present to the

postmaster or chief man: the writer adopted this plan in China, during the war of 1860, and found it answer most satisfactorily.

'Please oblige me by writing answers opposite the following questions: 1. The name of this village. 2. The names of the three principal inhabitants. 3. The number of inhabitants. 4. Its distance from the several nearest villages and large towns. 5. The nearest market town, and when markets are held there. 6. The number of horses, mules, and vehicles in this village. 7. The number of cattle, sheep, goats. 8. Have any patrols been here lately, and if so, the dates? 9. What was the strength of such patrols in infantry, cavalry, artillery? 10. What is the nearest place where there are any of the enemy, and how far is it off? 11. The names of the leading men in the next village to the front.

Other questions can be added according to circumstances. The C. of the S. should have large quantities of these papers of questions struck off, and distributed to officers going out with reconnaissances, who will get them filled up in the various towns and villages, being signed in all cases by those who write them. The opportunities afforded of visiting distant localities by these parties, should be made available for distributing proclamations amongst the inhabitants, promising them protection for themselves and their property, and inviting them to bring in supplies, which will be paid for.

To obtain information from the inhabitants of a hostile country is an art in itself; except under the most extraordinary circumstances, force should not be resorted to, and the infliction of anything approaching to torture, or corporal punishment, must be avoided. In questioning villagers, it is advisable to use the local information you have obtained from others previously examined; if you know the names of the curé, the mayor, &c., &c., and any peculiarities for which they are locally famous, by adroitly referring to them in your conversation, your statements will most probably lead to others from those you are interrogating, and will certainly place you on better terms with them. It may often, however, be useful to carry off leading men from villages when they refuse to give ordinary information. Guides taken from villages or hamlets frequently tell you they don't know the way to the nearest localities, which, of course, is untrue. During the Indian mutiny the writer adopted the plan of always making such men accompany him on the march for the next stage, telling them that if they did not know the road he would point it out to them; they generally managed to recollect all about the country after the first hour's march, and were very glad to accept their day's wages when the march was ended. It is a good thing now and then to make a raid upon a village whilst a fair is being held; you can then secure men belonging to the place you want information about, or to which you require guides. You can detain them nominally as hostages, so that it be not suspected you mean

to move in that direction. Never allow guides to be spoken to by the soldiers, as the rough ways of privates are apt to frighten the timid into stupidity, and to make the obstinate still more obstinate and silent. Keep the guide alongside your own horse; try to engage him in conversation about his own affairs, the number of his children, his means of livelihood, and so lead him on to talk of the war and the way it is regarded by the people, the general rumours abroad concerning it, and the contending sides, his knowledge of where the enemy are, their position and condition, prevailing sicknesses, &c. This information should not be written down at the moment, lest the guide should see that he is being pumped, but opportunities should be taken to do so as soon as possible afterwards, which can always be found by halting oneself, for a few minutes, ostensibly to make a partial sketch, or make a note about the road. If he must be mounted, take care that his horse is a very slow one; and if you suspect him, let a man ride close behind with his pistol ready to shoot him if he attempts to bolt; tell him these orders, and he will be careful to save his life. If he is on foot and you suspect him, fasten him with a rope round his arms and waist, the end being secured to a trooper's saddle. Under the following heads will be found the chief objects to be examined and reported on:—

Cities and Villages.—How situated, their population, commerce, and water supply. Are the inhabitants chiefly of the agricultural or of the manufacturing classes. Are they open or fortified: if the latter, of what class, and upon what system. How provided with guns and military stores. Have any large supplies of food been lately collected in them. All attainable information as to their powers of resistance, and the means of attacking them; are they commanded from without; are their suburbs within range of the works; the strength of their garrison; the name of their commandant; if besieged during any previous war; a sketch of the incidents of the operation, &c. (An officer of R.E. should be with all parties sent to reconnoitre fortified places, if it is intended to inspect the works closely.) If open, their capability of defence, the general nature of their buildings, the number of their houses, &c. State their resources in provisions, live stock, transport animals, waggons, and the names of those upon whom requisitions can be most effectively made; the names of the local authorities; the dates when markets are held; is there a post office; the dates and hours when the mails arrive; is there a line of telegraph from it; if not, what is the nearest point at which a telegraph wire passes; how many telegraph operators live there; what are the facilities for baking, &c. The accommodation they can afford in time of war for troops to be stationed there for a few weeks can best be arrived at by dividing the houses into classes, and by visiting one house of each class, estimate the number it could accommodate, and so arrive at a fair estimate of the

accommodation afforded by the whole place. See Article on "BILLETS" for the mode of calculating the number of men a house will hold. What is the fuel in use, and is there any large quantity of it in store.

Roads.—Their general width, whether raised or sunken, macadamised, or of sand or clay. (If not regularly paved or macadamised, it may be taken as a rule, that roads passing over soil that retains water are bad, particularly if inclosed by walls or banks. Those passing over coarse gravel, sand or rock, are generally good.) If in good order, inclosed by walls, hedges, banks, or ditches; can troops of all arms or baggage get freely on and off them to the fields at either side; the nature of the soil; cultivated with what crops; general character of the country; whether open or wooded; the fences, whether hedges, ditches, or of stone or wood; what rivers, streams, cross them, and the nature of bridges over them; of what material, of how many arches or spans, if safe for field or heavy guns. If the rivers are passed by fords; their character and depths; their ascents and descents, and their slope. Roads that join or cross; from where to where, and the distances; towns and villages; can they be avoided by marching round them; what other paths are there to the right and left running in the same direction that can be made available for troops, their nature, &c. If portions are out of repair, whether the material is at hand for repairing it. The distances between all towns and villages to be noted in English miles, also the time taken to march at a walk. All defensible positions; suited for what numbers. If the time permits, rough sketches of them to be made on 4 or 6-inch scale; all good sites for camps, permanent or only for the night, and suited for what numbers. Defiles to be carefully examined.

Railroads.—Their gauge in feet and inches, whether double or single line of rail, description of rail used, and how laid down, whether on continuous longitudinal sleepers, or on cross ties; are they secured by spikes or screws, and what is the mode of fastening them one to the other; what is the easiest method of destroying the line; general description of bridges, of what material, and their length, how to destroy them. The stations, whether large or small; built of what material; the length and breadth of platforms, and what facilities exist for enlarging them and constructing others; the position and length of all sidings, and means for loading and unloading cattle. The means of providing the engines with water, and whether such means can be destroyed; amount of rolling stock, and description of carriages used; the numbers they would carry of men, horses, guns, carts, &c. Whether the engines are powerful, and in good condition; places along the line where they can be repaired, and where old rails can be re-rolled. What is the general character of the line; whether level,

straight, or the reverse ; what are the ordinary gradients ; if there are any steep inclines, their length and nature ; how many sets of telegraph poles, and the number of the wires, and places where the batteries are kept. Whether there are many large tunnels, cuttings, or embankments, and their exact positions. Nature of the country passed through, &c., as described in previous paragraph. The reconnaissance of a railroad is most easily accomplished by an officer travelling over it on an engine at a walking pace ; when an engine cannot be used, one of the workman's little hand cars (called sometimes a trolly), which are propelled by a couple of men working a crank, are especially suited for this service.

Rivers, Streams, and Canals.—Whence they rise, and their general direction. Their breadth, depth, nature of their bottoms, banks, and beds ; current, and the effect of the seasons on all these points. The quality of their water. Do they freeze over, and when ; for what length of time do they remain frozen ; does the ice bear men, carts, &c. ?—3 in. thick will bear men in small detachments, from 4 to 7 in. cavalry and light guns, from 8 to 12 in. heavy guns. If rivers take their rise in mountains, they will be subject to freshets, which must be carefully inquired into ; the seasons when they are to be expected ; whether arising from rain or the melting of snow. Are they navigable ; between what points ; nature of boats and their sizes ; the number that can be collected at any one place. The position of ferries and flying bridges ; number and nature of boats used, their weight, and the number of men, horses, &c., that each can take at a trip, and the time taken in crossing ; breadth of river at such points. Positions of bridges ; their length, breadth, and construction ; if floating, the size and number of the boats, rafts, &c., and the load that can pass safely over them ; are they passable by artillery ; best method of destroying them ; what materials are at hand to repair them if destroyed ; the best positions for the establishment of bridges and works to defend them ; a section of the river should be submitted with this report ; it should be made with the greatest possible care, every yard of the river's bottom being carefully examined with a pole to discover the existence of rocks or large stones : rough sketches of such positions to be given on 4-in. scale ; best positions for a passage and for our batteries if the enemy holds the opposite bank ; the roads leading to them, where they lead to, &c. ; are there points where the bridge could be constructed unseen by the enemy, and from thence floated into position ; which are the best points to make a feint of crossing to distract attention from the real position, &c., &c. The towns or villages on the banks or close by. Islands : their position, size, wooded, or cultivated. Mills and millraces. The number and size of locks in canals. If easily destroyed, and the best plans for doing so, and how fed with water ;

nature and condition of their towing paths, &c. The extent to which both rivers and canals can be made to assist in the conveyance of stores, &c. This must greatly depend upon the direction in which they flow. In examining rivers note down the height of old watermarks above their existing level. Sections of rivers should be given for proposed points of crossing.

Common expressions applied to the velocity of rivers.

Sluggish, not exceeding 1½ ft. a second, or about a mile an hour; the fall is slight.							
Ordinary, from 2 to 3 ft.	,,	or	2 miles	,,	,,	,,	moderate.
Rapid, ,, 3 ,, 5 ft.	,,	or	3 ,,	,,	,,	,,	rapid.
Very rapid, ,, 5 ,, 8 ft.	,,	or	5 ,,	,,	,,	,,	considerable.
A torrent, all above 9 ft.	,,	or	6 ,,	,,	,,	,,	very rapid.

The simplest mode of measuring a river's surface velocity is with a common log as used by ships at sea, or by measuring one or more hundred yards on the bank, and calculating accurately the time any small substance takes in floating from one extremity to the other, repeating the experiment several times, and taking the mean. For mean velocity, see "PHYSICAL MEMORANDA," at end of book.

Fords.—Their exact position; their length and breadth; nature of their bottoms, whether sand, clay, rock, or gravel; do quicksands exist in their vicinity, and do they remain stationary, or do they sometimes form in the ford itself. Are such quicksands very dangerous, or can they be trampled out by camels. Describe the roads and approaches to the ford; the velocity of the water, whether passable at all seasons; if not, at what time of year; general configuration of the ground on both banks; height of both above river; best position to be taken up to defend them; description and position of works to be constructed to cover and defend them; easiest means of destroying them; what houses or villages are near them. The depth for cavalry should not be more than 52 in. in rapid, or than 56 in. in sluggish currents; for infantry, 3 ft. or 42 in., and from 30 to 33 in. for guns and ammunition waggons according to the strength of the current. Place no confidence in the reports of the people regarding the non-existence of fords. It is very common to find fords about which the inhabitants know nothing. Always examine the fords by crossing them yourself several times backwards and forwards. They are generally to be found above or below sharp bends, and they almost always run diagonally across the river. Those with bottoms of coarse gravel are the best. In seeking for a ford, the easiest plan is to ascend or descend the river in a small boat provided with a short lead line and sounding-pole. It is difficult to render them impassable, but large stones rolled into them, farm harrows with the spikes upwards, ploughs,

planks with long spikes driven into them, trees felled and well staked down, a ditch dug across it, &c., will retard the passage of an enemy for some time. It may sometimes be necessary to use fascines to render fords practicable. In India, where quicksands are common, the fascines are sunk by means of stones.

Mountains.—The valleys must be explored, as along them the roads are sure to be found. For military purposes, a knowledge of the roads, passes, and paths over mountains is all that is required. Are they wooded, cultivated, rocky, or covered with heath ; describe the strong positions to be found in them, their general shape, and whether practicable, and if so, where and for what species of troops. The best way of defending the roads and passes ; the works that will be required ; the supplies to be obtained ; at what seasons impracticable from snow, freshets, &c. If possible, mark on your map the general configuration of the line of watershed. The feasibility of constructing new routes should be reported on.

Forests.—Whether troops can march through or only along the roads ; if the latter, the reason. General description of the trees ; are there many open spaces ; if so, their usual extent. The roads and rivers to be carefully examined ; their direction and condition. The necessity and facilities for opening new roads. Are there good positions ; can they be turned. Can these woods or forests be avoided altogether by following other routes ; if so describe them. The nature of the country in the vicinity, particularly where main roads go into and come out from such forests. There is no underwood in beech woods. Forests may be composed of green, resinous trees, such as the numerous varieties of pine, spruce, &c., or of deciduous trees, such as oak, elm, maple, birch, beech, &c., or of a mixture of both. S.Os. should be able to recognise the various sorts of trees commonly met with, and should know their respective usefulness.

Plains and Heaths.—General character, whether cultivated, sandy, or swampy ; if suited for large camps ; supply of wood and water ; nature of roads ; the rivers, ravine, or other obstacles ; the towns, villages, and houses, &c. All prominent landmarks, such as tall single trees, &c., to be marked carefully on the map.

Marshes, Lakes, Ponds.—Their cause, and how fed with water. If dry at some seasons ; where roads cross them, or means of crossing afforded by boats, ferries, &c. ; their general character, &c.

Farmhouses and Residences of the Gentry.—How are they generally built ; of what material ; their roofs ; if generally well supplied with forage and provisions ; if they generally have vaults under them. Their

defensible capabilities; whether easily burnt. The accommodation they would afford, &c.

Coasts.—In reconnoitring a coast from the sea, the following points must be entered upon as minutely as possible. The most favourable positions for a force to land: they are generally to be found at points where rivers or streams flow into the sea; if no such exist, the next best are long, low promontories, jutting out into the sea of about a mile in width, so that the first division that landed should, in taking up a position to cover the disembarkation of the others, be able to rest its flanks on the sea, and so have the fire from the fleet to sweep across its front in case of attack. No place is good for the disembarkation of an army unless the depth of water, and the configuration of the coast, and general character of its slopes enables one to derive full advantage from the fire of the fleet; this must always be borne in mind when selecting a point for the purpose.

All bays, inlets, and the mouths of rivers to be carefully examined, with this object in view; the best position to be taken up by the fleet to cover the landing to be noted on the sketch; the roads leading from the shore inland with distances to principal towns. Are there woods near, and what is their extent; are there any wharfs, and what are the facilities for constructing them; is there a dangerous surf, or can boats land at all times. What are the winds that render the approach to the shore dangerous; is the anchorage good; is the bottom sand or rock; what is the height of the ordinary and spring tides; is good fresh water to be had in large quantities upon landing, and is it from wells, streams, or tanks; what is the position and number of the enemy's forces in the neighbourhood. Soundings must be carefully taken, showing how near the different classes of vessels can approach. The prevailing winds and currents; is the coast bordered by downs; are there precipitous cliffs. If there is a beach, is it of mud or sand. In reporting upon a coast with a defensive object in view, the points where landing can be effected are to be minutely examined and sketched. All bays, coves, and harbours to be surveyed, and reports made as to the best means of defending them; the nature of the tides; all islands, towns, villages, and houses on coast to be reported upon; all forts and other coast defences, the nature of their armament, capabilities of defence, their existing garrisons, and the strength their garrisons should be for an effective defence. The best position for camps of observation to guard against invasion, and what is the best scheme for the general defence of the coast.

Scouting.—As long as the opposing forces are at a distance from one another, the front of each will be covered by a screen of cavalry or

mounted infantry, or, what is still better, by both combined, under the command of one man. From this screen patrols will be despatched at all hours of the day and night to obtain information, and from these patrols scouting parties will be pushed on into the enemy's theatre of operations, worming themselves through his line of outposts or round his flanks. The officers and men in scouting should always go in twos or threes, having been given a place of rendezvous in rear, and a time named when all should return to it, those reaching it after that hour to understand that the others had left, and that they were consequently to make their way back to their regiments at once as best they could; they should avoid the main roads as much as possible, although it is very necessary that they should strike in upon them now and then to ascertain what is taking place there, but as a rule they should keep to by-paths and farm tracks. In England they could do this easily, without running great risk of compromising their safety, as the population would afford them every assistance; but it must never be forgotten that the most valuable information is very seldom to be obtained without danger, and it may often be necessary to lose many men as prisoners, in order to learn what the general requires to ascertain. Every officer employed upon this duty should have in his position a detail of the enemy's army, showing the regiments in each brigade and division, and affording particulars as to the dress and peculiar equipments of each battalion, &c. This information will soon enable him to ascertain what are the actual regiments the enemy's advanced force consists of in his immediate neighbourhood, and when collated from a large number of scouting parties acting along an extending front may enable the commander to estimate with tolerable accuracy the total force that an enemy is operating with. This duty is calculated to give scope for all those virtues of daring gallantry, bold riding, individual prowess, and self-reliance, that we pride ourselves upon possessing above all other nations. Upon the manner in which it is performed during war much must always depend. I would therefore urge upon all cavalry officers the necessity of learning the use of maps, so as to find their way through a country by means of maps on a small scale. All officers should be able to sketch ground, an art that is now to be learnt by attending a garrison instructor's class.

In every cavalry regiment there should be a party of scouts under the best subaltern in it, and when a cavalry brigade is formed, these several parties should be collected into one under a captain, selected for his special fitness for the duty. In a very mountainous or densely wooded country where horses cannot be used, these duties must be performed by infantry, as was the case during the late war in Ashanti. Next to courage, daring, physical strength, good horsemanship, good eyesight, and quick intelligence, an aptitude for finding one's way over a country is the qualification most necessary for all ranks employed upon this duty. An officer and two

dragoons will frequently be able to penetrate to positions without being observed, and if discovered will succeed in escaping capture in a manner that could not be looked for from ordinary patrols of the usual strength. This system of scouting is now being taught in some of our cavalry regiments, and was practised with the best effect by the cavalry of the southern force during the autumn manœuvres of 1872. The information thus obtained is better and more reliable than that collected by parties consisting of troops or squadrons, and the work of both men and horses is greatly economised.

In a difficult, hilly, forest or bush country, where cavalry cannot act, scouting must be done by parties of infantry, say of from 10 or 20 to 50 men. They should move as much as possible by night. Much can be done by them especially in savage warfare: by lying in ambush on the paths frequented by the enemy, prisoners can be taken and heavy losses inflicted upon them. If your ambuscade is on a hill path, place your men on the lower side, as you can see better at night when looking upwards. Before halting quit the path as far as possible from the spot where you intend to form your ambuscade, so that your trail may not be easily visible, and when returning to camp from this duty take always a different path from that you followed in going out as a precaution against being waylaid. Your party for such duties must be selected for their coolness and intelligence; the men employed should be all eyes and ears, speaking only in low whispers; no fires or smoking to be allowed; cooked rations for 2 or 3 days to be carried by every man. If at any time you think you are being followed by the enemy, get into the bush and marching back some distance through it, lie in wait for him in a well chosen spot.

GENERAL CONSIDERATIONS.—In all the various species of country to be inspected, the wants of an army must ever be borne in mind, and the quantity and quality of fuel reported upon; the slopes and undulations of the ground, the nature of the crops, and of the fences described, whether hedges, stone walls, or rails, &c. The climate should be carefully inquired into. All physical causes supposed to influence it; the temperature in summer and in winter, the length of the seasons, and the dates at which they generally begin and end; the general appearance of the inhabitants, prevailing diseases and means commonly adopted by the people to guard against and cure them; the principal resources of the country, whether agricultural or pastoral; whether open or inclosed, &c. Give any information you can as to the geology of the country, without entering into technical details; is the soil easy of excavation, and is water easily obtainable by boring wells.

4TH.—THE RECONNAISSANCES MADE DAILY and sometimes several times a day from outposts are conducted by Os.C. piquets, or by S.Os., who,

taking out a corporal and a couple of men, or sometimes going alone, contrive to creep up to commanding points near the enemy's position, for the purpose of seeing what he is about. They come under the head of patrols when made to any distance beyond the outlying sentries. See preceding Article on "SCOUTING."

MAXIMS TO BE REMEMBERED BY OFFICERS ON RECONNOITRING DUTY.—In conclusion, it must be remembered that to fight can lead to no military result; at the same time many a reconnoitring party has been saved by the boldness of its commander, who, finding himself suddenly in presence of a superior force, makes a dash at it, engages it boldly, and is thus enabled to get safely away under cover of the confusion occasioned to the enemy, who judged that he must be strong to do so. The timid or hesitating man would be lost under such circumstances. Fertility of resource and quickness in devising expedients, are essential qualities for an officer employed in these duties. No English soldier who is well mounted should ever be taken prisoner.

BALLOONS.—One of the most effective means of learning the whereabouts and doings of an enemy is by means of balloons, for although the undulations of the ground when viewed from the car of a balloon at an elevation of about 1000 or 1200 ft. do not show, yet the position of troops can be accurately ascertained in close, still weather. Ascents by night, particularly in wooded countries, are most useful for this purpose, as the fires indicate the enemy's position, and his numbers may be roughly estimated, by allowing ten men to each fire.

During an action, a staff officer in a balloon at such an elevation would be of infinite service. The ascent should be made from some height about a mile in rear of the skirmishers; a telegraph wire from the car should lead to the spot where the G.O.C. had established himself, who could then be kept acquainted with where the enemy's reserves were posted, &c.

MILITARY INDICATIONS.—As stated in the Article on "OUTPOSTS," officers should study attentively the customs of their enemy, their hours for dining, commencing their marches, &c., and the many indications of intended movements which an enemy may unwittingly afford. The collection of boats, heavy guns, scaling ladders, gabions, &c., at particular places, are indications that must always precede the passage of rivers, sieges, &c. If large magazines of stores or provisions are collected anywhere, it is clear that no retreat is contemplated; if, on the other hand, the parks of heavy, or spare guns, ammunition, engineer stores, &c., are being sent to the rear, a retreat is imminent, or being prepared for. The dust raised by columns is a fair guide in some countries as to the numbers and composition of the

force marching. That raised by cavalry forms a high light cloud, by infantry a lower and dense one, by parks and baggage one more dense still. With a good glass you can sometimes learn from the manner in which troops move, and from their dress, whether they are regulars or militia, or if they belong to any special corps. The manner and bearing of the people in a hostile country is usually a fair indication of the public spirit and feeling; if they are gloomy and anxious, it is an indication of want of confidence in their cause, and that their troops are distant; whilst if they are excited and insolent, it shows that they rely upon assistance near at hand, and anticipate success from the number and efficiency of their army. In following a retreating army, much can be learnt from its trail; if the *débris* of arms, accoutrements, &c., lie about, there is a want of transport, and it is a sign of demoralisation according to the extent to which it is the case; large numbers of graves indicate the existence of disease in the enemy's army. The places where they halted for the night should be carefully examined; and all indications carefully noted. Did they bivouac or pitch tents; was their camp laid out with regularity; were their cooking places neatly made (in India much can be learnt from examining them, for when hurried the natives make but few, preferring to eat uncooked messes, to forego the requirements of their caste in such matters). Is their track strewn with dead or dying transport animals; have they plundered the inhabitants or burnt their crops or houses; have they effectually or only partially destroyed the bridges, &c.? The most insignificant circumstances afford sometimes whole pages of information to officers who, having studied the manners and customs of an enemy, know how to interpret them aright. Os.C. small detached parties sent out on reconnoitring duties, may many times avoid falling into the hands of strong patrols or detachments, by learning their proximity from their track if crossed anywhere; the number and composition of such detachments may easily be estimated from it.

MARCHES.—To arrange for the march of a force consisting of all three arms of the service, especially when a collision with the enemy may be expected, is a staff duty of the highest importance. Success in most wars depends very much upon the manner in which this duty is performed by the staff, and upon the manner in which the arrangements ordered have been carried out by the troops. Let me see two armies on the march, and I believe I could tell you the respective fighting value of each. No military quality is so frequently tested as that of marching.

Marches are means to an end, that end being a battle which has for its object the destruction of your enemy's army. The more rapidly they are made, the greater becomes the difficulty of feeding your men.

There is one general principle which applies to every description of march,

by the shortest possible routes, no matter when or where it may be undertaken, i.e. always march in as many columns as you can, and let each column march upon the largest possible front. Care must of course be taken that no one of these columns is so weak that it could be overpowered before supports could reach it. Each column must have its own advanced guard. The greatest harmony of movement should exist between these columns, all working together, not as independent units but as intelligent portions of one machine, the movements of all being at all times known to the staff of each column, all being ready to concentrate when required and to march to the sound of the cannon when in any doubt as to where that concentration is to be effected. In arranging for the march of an army or of any body of troops where they may have to fight, your first consideration should be, that they should be at all times so distributed as to be not only ready to fight, but to do so with the advantages of position in their favour. When no encounter with the enemy is to be calculated upon, then the greater the number of columns that any army is divided into on the march, the more easy will it be to feed it, and to find accommodation daily for men and horses. The number of columns you can march by will generally be decided by the number of roads more or less parallel one to the other, leading in the required direction, remembering that when far away from an enemy you may extend your columns to the right and left greatly beyond the space you occupy in fighting, contracting your front the nearer you approach him, so that when within striking distance you do not cover more than your front of battle.

When it is possible, cavalry and H.A. together should march by a different road from the infantry, as it is very fatiguing to horses to keep pace with men on foot. If this cannot be done, large intervals should be allowed between the mounted and dismounted branches of the service when on the march. Unless the country is deep or very much cut up by canals, cavalry can often make its way across the fields, having a detachment of mounted sappers with tools carried on pack-horses for the purpose of opening ways through and over obstacles. Artillery should not, however, ever march alone.

When far from the enemy all your arrangements for the march must be made with a view to the comfort of your troops, and to the convenience of supplying their daily wants, unless you have some object of primary importance, such as great rapidity of movement for purposes of concentration, in which case, of course, everything must give way to it.

The fitness of troops for the great final struggle, when they at last meet their enemy, must ever depend greatly upon the manner in which their marches have been arranged. Men overmarched, or whose health and comforts have not been duly attended to whilst on the march, can never be expected to go in at an enemy whose men have been well cared for by an

able staff administration. It behoves those S.Os. who have to make arrangements for a march to take good heed that everything has been thought of and provided for beforehand.

All our Regulations are based upon the rule that tents are to be carried for every one, and that the army is to encamp every evening. In Europe the army that attempts to make war upon this system will most certainly be beaten by an army that carries no camp equipment, but that bivouacs and makes use of the shelter afforded by villages and farm-houses, &c.

In arranging for the march of an army, the C. of the S. will merely indicate in his instructions or G.Os. the position to be occupied by the Hd. Qrs. of each army corps or division every night, and the hour they should be at their destination in a fighting condition, taking care, however, that the march of no two should clash with or cross one another, which is always possible when a road occupies a sort of neutral position between two columns: under such circumstances it will be for the C. of the S. to state in orders which army corps or division is to use it.

In framing the G.Os. for any march the C. of the S. will be guided by the object sought to be obtained by the movement, and the information he has had regarding the enemy's strength, intentions and movements. At the beginning of a campaign all the available cavalry and mounted infantry supported by R.H.A. should be pushed well to the front one or two marches ahead of the army, until the "*touch*" with the enemy had been secured, and once obtained, if the cavalry is well handled by its commander, it should never be lost. As explained under the headings of *reconnaissances* and *scouting*, every movement of the enemy should be ascertained, and in fact his intentions divined by this independent force of cavalry, and reported—if possible, by telegraph—to G.O.C. the army in rear.

In selecting the position for the Hd. Qrs. of an army or of any force, the rule should be to fix them in as central a place as possible: this is, however, subject to many modifications depending upon the roads, and the facilities for communicating orders and receiving them from your own Government: the existence of a telegraph wire along any road would generally point it out for Hd. Qrs. in preference to others.

Forced marches should be avoided as much as possible, for they fill your hospitals with sick. At times they are of course necessary, but when made to excess, they are ruinous to military efficiency.

The wants and comfort of the individual soldier should never be forgotten by the S.O. when framing orders for a march, although the exigencies of war may necessitate their being purposely ignored for the time during some particular operation. Above all things endeavour to spare your men and horses all unnecessary fatigue, for the less you take out of them, the greater will be their powers of endurance, when in any emergency you have to call upon them for extraordinary exertion.

When far from the enemy, your front being well covered by cavalry, the orders for the march of an army may be most conveniently drawn up in the form of an itinerary, giving the names of the villages or localities where each Army Corps or Division is to be billeted or to bivouac, and where the Hd. Qrs. of its Commander are to be each evening; the roads to be at the disposal of each Army Corps to be stated thus: "The 1st Army Corps (or Division, as the case may be) will march by the country lying between the A.B.C.D. and the R.S.T.V.X. roads, both those roads to be at its disposal. The 2nd Army Corps (or Division) will march by the country lying between the R.S.T.V.X. and M.N.O.P. roads, but will not move troops on the former, which has been placed at the disposal of the 1st Army Corps, &c., &c." The boundaries so fixed will indicate the extent of country from which the Commissary of each Army Corps or Division can obtain supplies either by purchase or requisition for the troops under his charge. The exact position of Army Hd. Qrs. every evening during the operations to be specified, as well as the road by which the C.-in-C. will march. According as you approach nearer the enemy, the orders for the march must become more detailed.

Opening out on the March.—If troops are accustomed to march together in large bodies, there is no reason why on fair roads the opening out—which is unavoidable even under the most favourable circumstances—should exceed 20 per cent. of the depth of the regt., &c., in column of route when formed according to the drill-book. If the weather and roads are bad, and the troops indifferent marchers, 25 per cent. should be allowed. It is better at starting to recognise this inevitable opening out, and to allow for it. Instead therefore of marching off with only the regulated distance of 30 paces between Battalions, it is better to increase it by 20 or 25 per cent. of the number of paces of road that the Battalion would occupy in column of route according to Regulations. This will give each greater freedom and independence of action, and tend much to abate the inconvenience and irritating fatigue occasioned by those checks, which, do what one may, will frequently take place on the march.

The D.A.G. of each Army Corps will make all the arrangements for its march, indicating the hours of starting for each of the Divisions, and stating the roads they are respectively to march by, and how communication is to be kept up between them whilst on the march, and stating the villages or exact locality where the Hd. Qrs. of each are to be every night. The same will be done for each division by its A.A.G., who will go fully into details as to the exact hour when the advanced guard and the other principal fractions into which the columns are divided should march off, &c., &c., as shown in the supposititious orders given farther on for the division detailed as the advanced guard of the army.

In moving an army it is desirable, if possible, that only one division should march by each road. The largest unit that can at all conveniently march by one road in a continuous column is an army corps; but its pace will be very slow, and great fatigue will be entailed upon men and horses.

Orders for the march should contain :—

1st. General direction and object of the march, giving a brief outline of the military situation and condition of affairs, so as to secure on the part of all offrs. commanding columns an intelligent conformity with the views, wishes and intentions of the C.-in-C.

2nd. Date, hour, and order of the march, and the roads to be followed by each column, &c., &c.

3rd. Formation of advanced or rear guards, and special instructions for flanking parties and detachments of all sorts.

4th. Instructions for field hospitals, reserve ammunition, R. E. pontoons, and military portion of the train generally.

5th. Instructions for supply of troops and orders for baggage and provision columns.

6th. Position of general on the march, and of Hd. Qrs. for the night.

As regards No. 2, it is very necessary that each echelon or fraction into which the column is divided should receive distinct orders as to the exact hour it should start from a named point on the road to be followed, or from a stated rendezvous. To assemble all a Division at a named rendezvous to be marched off from thence, is a species of military folly not very uncommon; the unfortunate regts. are kept waiting under arms sometimes for hours, until their turn arrives to march off. The S.O. before issuing instructions for the march must study the position of Brigades, Regts., &c., and see how each can, with most convenience to itself, be brought into its place in the column of route.

In order more fully to explain the movement of an army, we will suppose that one, consisting of two army corps and a reserve brigade of heavy cavalry, assembled on a front of about 10 miles, between the villages A and B, is to advance and attack an enemy, or take up a position in his neighbourhood, C, D, which is 80 miles distant. Let us assume that it has not been thought advisable to detach the cavalry to the front as an independent force to cover the army. The army during its march to be always ready to form line of battle before its advanced guard could be overpowered, all its columns being in constant communication with one another, and the Hd. Qrs. being as near the centre as possible.

Even such a simple movement as this requires much nicety of arrangement. If speed is an object, the difficulty is increased tenfold, for when a flooded river, a broken bridge, or other obstacle is encountered on any one of the roads by which the advance is made, the delay can easily be remedied

if the army is moving by short marches, but if it is doing 20 miles or more a day, the delay of one column may derange the plan laid down for all.

Let us assume that 4 roads, with intervals of from 2 to 3 miles between each, lead from A, B, to C, D, No. 1, on the left, being hilly, and generally unsuited for wheeled conveyances; the next one, No. 2, is the main road, paved or macadamised throughout; the next, No. 3, is a good country road; the last, No. 4, is a clay road, passing through an open country. When the maps are not very accurate or detailed, in calculating distances on them, or the time that columns will take in marching over mountain roads, or even those in the plains that twist about very much, allow from 4 to 9 minutes extra for every mile to be marched.

The following would be the orders sent either in a memorandum to the G.Os.C. army corps, or published in general orders, as might be thought best; they should be issued by the C. of the S.

Memorandum, or General Order (as the case may be),
Army Head-Quarters,
4th June, 1882.

1. The army will advance on Wednesday the 6th inst. in the direction of C, D; the 1st army corps by No. 3 road and the country between it and No. 2 road, the 2nd army corps by No. 2 road, and the reserve cavalry brigade by No. 4 road.

2. Each army corps will be covered by an advanced guard consisting of its cavalry brigade, &c., &c. (*see Article on* ADVANCED GUARDS). The advanced guard of the 2nd army corps will cover No. 1 as well as No. 2 road by which that corps is to march. The advanced guard of the reserve brigade of cavalry on No. 4 road will consist of one regiment of cavalry, 2 H.A. guns, and the odd battalion of the 1st army corps that will be attached for this purpose to the reserve brigade of cavalry until further orders.

These advanced guards will march to-morrow the 5th inst. at 6 A.M., constant communication to be maintained between the advanced guards on all four roads; they will halt for the night in the neighbourhood of the villages E, F, G, and H.

The men will take rations for the day in their haversacks; corn for the day to be carried by each horse; hay to be obtained by purchase from the country. Rations and corn for one day to be taken in waggons with each advanced guard, to be replenished daily from supplies with main body in rear: these waggons will not march to-morrow until noon.

3. A route will be sent (or is forwarded with this, as the case may be) to all general officers, and to the brigadiers commanding advanced guards, indicating where the Hd. Qrs. of the army, of the O.C. the advanced guards, and of each army corps, will be each evening during the movement.

4. The O.C. each advanced guard will, as soon as possible after each day's march, report the events of the day to the G.O.C. the column from which he has been detached, accompanied by a road sketch giving the fullest possible information as to the country, supplies, &c.

5. The distance to be maintained between the advanced guards and the columns in their rear will be about four miles.

6. The C.-in-C. will march at the head of main column of 2nd army corps, and Army Hd. Qrs. will be at —— for the night.

(Signed) G. J. W.,
Chief of the Staff.

The orders issued by each G.O.C. an army corps, a division, or an advanced guard must be of a much more detailed nature. As an example we will sketch out here those that, under the above circumstances, would be issued by the brigadier detailed to command the advanced guard of the 2nd army corps.

Advanced Guard, Orders, 2nd Army Corps' Camp, 4th June, 1874.

1. With reference to G.O. No. 2, of this date, all reports from the 2nd cavalry brigade will be made in future to these Hd. Qrs.; its major of brigade will attend here daily for orders, as soon as possible after the march is over.

2. The advanced guard 2nd army corps will march to-morrow at 6 A.M. in the direction of C, D, and, unless otherwise directed, will halt for the night at K.

3. A detachment consisting of the 1/Royal Rifles,* the 7th Hussars,† 2 guns from —— Battery of H.A., a party of 20 men R.E. with tools on pack-horses, and an ambulance detachment, will march by No. 1 road. It will parade this evening at 5 P.M. immediately in front of —— Regiment, and proceed to the advanced post near the village of ——, on No. 1 road, which upon being relieved will rejoin its brigade. This detachment will begin its march to-morrow punctually at 6 A.M. Colonel B. J. will command this detachment until further orders, and will arrange his own order of march. It will halt to-morrow night at L.

4. The following arrangements to hold good for to-morrow and for all marches made subsequently, unless orders are issued to the contrary.

5. The order of march for the main body of the advanced guard on No. 2 road will be as follows (see page 313).

* *This to be the odd battalion of the division furnishing the brigade of infantry for the advanced guard.*

† *This to be the regiment of cavalry belonging to the division furnishing the brigade of infantry for the advanced guard.*

6. No bugling, beating of drums, or playing of bands will be allowed in camp or on the line of march without the express order of the brigadier commanding the advanced guard.

7. The men will to-morrow be roused at 4.30 A.M. (and on all subsequent marching days, one hour and a half before starting), and will at once pack the baggage waggons: they will breakfast at 5 A.M., and will fall in punctually at 5.30 A.M. on their private parades, and will form up in the column of route on the road, so as to be ready to march punctually at 6 A.M. The scouting party will always parade half an hour earlier than the main body, so as to be formed up at the outlying piquet on the main road, and ready to start at 6 A.M.

8. The vanguard to-morrow will consist of the 10th and 13th Regiments of Hussars, —— Battery of H.A. without waggons, —— Company of R.E. with tools on pack-horses, and the Scottish Rifles without its band, all under the command of Colonel ——. Upon halting for the day the front to be covered with outposts to be posted by that officer, and taken from the force under his immediate command. The piquets to communicate with those on Nos. 1 and 2 roads.

9. There will be a halt of 5 minutes in every hour; the first being at 6.30, the second at 7.30, and so on, as it is essential that every one should halt at the same moment.

10. All corps will march upon the largest front that the routes will admit of.

11. The brigadier commanding will march at the head of the main body on No. 2 road.

By order,
(Signed) G. J. W.,
A.A.G. Advanced Guard 2nd Army Corps.

In issuing orders for subsequent marches, but little need be said beyond that "the advanced guard will march to-morrow at —— A.M., in the same order as specified in the orders of 4th June."

The length of ordinary Marches, for a force not stronger than one division, moving by one road, should be from 12 to 15 miles a day for 5 days out of 6, or at most for 6 days out of 7. At the opening of a campaign it is essential that you should begin to practise your men in marching as soon as possible, and even during any long halts occurring in a war, give your men plenty of route marching. When there is no necessity for haste, begin by short marches of 6 or 7 miles, gradually increasing their length until your men are in good marching condition. If the men breakfast at 7 A.M., being roused at 6.30 A.M. and starting at 8 A.M., they ought to be at their new bivouac or camping ground, 6 miles off, at 10.15 A.M., and their dinners should be ready at noon. Ordinary marches of 15 miles

in fair weather and over average roads should not occupy more than 8 hours. This does not include the time taken in forming up previous to encamping or bivouacking for the night.

As soon as the men are in good marching trim, the distance should be increased to 12 or 15 miles. In extensive operations, however, when large forces have to be moved, not more than 10 miles a day for continuous marching can be calculated upon. There should be a halt from 5 to 10 minutes every hour, and for marches of from 10 to 12 miles it is a good plan to halt for half an hour when half way. Sometimes a longer halt is advisable to allow the men to have a meal with cooked tea or coffee. As a general rule, however, long halts are not to be advocated when the men are in good condition, as they prefer getting their march over as soon as possible, and to have a good hot meal then. It is very desirable that the short hourly halts should be made by every unit in the Division exactly at the same moment. Each battalion, &c., should therefore be ordered before starting to halt for a specified number of minutes exactly at the beginning of each hour. When the O.C. the Battn. gives the order to halt, the leading files of each company will halt, those in rear closing up. If this is not attended to, and the whole Battn. has to close on its leading Company each time of a halt, the men in rear will reap no benefit from the halt at all.

The rate of Marching.—In calculating the time occupied in marching certain distances, a division on one very good road, during good weather and in a temperate climate, with all its *impedimenta* can march 2½ miles an hour if the arrangements are very good, but in large combined operations, unless the weather is very fine, and the roads very good, the time should be calculated at the rate of 2 miles an hour only. The ordinary hourly halts of about 5 minutes each are included in these estimates. If the roads and weather are bad, and the country deep, large bodies of troops will not do more than 1 or 1½ miles an hour. Heat has a very serious effect upon the rate of marching: from 4 to 5 minutes more per mile will be taken if the thermometer stands at from 67° to 77°, and another 10° of heat will double the extra time required. Sandy or slippery roads affect the pace seriously, also heavy rain or snow, or a strong head wind, especially if it be accompanied by heavy dust or rain.

Our quick time is at the rate of 116 paces in a minute, or 3 miles 520 yds. in an hour, say of 3·3 miles an hour without halts. At the double, 165 paces of 33 inches in a minute, or 5 miles 275 yds. in an hour. When moving in small bodies independently, the rate of marching on fair roads may be calculated thus: for infantry, 2¾ miles an hour; for cavalry and H.A., 5 miles; and for field artillery, 4 miles an hour (ordinary marching halts included). The larger the force moving upon any one road, the

slower will be the pace. Baggage trains under a good military organisation can do 3 miles an hour well, and if properly looked after, the animals being good, can do from 90 to 100 miles a week. No march for the train should exceed 25 miles, and this distance should be exceptional. When civilian transport is used, not more than 2 or 2½ miles as a constant rate for large trains can be calculated upon. The rate of Cavalry and R.A. is quicker than of Infantry in the proportion of 6 to 5.

Order of March.—In issuing orders for the formation of columns on the march, the nature of the country, the fighting characteristics of your enemy, and the object to be attained, must be duly considered, as troops, guns, ammunition, &c., &c., should be placed in the columns in the order in which each is likely to be required: when there is a possibility of having to fight, tactical considerations must be first provided for; but when at a distance from the enemy, the comfort of the troops and the convenience of supply should have most weight in determining the order of march.

It is for the G.O.C. to decide the order in which the several arms are to be distributed in the column of route. His S.O. having received his instructions on this point, should indicate in orders the exact time when each important unit of the column, such as the scouting party, main body of advanced guard, head of the main body of each Division, Brigade, &c., is to enter the column of route, and to specify the exact spot on the road for each to do so. The time should be calculated as follows:—The exact strength of each unit being known, the space each would occupy in column of route to be calculated, and allowance made for opening out as stated above. The Table at page 324 will be useful in making these calculations. Say for example, that the distance in the column of route between the head of the 1st and of the 2nd Brigade has been calculated to be 3,500 paces, it is easy to calculate how many minutes it will take to march that distance by dividing it by 116 (the number of paces taken at quick time in a minute); in this case it would be 30 minutes. If it were intended that both Brigades should join the column of route at the same point on the road, both having bivouacked at equal distances from it, the second Brigade should not start for 30 minutes after the 1st had left its bivouac, that would secure to the men that length of time longer for rest before they paraded for the march. It is most essential to the comfort and physical well-being of the men to allow them to rest at their bivouacs until the latest possible moment. When the column of route will extend over several miles of road, it is cruel and foolish to order all the troops to parade at the same hour; it is by close attention to these minutiæ that men are kept in good health and spirits, and that a S. O. shows he is worthy of the important position he occupies.

Time required for Parade. — Fussy and fidgety C.Os., unless closely watched by the staff, are prone to turn their men out earlier than necessary.

For infantry on service, 15 minutes is ample to inspect the arms, ammunition and boots of the men, and to tell them off both in companies and in Battalion; in the cavalry 30 minutes is really enough, although it is usual for "Boots and saddles" to be sounded an hour before the Regt. actually receive the order "march" from its C.O.; in the artillery, 30 minutes is ample, 15 minutes being sufficient for trained drivers to harness, 5 minutes for hooking to, and 10 minutes for inspection. For purposes of parade and preparing for it, therefore, 30 minutes is ample for all mounted troops, and 15 minutes for infantry, and on the march in the field, C.Os. should not be allowed to exceed that allowance of time.

Order of March of an Army Corps.—Let us first sketch out what would be the normal order of march of an army corps moving by one road in a fairly open country over which cavalry could act, when the front was not covered by a detached and independent force of cavalry. The several units of Battalion, Batteries, &c., are here calculated for at war strength. The advanced guard of a strength as detailed at page 326 would march as follows (the length of road occupied by each regiment, battery, &c., is given in yards opposite each):—

Scouting Party to consist of the Regiment of Divisional Cavalry, of the leading Division, should march 30 minutes before the Vanguard, pushing out patrols in all directions a full mile from its main body, and the best selected scouts about a mile still nearer the enemy. If the country is well suited for cavalry, it would be well to send forward the whole cavalry brigade, to be some 5 or 10 miles in advance. Any mounted infantry there may be should also march with these scouts, and a detachment of mounted sappers with tools carried on horses. Every road, path, and village to a distance of from 5 to 20 miles of the line of march should be examined by small patrols. The distance to which these scouting parties should extend will depend upon circumstances, such as, whether the army corps is marching alone or in concert with others to its right and left. The main body of these scouts will of course follow the road, with scouts pushed forward some 3 or 4 miles, and will take care to keep up constant communications with the Vanguard behind it.

		yds.
Advanced Guard. Vanguard.	1 Regt. of Cavalry with one squadron on each flank . .	240*
	1 Battery of H.A. without waggons	190†
	1 Company of R.E. with tools on packhorses	100
	1 Battalion of Infantry without band, but with tools and S.A.A. carts	420‡
	Interval of from 500 to 1000 yards.	

* *The Divisional Regiment of Cavalry, 2nd Division.*
† *To be furnished from Corps' Artillery.*
‡ *The Divisional Battalion of 1st Division.*

		yds.
Advanced Guard. Main Body.	O. C. Advanced Guard and Staff	10
	1 Battery of H.A. without waggons	190
	1 Brigade of Cavalry minus 1 squadron and its battery H.A.	1450
	1 Brigade of Infantry (furnished by 1st division), each battalion having its tool and S.A.A. carts	1270
	1 Company R.E. with tools in waggons, and light bridge equipment	400
The waggons of two batteries H.A.		520
Led horses		140
Ambulance		80
1 Squadron of Cavalry		108

The main body of the advanced guard should march 45 minutes after the scouting party had started.

An interval of 1 or 2 miles.

Main body of Army Corps; The 1st Division to march $1\frac{3}{4}$ or 2 hours after scouting party had started.

		yds.
1st Division.	The G.O.C. and his combatant staff	50
	The G.O.C. 1st division and his combatant staff	20
	1st Division cavalry regiment, keeping up communication with advanced guard	500
	The 3 field batteries of 1st division	1200
	2nd infantry brigade with only tool and S.A.A. carts	1270
	Infantry and artillery reserve ammunition of 1st division	790
	1 field company R.E. and its tool waggons	200
	Forge waggons of cavalry regiment, &c.	50
	Ambulance and field hospital	150
	4 battalions R.A. of army corps (1 H.A. battery being with advanced guard)	1800
	Led horses of army corps staff and of 1st division	125

The 2nd Division to march $3\frac{1}{4}$ hours after scouting party had started.

		yds.
2nd Division.	G.O.C. 2nd division and his combatant staff	20
	Odd battalion of 2nd division	420
	The 3 field batteries of 2nd division	1200
	1st brigade, 2nd division	1270
	2nd brigade, 2nd division	1270
	Infantry and artillery reserve ammunition column, 2nd division	790
	1 Company R.E. and its tool waggons	200
	Ambulance and field hospital	150
	Led horses of 2nd division	104

The 3rd Division, in same order as 2nd, will march 4½ hours after the scouting party had started, its Regt. of cavalry bringing up its rear. Should the Divisions close accidentally one upon the other during the march, the G.O.C. each will take care always to keep an interval of about 200 yds. between his leading detachment and the rear of the preceding Division. The train should not begin its march for 6 or 6½ hours after the scouting party had started, but the chances of the troops being engaged during the day will regulate this. If a fight is expected, these columns should remain stationary and await an order from the C. of the S. before starting.

		yds.
Train.	Army Corps reserve Ammunition Column	1590
	Pontoon troop	796
	Telegraph troop	250
	Detachment of military police	40
Baggage Column :—		
	Detachment of military police	40
	Non-combatant staff of army corps.	10
	Baggage of army corps, head-quarter staff	80
	Baggage of the cavalry brigade and of the 3rd division in the order in which each corps stood in the column of route, the non-combatant staff being at the head of the baggage of each division: no tents carried	2300
	Commissariat trains	5000
	Troop of military police	150

Assuming the length of the march to be twelve miles, that the scouting party marched at 5 A.M., the vanguard at 5.30 A.M., the main body of the advanced guard at 5.45 A.M., the 1st Division at 6.55, the 2nd Division at 8.25, the 3rd Division at 9.40 A.M., and the train at 11.10 A.M., the rear waggon of the train could not leave its ground much before 12.55 P.M., and would not reach its destination before 5.25 P.M. at earliest. This calculation is based upon the idea that all the Army Corps had been concentrated in one camp formed *a cheval* upon the single road which was alone available for the march ; but as a matter of fact, under such circumstances, the Army Corps would naturally be encamped in several echelons along that road, the cavalry brigade most probably in front as the first echelon, then the 3 Divisions each in an echelon by itself at one, or two, or three, or more miles distance, one behind the other, and the train behind that again. This would be the only practical manner in which an Army Corps could march by one single road. It would also have to encamp daily in similar echelons. If all started from one camp (making no allowance for opening-out), the advanced guard from the scouts to the rear of the squadron closing its rear would cover about 4 miles of road. The main column from its head to the rear of the cavalry Regt. closing in its rear would occupy about 13 miles. The column of

baggage, exclusive of all commissariat trains, would cover about 1½ miles, or with those trains, say 4 miles.

Allowing, however, 20 per cent. for unavoidable opening out (the commissariat trains being as above), the Army Corps, from the scouts of the advanced guard to extreme rear of trains if thus extended along one road, would cover about 24 miles of road, no tents being carried. It is therefore very desirable to avoid when possible moving more than one division by any one road. Of course, in such a march as that I have contemplated, the advanced guard would be engaged in taking up the line of outposts to protect the new position to be occupied in their rear for the night, about the time when the 3rd Division was starting from its old camp.

The order of march for a division moving independently, when no detached force of cavalry covered the front, would be normally as follows :—

Advanced guard, strength as given at page 326.

Scouting Party. 3½ squadrons pushed some few miles well ahead and to the flanks.

			yds.
Advanced Guard.	Vanguard.	¼ troop to keep up communication with scouting party	25
		2 13-prs. guns without waggons (H.A., if possible)	60
		4 companies of infantry without any carts, &c.	180
		Section of R.E. with tools on packhorses	50
		This vanguard will march half an hour after scouts.	
	Main Body.	O. C. advanced guard and staff	10
		¼ troop to keep up communication with vanguard	25
		4 13-prs. without waggons	130
		4 companies of infantry with tool and S.A.A. carts of battalion	250
		Remainder of field company R.E. with tools	150
		Section of Ambulance	40
		The main body of advanced guard should not march for 10 or 15 minutes after the vanguard had moved off, that is, say for 40 minutes after scouts had marched.	

Main Body of Division :—It should not march for 50 or 60 minutes after the scouting party had started.

	yds.
G.O.C. and his staff	20
¼ troop to keep up communication with advanced guard	30
The 2 remaining batteries of divisional artillery *	800

* *If the country is very close, it may be at times desirable to place a battalion in front of these batteries, but it should only be done when absolutely necessary, as its presence in front impedes and checks the pace and harasses the gun horses considerably.*

	yds.
Interval	100
2 brigades of infantry with only tool and S.A.A. carts*	2600
Interval	100
Waggons of battery with advanced guard	260
Infantry and R.A. reserve ammunition-column, and force waggon of cavalry regiment.	800
Ambulance and field hospital	150
Led horses	100
Interval of from 1 to 10 miles according to the probability of fighting.	
Train :—	
Baggage master with ¼ troop	30
Non-combatant staff	10
Detachment of military police	30
Baggage of divisional head-quarter staff	50
Baggage of brigades, &c., according to the order they occupy in the column of route	1050
Commissariat train.	1000
Military police	120

The advanced guard from leading scouts to its rear would occupy about 3 miles of road. The main column would occupy about 3 miles of road, and the train about 1⅓ miles, no allowance being made in any of these calculations for unavoidable opening-out, or for the distances between scouting party and advanced guard, or between it and main body, &c., &c.

Allowing 20 per cent. for opening-out, the division would cover about 7 miles of road, not including its baggage and train : if we assume the distance between the rear of the division and the head of the train to be a mile, and the depth of the train to be 1¼ miles, then the whole division marching without tents from its leading scouts to the rear of the train would occupy about 9½ miles.

In the foregoing orders of march the commissariat trains are placed after the baggage, it being presumed that the men are carrying a day's provisions in their haversacks, as must invariably be the rule when there is any possibility of meeting the enemy : when they do not carry rations with them, the waggons carrying one day's rations for every one should precede the baggage.

Previous to all marches it is very necessary that the P.M.O., the G. of C., and the Commissary Genrl. should receive the earliest possible notice so as to make the necessary arrangements beforehand. As the enemy is most likely to receive information through contractors, it may sometimes be essen-

* *If it is considered advisable to have 2 instead of 1 battalion with the advanced guard, the second must be taken from the leading infantry brigade.*

tial to keep the Commisst. Dept. in ignorance of your intentions; upon such an occasion the C. of the S. must satisfy himself that there are ample supplies at hand. A very successful plan sometimes for deceiving an enemy is by the formation of magazines at points far removed from your intended line of movement. With the advanced guard there should be no hospital, and only a small ambulance establishment, the sick to be collected every day, and left—under cover if the weather is bad—in charge of a M.O. until the main body arrives, when they will be provided for by the P.M.O.

In open countries like India, the advance of armies is an affair that can be laid down on paper: the baggage being mostly carried upon elephants, camels, and bullocks; marches, independent of roads, upon the flank which is least open to attack.

In future European wars, it may be expected that the advance of armies will be parallel with railroads, along which supplies can be forwarded as required.

The electric telegraph is a new element in war; wires can easily be laid down as each column advances, by which messages can be sent back to the original starting-place, and so to the front, along the road upon which the C.-in-C. is marching: in other words, he can be in momentary communication with all his columns. Such was the case when the Prussian armies advanced from their frontiers into Saxony and Bohemia in 1866.

The hour of Starting.—The season of the year, the distance to be got over, and the climate must determine the hour of setting out; it should be an understood thing, however, that the men should have their breakfast before starting; when the marches are over 15 miles, the men should halt for dinner, and have an evening meal when they reach camp.

Having as far as possible calculated the time it will take to march to the intended halting-place, and the difference in time of arrival between the head and tail of the column, you can fix the hour for the starting of each part of the column, arranging so that the last waggon of the train shall reach its destination before noon. Unless it be necessary on account of the sun's power to march extremely early, it is better for men and horses not to march until a good hour after daybreak, so that all may have had a good meal by daylight.

In warm weather the earlier that infantry march the better, but one hour after daybreak is more convenient for cavalry and artillery, as horses feed better then, and the men have light to arrange their saddlery and harness, which is generally badly done for marches begun in the dark, and which entail upon the men much loss of their natural rest and sleep. Owing to extreme heat it may at times be necessary to march by night, and other circumstances may render night marches necessary, but they should be avoided as much as possible: they are very wearying to the men, and require at least half as much time again as the same distance would require by daylight.

Brigadiers and G.Os.C. should stop frequently to see that the order of march is kept regularly: it is a good plan for all commanding officers to see their men file past them once every day on the march. They should from time to time send their As.D.C. along the column to the rear, to see that all is going on well, and to report any irregularity.

Each division must be led by its A.A.G., who is responsible that the correct road is followed. He must obtain the guides, marching with one himself in front of the advanced guard, one to keep with the head of the column, one with the tail of it, and one with the rear guard.

During night marches it is advisable to have one or two others distributed at equal distances along the column: for the treatment of guides, see Article on "RECONNAISSANCES."

Unless there is some urgent necessity for speed, halt always one day in the week; in fact, the main features of the march depend upon the enemy's proximity, the nature of the country (which bears greatly upon the facilities for lateral communication between the columns), the relative strength of the opposing forces, and the objects in view.

The mode in which the army daily encamps or bivouacs (as the case may be) must depend upon the same circumstances. If obliged to fight at any moment, the 2 infantry brigades of the advanced guards can quickly form to the front, on their leading regiments; one forming to the right, the other to the left, the brigades of cavalry forming up on their outward flanks (having left strong patrols on all the roads leading towards the enemy) will endeavour to check the enemy by threatening or charging his flanks. The army in rear will thus have time to deploy into fighting order.

In the foregoing examples of the order in which the several arms are formed in column of route, the cavalry have been shown in front; but in marching through a very enclosed country, or at night, except on open plains, it would be very dangerous to have the head of the column formed by a large body of cavalry, as they would be nearly helpless in case of attack. The infantry should be in front under such circumstances, having a few mounted men a mile or two in front. It will be seen that the guns are pushed well to the front, so that they could at any moment come into action to cover the deployment of the infantry in case of attack, or the necessity arising for an attack being made upon the enemy.

THE DUTIES OF THE STAFF are endless during the march, and no matter how zealous the junior S.Os. may be, unless the C. of the S. is experienced in war, and a man of ability, roads will become blocked up with troops, waggons, &c.; advanced guards will find themselves without columns in their rear; brigades and divisions will lose their way, not knowing they have done so, until their leading battalions have been pulled up short by an impassable marsh, bridge, or river; baggage will be lost; short

marches will be badly executed at the cost of immense fatigue to men and animals ; and if attacked *en route*, nothing but the individual physical superiority of the Briton over all other nations can save the honour of Her Majesty's army.

The minor details to be attended to by Os. C. battalions and brigades, as well as those on the staff, are numerous. The following sketch is a general outline of them :—

The physical condition of the men and horses is of the most vital importance. Do all you can to economise the strength of both by accomplishing your object with the least possible expenditure of vital energy. Both must be well fed during the march, for the wear and tear upon the system is much greater than when halted ; an extra allowance of meat and tea should always be given. See Article on "DIET."

The men's stomachs being attended to, their feet come next, and are of equal importance ; good shoes and woollen socks are indispensable, the latter to be washed whenever there is a halt.

Captains of companies should impress upon their men the necessity for greasing their boots, which, while rendering them waterproof, also makes them soft : they should be instructed to soap their stockings for the first few days' march, taking care to wash their feet and prick any blisters that may have risen, as soon as they encamp. It is a good plan to rub the feet with a decoction of salt and a little alum dissolved in warm water.

Men who suffer in the least from ingrowing nails must have their feet examined by the doctor. Whenever the force halts for a day, captains must examine their men's boots, and take immediate steps for supplying all wants in that respect. The old prejudice against drinking water on the march has been murdered by scientific discoveries : however, men should be discouraged from drinking large quantities at a time, and persuaded instead to drink a little frequently.

Make use of the "double" as seldom as possible. It looks very smart, no doubt, to perform movements at a running pace, and some C.Os. are very fond of doing so on the march, but the colonel who thus "takes it out" of his men is ignorant of his work. If distance is lost, wait for the next halt to regain it.

Whenever it is possible, have music to march to. If the band is broken up, the drums and bugles should play together as the French do. Nothing is more martial in sound, and the men march a hundred per cent. better to it than in silence. If you have nothing else, get your men to sing by companies. During long night marches in India at the beginning of the mutiny, I found that with singing we got on admirably, whilst, when we marched in silence, as men will do after the first half mile at night, they almost went to sleep, lagged behind, stumbled and fell. The moment a song was struck up the men stepped out briskly.

There are no occasions on which the discipline of a regiment becomes more conspicuous than upon the line of march, nor on any on which the attention and vigilance of every officer in maintaining order and regularity are more especially requisite.

Officers of all ranks must be sensible of the importance of preserving the compact order of a column of march, by not allowing irregular intervals, straggling, or falling out, except during periodical halts, which should be frequent and at a distance from public houses. It is quite possible to maintain great precision of formation, whilst the men are allowed to march in the manner most comfortable to each.

After a march, the men are to occupy themselves in putting their arms and appointments in complete order.

Drunkenness, or irregularity upon a march, is to be considered as committed on duty.

When not likely to be engaged, and when tents are used, it is desirable that the Q.Ms. and the camp colour men of the advanced guard should march at the head of the column ; those of the columns of the main body with their respective advanced guards, but in rear of them. This will save much time when the several columns approach their encamping ground.

When marches are undertaken beyond the enemy's reach, they can best be accomplished by divisions, or perhaps by even smaller bodies. The greater the number of detachments of about 6000 each, and the greater the number of roads marched over, the easier it will be to administer to the wants of every one. In such cases, the comforts and physical condition of the men must be closely attended to, and must regulate the length of the march and the hour of commencing it ; when there is any likelihood of being engaged, military considerations must outweigh all others. Avoid unhealthy and malarious districts ; but, if obliged to pass through them, arrange to halt the fewest possible number of nights there, beginning the march about noon in cold countries, and somewhat later in hot.

Places like the Terai in India are mostly deadly at certain seasons, if the nights are passed there, although one may safely march through them in the middle of the day. It can generally be traversed in one march, but if obliged to encamp in it, every tent should be closed after sunset, and kept closed until an hour after sunrise. Guards should be reduced to a minimum, and every man on night duty should be given from 3 to 5 grains of quinine, both going on and coming off duty. The Indian medical men recommend that every man obliged to halt in malarious places should receive a daily ration of quinine, and in such cases the expense of physic ought not to be considered. The best time to take it is immediately after the morning meal of tea or coffee.

No matter what the length of march, or how distant it may be from the enemy, all the precautions necessary when in his presence must be adopted.

Avoid marching through towns or villages. Go round them if it can

possibly be done. When that is impossible, take every precaution to prevent the men from leaving the ranks. Under no circumstances should a temporary halt occur within such places. To avoid doing so, the place of exit must be kept clear. If any obstruction occurs a little in advance, the column marching through the town must not be halted, but kept passing through and forming up beyond it, until the check has been remedied.

When starting, if in the neighbourhood of the enemy, the men must not burn up the straw and rubbish of their camp and bivouac.

At the head of every column of less than a division should march as a detached body all the regimental pioneers, who should take their orders from the S.O. on the spot. This is not necessary when a company of R.E. with tools accompany the column.

If the obstacle to be overcome is only a small one, care must be taken that only sufficient pioneers or engineers are left behind to accomplish what is necessary ; the rest should go on with such portion of the column as can get on, notwithstanding the obstruction.

Wherever the road divides into two or three branches, the A.G. or C. of the S. of the force must take care to make a mark by notching the trees or breaking down some branches along the road that is to be followed. A pile of turf or stones will serve the same purpose. During night marches, unless there are a number of guides, a mounted officer or man should be left to point out the way at all places where roads branch off from the one you are following.

The discharge of any firearms during the march is strictly forbidden.

March in the most open order when at a distance from the enemy. This is all the more necessary in hot weather and in the tropics. I have seen men drop down dying in India from being marched into action in line of quarter columns, in the centre of which the want of air was actually suffocating. For this reason, fours is a bad formation in hot weather. Companies, sub-divisions, or even sections, are the best formations to be adopted, according to the breadth of road.

Os. C. companies to be held responsible that the water-bottles are filled before starting. Take your men cool into camp, and do not allow them to remove their coats for half-an-hour after reaching camp.

When tents are up or the bivouac marked out, as the case may be, the men not employed on fatigues should change their under-clothing and wash well. The clothes taken off to be brushed or beaten, and hung up in the wind.

In marching with other corps, C.Os. must be careful to prevent as far as possible checks taking place at the head of their column. If a narrow bridge or gateway has to be passed, it should be done at the double or stepping out. G.Os.C. cannot be too severe upon C.Os. who are negligent on this point.

Whenever a stream, ditch, bank, or other obstacle is to be crossed, it will be generally found that, instead of defiling or diminishing the front, the very contrary should be done, not only by causing the files of each section to open out gradually before they arrive at the ditch or obstacle, but even by forming subdivisions or companies.

When a bad place is to be passed, the majors and captains will go to the head of their respective wings and companies, to see that any orders which may have been given are obeyed with regularity and steadiness. They will remain at the spot till the whole of their wings or companies have passed, and will then resume their stations in the rear, and give the words, 'March at ease.' When several roads converge upon a bridge, ford, or other defile which must be passed by all the columns, in issuing orders for the operation, calculate the march of each so that no two should reach it together. The exact hour that each should begin to pass it, and will take in passing it, should be noted in the instructions issued.

It is of the greatest importance that the men should not on any account be hurried on the march; they are to be instructed that they are never to step out beyond the regular step, still less to double, unless by word of command.

No man is to remain behind or quit the ranks for any purpose, or on any account whatever, without permission from the captain or O.C. the company.

Officers are never to give permission to any man to quit the ranks excepting on account of illness, or for the purpose of easing themselves, or for some other absolutely necessary purpose.

The officers must be particularly attentive to prevent the men from going out of the ranks for water. When this is required, the regiment or column will be halted.

Men who obtain permission to fall out for a short time to ease themselves, or for any other cause than illness, must invariably leave their arms and packs to be carried by the section they belong to until they return.

The following Table gives the actual number of yards in depth occupied by regiments, brigades, &c., marching along a road in column of route with regulation distances, no allowance being made for opening out. An allowance for opening out (as already explained) should be added to all these distances in calculating the depth of a column of route.

The following is a rough rule for calculating the length of road occupied by columns on the march; allow 1 yard for each horseman, 1 yard for every 2 foot-soldiers, and 20 yards for every gun and for every description of waggon. Abroad, it is usual to calculate that an Army Corps, with only such portions of its train as it can never separate from, would cover from about 15 to 19 miles of road.

An army moving to fight must be encumbered as little as possible by baggage and waggons of all sorts: tents and provision trains should be left in rear, the men being served out with 2 or 3 days' provisions. The fighting portion of the army to be closed up to the front as much as possible.

UNITS ON FULL WAR STRENGTH.	Yards of Road occupied, allowing for Regulation distances. Infantry in fours, Cavalry in sections, R.A. in column of route, Transport Waggons in file.
	yards.
A Squadron of Cavalry (53 files) without baggage .	118*
A Regiment of ditto, with baggage but without tents	880†
Ditto ditto, with tents and all regimental transport	944
A brigade of ditto, including Battery of H.A., with baggage but without tents	1875‡
Ditto ditto, with tents and all regimental transport	2070‡
A Battalion of Infantry, with only tool and S.A.A. carts	421§
Ditto ditto, with all baggage, &c., except tents. .	550
Ditto ditto, with all its regimental transport . .	600
A Brigade ditto, with only tool and S.A A. carts .	1263‖
Ditto ditto, with all baggage, &c., except tents .	1650‖
Ditto ditto, with all regimental transport . . .	1800‖
A Battery of Horse Artillery	450¶
A Battery of 16-prs.	400¶
A Field Battery of 9-prs.	340¶
A Battery of H.A. without waggons	190
A Divisional Reserve Ammunition Column . . .	790
One Division Army Corps ditto . . .	530
Army Corps ditto ditto . . .	1590
A Field Company, Royal Engineers	193
A half Telegraph Troop ditto	325
A Pontoon Troop ditto	796
Fd. Park with an Army Corps	147
A Divisional Ambulance Column	..
One Field Hospital	..
One Infantry Division without baggage as part of an Army Corps as shown at page 317	5766

A two-horse waggon	12 yds.	Including an interval of 4 yds. between the leaders' heads and the rear of the waggon in front of them.
A four ditto ditto	16 ,,	
A six ditto ditto	20 ,,	
Horse, Mule, or pack animal	4 ,,	
Camel	5 ,,	

Allowance is made in this Table for space occupied by Infantry but not by Cavalry Bands. * *Including one squadron interval of* 12 *yds.* † *Including* 3 *squadron intervals of* 12 *yds. each, and a regimental distance of* 50 *yds. and* 100 *yds. for* 60 *led chargers and* 4 *spare draught horses.* ‡ 3 *intervals of* 50 *yds. each allowed between Regiments for convenience in marching.* § *Including* 30 *yds. as the distance between it and next Battalion, &c.* ‖ *Including distances of* 30 *yds. between Battalions.* ¶ *When tents and loose blankets are carried,* 2 *G.S. waggons extra are required, which will add* 28 *yds. to these figures.*

Baggage.—Happily for our army the system of regimental transport has now been definitely adopted. It is essential that there should be a good active officer in charge of the baggage of each division. The baggage master must be considered a S.O. whilst on the march, and as such, being the mouthpiece of superior authority, his orders must be obeyed. He will be, during the march, the S.O. to the F.O. of the day, who, commanding the rear guard, can, if necessary, give him orders; but, unless under peculiar circumstances, it is better that he should leave him to make his own arrangements; supporting him if appealed to by him on questions of authority.

After the march he will report to the A.A.G. of his Division all irregularities that may have occurred, or the negligence of any officer with the baggage guard, and will make suggestions regarding the baggage on future occasions.

The baggage of corps should be kept together, and not allowed to mix with others; this must be attended to by the regimental officer permanently in charge of the transport of each regiment, who will distribute his guard amongst it with that object in view. One N.-C.O. should be with the leading and one with the last cart. Under no circumstances must the guard be allowed to ride on any of the animals, or in any cart, or to put their arms or packs there. The officers cannot be too strict in preventing their men from straggling, and all stragglers should be made prisoners.

If a load tumbles off, or a cart breaks down, the whole of the baggage of that regiment is to draw up on the near side of the road, allowing that of other corps to pass on. The guard must then, under the directions of the officer, repack the load, or, if necessary, distribute it in small quantities amongst the others. Os.C. regiments should take steps for punishing those whose baggage tumbles off, for if carefully packed it would not do so under ordinary circumstances.

Allowance of Personal Baggage.—Transport will be found in the field for 80 lbs. for all regimental F.Os. and others ranking as such (brevet rank not included); for 60 lbs. for mounted officers not being F.Os. (in South Africa lately they were only allowed 50 lbs.); and for 40 lbs. for all of inferior rank. This includes bedding, &c., but does not include cooking utensils, for which transport will be found at the rate of 22 lbs. for each troop or company, or mess of 3 officers. Baggage to include bedding, will be conveyed for civil servants (when authorized) at the rate of 20 lbs. each: camp equipment will also be provided for them. In South Africa each S. Sergt. was allowed 17 lbs. and 2 kettles per Battn. were carried for them.

In Bengal on service 1 camel is allowed for the baggage of each regimtl. offr. irrespective of rank (400 lbs. per officer) not including camp equipment. For service in the hills 1 mule is allowed for the baggage of every 3 offrs. 1 for the C.O. and 2 for each Battn. mess.

Advanced Guards.—No body of troops, from an army down to a company, should march without being covered by an advanced guard. It fulfils for troops on the march the same duties that outposts do when they are halted, and the same rules apply to both.

Its object is to search the country in the vicinity of the roads by which a force marches, for the purpose of ascertaining where the enemy is and what he is about, so that he cannot possibly take it unawares, and in the event of his attacking, to engage him in action until the main body of the column has had time to deploy and make arrangements for taking up a good position or for retreating as may be determined upon. When the news is first brought to you by your scouts, that the enemy is deployed and advancing to attack, the head of your column may have reached ground where it would be very unadvisable for you to engage: to fight to the best advantage, you might have to move a mile or so backwards or forwards to secure a really good position suitable to your force. Its duties include the repair or preparation of roads and bridges for the use of the main body. To it is often confided some special operation, such as the seizure of some important position, bridge, defile, &c.: it should therefore be composed of Light Troops having great powers of mobility, and in such instances, it must be strong enough to hold the captured position against all possible comers until support could reach it. Its mission at times may be to engage the enemy at all hazards to prevent his retreat, holding him engaged until the main body can come up.

In their composition they should represent a miniature army, the proportion between the three arms being decided upon the same rules that hold good in the formation of an army for each particular sort of country. As a general rule about $\frac{1}{4}$ of the infantry forming the column should be allotted to the Advanced Guard.

It is the duty of the A. A. G. of the division to see the advanced guards properly detailed and formed up, as also the rest of the division. The officers in charge of the baggage, stores, &c., must take their orders from him as to the position they are to occupy on the line of march.

The following may be taken as the normal strength of the advanced guard required by an English army corps and division respectively, when the front is not covered by an independent force of cavalry pushed forward as detailed farther on, and as described in Article on "SCOUTING."

For an Army Corps.—The brigade of cavalry with its battery of H.A.; 4 battalions of infantry; any mounted infantry there may be attached to the army corps, 1 battery of H.A.; 1 or 2 companies (according to circumstances) of R.E., with a light bridge equipment if it is likely to be required, and an ambulance detachment.

For a Division marching independently.—The divisional regiment of

cavalry minus 1 troop (to be left with G.O.C. at head of main column): the odd battalion of infantry not attached to either brigade; 4 guns, or in some instances an entire battery of 13-prs., any mounted infantry there may be available; one company of R.E. with tools and a detachment of the ambulance. Sometimes it may be desirable to add half a battalion, or even a full battalion.

The fewest possible number of non-combatants should be with all advanced guards.

Their distance from the main body must greatly depend upon the relative condition of the two opposing armies; if you are prepared to attack whenever you come up with the enemy, the distance should be small, say about a mile; but if you consider it will be necessary to devote some time to reconnoitre his position before attacking it, or should you not feel sufficiently strong to warrant you in accepting battle at all times and under all circumstances should he assume the offensive, it will be necessary to increase that interval to several miles, say roundly 4 or 5 miles. The nature of the country will always be an element in calculating these intervals, for if it abounds in strong natural positions, there is less liability of the advanced guard being overpowered by an enterprising enemy before it can be supported by the main body. The state of the weather and of the roads have also more or less influence upon this point.

It is impossible to lay down rules to meet every case regarding the exact distances to be maintained between the main body and the advanced guard, and between the component parts of the latter. The general principle, however, should be that under no circumstances shall it be possible for the enemy to open an effective artillery fire upon the main body, until time has been afforded for getting its guns into position, and its infantry formed up for their protection.

The order of march for advanced guards is given in the Article on "MARCHES."

With an army, all the available cavalry should be pushed out well to the front, scouting parties being still farther in front of it again, by which means the enemy's doings and intentions are most easily discovered, and the army is in consequence best protected from surprise. It should be a screen covering every approach to the positions occupied by your troops, behind which you should be able to move as you pleased without the enemy's knowledge. The distance to which it can be safely pushed to the front is regulated by the same circumstances that regulate the distance between advanced guards and the army, and also by the strength of the cavalry and mounted infantry at your disposal for this most important duty; generally and roughly speaking, the distance may be stated at from 5 to 15 miles. H.A. should accompany a force of cavalry so employed, also some R.E. either mounted

or carried in carts, their tools being on horses. The fewest possible number of wheeled conveyances ought to be with such a force, and the baggage should be reduced to a minimum, to render it as movable as possible ; it must live as a rule upon the resources of the country, and no tents must be taken with it.

When the army is not covered by cavalry as above described, when on the march it must not only have its front covered by what may be called 'moving outposts,' but the flanks must above all things be protected by detached parties. The scouts and patrols sent out from the advanced parties, and the extent of front covered by them and their skirmishers, should render it impossible for an enemy to be concealed in sufficient numbers near the line of march to make any serious attack upon the flanks of the army.

All ground that could afford cover to an enemy must be examined, and cavalry patrols sent to all villages near the line of march. Each patrol to be commanded by an officer, who will approach the village or houses he has been sent to examine with the greatest possible caution, sending files round both sides of it to reconnoitre it well from several positions before he enters it. He must endeavour to obtain information upon all such occasions from the respectable inhabitants.

S.Os. not required for immediate duty with the columns should accompany these patrols for the purpose of collecting information regarding the enemy.

When the front of the army is well protected from surprise by an independent body of cavalry covering its front at a distance of 5 or 10 miles from it, the advanced guard of an army corps or of a division may march as one body without greater intervals between its component parts than are required for the convenience of marching. Of course, under such circumstances it would be composed almost exclusively of infantry and R.A., which should be formed in an order of march best suited for coming into action as quickly as possible. The object of such an advanced guard is not to protect from surprise, but to be a small, handy, compact column of all arms, stripped of all *impedimenta*, and ready to fight in any direction at a moment's notice, and to hold the enemy engaged whilst his force and position were being reconnoitred, and your main body was being deployed in its rear.

It is very advisable that a detachment of the signal corps should accompany the advanced guard, the officer or N.-C.O. in charge of which can communicate with the signal parties sent to the high points in the neighbourhood.

All advanced parties and patrols should be instructed by the officer from whose company or squadron they have been detached to make known the presence of the enemy to those in rear by means of some preconcerted

signal, such as holding up the shako on the end of the sword or rifle, &c. See Article on "SCOUTING."

Entering a Defile or Hollow Way.—The head of an advanced guard must never commit itself by entering a defile, or hollow way, without previously occupying the heights on either side by flanking parties. When the heights are thus crowned, the leading party on the road will send on a single file, which will be followed by others in succession, near enough to keep the preceding one in view, the flanking parties on the heights of either side continuing to precede the centre until the defile is passed, when they will gradually fall back to their former stations, and the whole move forward in the original formation.

The Flanks of all Objects to be turned.—Generally speaking, the flanks of every object capable of affording concealment to an enemy will invariably be turned, and the rear threatened previously to its being felt in front; by this means the enemy will be discovered, and most frequently dislodged without loss.

Ascending a Hill.—On coming to a hill the flank files will first move in both directions round the base; a leading file will then ascend, creeping up when near the top so as not to show itself upon the summit, but making its observations from behind the brow; it will then signal to the rest of the party whether the enemy is in sight or not.

Rear Guards must be considered under two aspects :—

1st. As a small guard to close in a forward movement, to pick up stragglers, and if in an enemy's country, to be sufficiently strong to prevent a few armed inhabitants or small parties of cavalry from annoying the baggage or carrying off individuals.

It should march with flankers, particularly taking care to guard the flanks of the line of baggage.

The troops composing the rear guard, even though small in number, should be commanded by an officer of rank, certainly not under that of lieutenant-colonel for an army corps.

It must on no account commence its march until all the waggons and baggage have moved off.

The baggage master or other transport officer should report to the O.C. the rear guard when all the *impedimenta* are formed up and moving off, and such officers should be in constant communication during the march. As most of the provost establishments must be with the baggage and rear guard, the O.C. should lend every assistance to the P.M. and his assistants, and take charge of all prisoners made by them.

As several hours will almost always elapse after the advanced guard marches before all the baggage is *en route*, the piquets which were guarding the rear during the night must remain at their posts until almost everything

has moved off, when they will be withdrawn by order of the O.C. the rear guard, and form part of it.

A staff officer should remain behind with the rear guard until it marches, to direct in the collection of the baggage, and forming it up, in accordance with the orders issued by the C. of the S. upon the subject. When all is *en route* he will gallop to the front, to report to the C. of the S. that all is correct.

It is at times essential that a S.O. should remain with the rear guard, to assist in carrying out the orders of the officer commanding it.

No more disagreeable duty can fall to the lot of an officer or soldier than that which has been briefly described above. It is sheer hard work, without any excitement or glory. Under the most fortunate circumstances the men composing such a rear guard cannot expect to be in camp for some hours after the main body. It is most fatiguing to march in the dusty wake of an army, but it is on such occasions that officers show their true metal; any man can be cheerful and zealous with an advanced guard, or even with a rear guard during a retreat, but it is only those who have the keenest professional feelings who can throw all their energies into every little duty, irrespective of its being agreeable or otherwise.

Unlike all other duties, it is advisable that whole battalions should seldom be employed upon a rear guard of this nature. It should be formed of companies from several regiments, their cooks, and a few men to help them, being sent on with the main body; by this plan the men composing it will find upon arriving in camp everything ready for them, their rations drawn, if not cooked, &c., &c., and they should never, except in extreme cases, be employed for the rest of that day upon fatigues.

It would be well to punish irregularities on the part of officers while thus employed, by ordering them again on a similar duty, if necessary, without their own men.

THE SECOND CONDITION under which a rear guard has to be considered is that when it is acting between the advanced guard of the enemy and its own army. Circumstances, such as want of provisions, political combinations, &c., may require an army to change its position, sometimes even its base and line of operations; such a movement should be protected by a strong rear guard; or it may be necessary, to cover the retreat of an army during a retrograde movement, made in order to take up a position in rear, like that made by the English on Quatre Bras, and the Prussian force under Ziethen on Charleroi in 1815: or when covering the retreat of a beaten army. Under such circumstances its strength should be similar to that laid down for an advanced guard.

The great object to be attained is to retard the enemy, which, with a well-disciplined army that has not yet engaged—as, for instance, the allies

previous to Waterloo—is comparatively easy, but with a beaten and perhaps a demoralised army, is the most trying of all operations. For this reason it should be strong in artillery. The O.C. such a rear guard should be the best in the army ; it may not be necessary that he should be so *rusé* as the commander of an advanced guard, but he must be one for whom danger has at least no horrors : he must possess dogged determination, courage of the highest order, and untiring energy. Feeling the responsibility of his position, he must be at all times prepared to sacrifice himself and those under him to the necessity of the time, and for the safety of the army which he is protecting.

Rear guards have not the same necessity to reconnoitre the ground to be passed over as advanced guards have, for the army having already marched over it, prevents the possibility of an enemy being concealed there.

A rear guard of this nature must have no *impedimenta.* Indeed, officers should be without baggage altogether whilst so employed ; all baggage should be sent to the front, to march with that of the reserve.

Its wounded should be forwarded daily as far to the front as possible. It may even sometimes be necessary to leave its wounded behind : in such cases a M.O. should always be left with them ; he should be left supplied with money and with medicines if they can be spared.

Rear guards told off to cover the retreat of a beaten army should be formed from the reserves, or at least from the freshest troops : their strength should be one-fourth or one-fifth of the whole force. If the road by which the retreat takes place is not well known to the O.C. the rear guard, experienced S.Os. should be told off specially to reconnoitre the road a day's march ahead of the rear guard : they must of course act in concert, under one as the head, who will send back reports constantly as to the condition of the road, its bridges, the streams and villages to be passed, &c. ; every position suitable for the rear guard to defend itself in to be especially noted, and a rough sketch supplied of its features. If this most important of duties is ably performed, it will render the commandant's duties much lighter, and tend above all things towards the main object in view—that of retarding the enemy, so as to afford the army time to retreat unmolested in an orderly manner.

The nature of the country must affect its manœuvres and composition. In an open country all the available cavalry and mounted infantry, if there is any, should be with it, for the pursuing enemy's advance is sure to be chiefly formed of mounted men. Under all circumstances, however, it should have some of the best infantry with it, for all countries, where armies can operate, must have rivers, streams, or watercourses of some description, and such generally afford positions where infantry can make an effective stand ; the pursuing cavalry being arrested, they have to wait for their infantry. If the position occupied by the rear guard is in an intersected

country, the enemy will have to reconnoitre it and form up his troops for attack: perhaps deployment may be necessary. All this takes time, and worries pursuing troops beyond description, when it is constantly repeated with the same result, viz., when completed having only the satisfaction of seeing the rear guard march off under a cloud of skirmishers.

To conduct such manœuvres properly requires the coolest head, endowed with great judgment. No man who has not had some experience of war can command a rear guard efficiently; without it he is apt to relinquish his vantage ground too soon, or remain there too long—both serious errors, the last a fatal one. His watch must be his guide in a great measure, unless he has a clear view of the enemy's movements. His flanks will always be his weakness, particularly if there are one or two other roads running in the same direction as that by which he is marching. If so, they must be provided also with rear guards, the relative strength of each to be dependent on their distance from the main road, and upon the manner in which the pursuit is conducted. If at any time the enemy concentrates and attacks one of these secondary rear guards in force, it must be at once supported from the main body of the army, and the attacking party driven back at all hazards.

The fact of there being several parallel roads cuts both ways; for if it gives the pursuers opportunities for outflanking the rear guard, it also facilitates the retreat immensely, the balance of advantage being greatly in favour of the latter.

The great art of rear guards is that of being able constantly, without risk, and with but little trouble, to force an enemy to deploy, attack, and then to get safely away without any serious fighting; in other words, the rear guard should, by frequent occupation of strong positions, be continually threatening to fight, as it is by so doing, and not by actual conflict, that it best fulfils its purpose.

In a long retreat, when this course has been followed for a number of successive days, the general commanding the pursuit is apt to become reckless, and, neglecting to take all necessary precautions, may push on to attack with an insufficient force at hand, or in an irregular manner: it will then be for the rear guard to pounce suddenly upon him, with all his available force, and having struck him a severe blow, at once resume the retreat. The O.C. must not allow himself to be carried away by any partial success of this nature so as to forget his primary duty, for he should bear in mind that he cannot stop, except to retard the pursuit, and that every succeeding quarter of an hour brings his enemy reinforcements. The length of time that a rear guard can remain with safety in a position depends on its intrinsic strength, and the obstacles in the way of an enemy s turning it.

The distance that a rear guard should be from the main body depends

upon the nature of the country, its numbers, and the manner in which the pursuit is conducted. If the pursuit is slack, and the rear guard is composed of an infantry division and a suitable proportion of cavalry, it can safely be a march in rear. Under all circumstances, however, constant communication should be maintained between it and the main body.

In the absence of a regular force of mounted infantry, if a few hundred infantry, selected for being good shots, can be mounted, they will be found invaluable with a rear guard ; working with the cavalry, they will enable a position to be held after the infantry have retreated. When seriously pressed, the H.A. can limber up, and go off at the trot until it reaches the main body of the infantry, when these mounted infantry and cavalry skirmishing on foot, might run back to their horses, mount, and be off at the trot or gallop. The manœuvres of a rear guard should be performed as much as possible in echelon, each echelon supporting the other, and retiring alternately when pressed.

The actual rear of the rear guard should be a line of skirmishers, as far as the nature of the country will admit of it, the three arms being used according as the ground is suited to them.

It is not necessary to have any large reserves of ammunition with the rear guard, as the main body can drop daily all that may be required, and the fewer waggons, the easier will be the work of the rear guard.

An army of 2 army corps and a reserve brigade of cavalry retreating by three roads about 2 or 3 miles apart, with a rear guard of 1 division and 2 brigades of cavalry, and a reserve Battery R.A., would be disposed upon the three roads, as shown in Fig. 23, if the ground traversed by each road was of the same general nature and tolerably open ; in this sketch the supporting parties of cavalry are not shown, neither are the numerous flanking parties.

In retreating over a bridge that it is intended to blow up, arrangements must be made that the fuse or saucisson that is to fire the charge cannot be got hold of by a sudden rush of the enemy. When all the troops have passed the bridge to be destroyed, all the disposable guns should be in battery, so that the ground immediately in front of it may be well swept by a heavy fire.

If hardly pressed, and the country is so inclosed that artillery and masses of troops can only move upon the roads, to set fire to a village after your artillery has got safely through is a good means of retarding the enemy.

Care must be taken to burn and destroy all provisions, standing corn, &c. —in fact, everything that would serve as supplies for the pursuing enemy. His great difficulty will be to feed his army when moving rapidly away from his base ; so everything that tends to increase that difficulty should be attended to.

To retreat through a defile with a beaten army must be annihilation, if

your enemy understands war; but if the main body succeeds in getting through it before the rear guard has been overpowered, much time can be gained for the general retreat by an obstinate contest at both extremities of the defile as well as in it. The nature and length of the defile must determine the movements to be made; but provided that the heights on both sides have been well crowned by troops from the main body, for which there will be ample time prior to the arrival of the rear guard, the enemy ought to pay dear before his army can form up beyond the defile. It is a vulgar error to suppose that the most determined stand should be

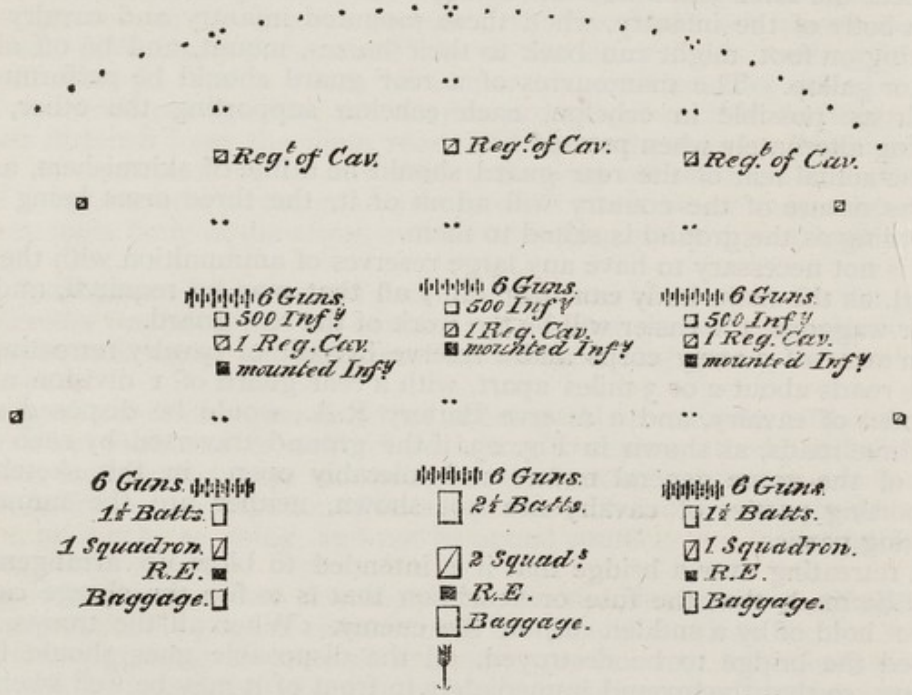


Fig. 23.

made on the near side of defiles; the entrance to them should without doubt be disputed, and the troops employed in defence should not be withdrawn until the enemy had deployed in force, and begun to scale the heights on either flank; of course the artillery should go first; having fired their last shot, the guns (to be the lightest of the army) will limber up and gallop off, their waggons having left previously. A strong line of infantry skirmishers to be well posted on the heights on both sides. The main body will then move off, followed by the supports. If possible the

last line of skirmishers should be furnished by mounted infantry, or good dragoons. When the supports had reached the entrance to the defile, these skirmishers should mount and gallop to the rear; they will soon be safe from the swiftest cavalry, for once past the line of infantry skirmishers posted along the flanks of the defile, the fire from these last will soon check pursuit. If the ground is well disputed in the defile itself, the G.O.C. will be enabled to organise a small line of battle at the far side, with batteries arranged to enfilade the defile, and cavalry ready to charge those first debouching from it: advantage being taken of the ground, the enemy's advance ought to be retarded a long time, and he should have to pay dearly for his success, before he succeeds in drawing up his army on the plain beyond.

Pursuits.—You have won a great battle, and the enemy are in full retreat; run after him; hammer him with guns, charge him with cavalry, above all things pass round his flanks, and keep pushing him and hitting him from morning until night. His forces will soon cease to be an army. The French, after Waterloo, when well beaten by the English, and pursued without intermission by the Prussians, flocked back across their frontier a disorganised mass without arms.

The general who, in pursuit, acts with precaution, who manœuvres instead of charging, will never inflict much harm upon an enemy; caution is out of place when you have a beaten army before you. This conduct, which by some may be termed reckless, may at times occasion losses to the pursuer, but unless it is practised, you can never expect to crush a retreating enemy. Then is the time for cavalry and mounted infantry, if you have any of the latter.

As soon as it is perceived by a general during an action that his enemy shows signs of exhaustion, arrangements must at once be made to have everything ready for pursuit whenever he begins to retreat.

The C. of the S. will detail the troops to take each road, and intimate to the generals to command the several columns, their order of march, &c.

After a success, theory says it is for the cavalry to reap the fruits of victory by a harassing pursuit. The first requisite is a daring, able, adroit and determined cavalry leader, and he is indeed a rare man to be found. This intensely active pursuit is not always possible, but if you have any cavalry at all, you can at least keep touch of the enemy. Napoleon paid dearly for losing touch of the Prussians after he had defeated them at Ligny. A retreating enemy will naturally do his best to conceal his line of retreat, by freely using his cavalry and H.A. If you are strong enough in those arms, you will naturally push him back; mounted infantry are invaluable for such work: but if you are not strong enough in mounted

troops to press him hard, you must still watch him closely by means of scouting parties under officers, who must endeavour to get round his flanks, and by obtaining a view from some high ground in his vicinity, ascertain to a certainty the roads he has retreated by. When, as in instances of pursuits, the services of cavalry are urgently required, do not be deterred by a dread of using up your horses: you could not lose them in a better cause. Don't fritter away your cavalry during an action; keep it fresh for the pursuit when the day is yours.

The enemy will, of course, endeavour to cover his retreat by all his freshest troops, with whom he may even, perhaps, make an offensive movement. Then is the moment for reserves to be launched out upon him to crush him; the whole of the army should go in straight at his rear guard by front and flanks; with his main body formed up in columns of route, and considerable portions of it already well in retreat, everything is in your favour, and no such opportunity can be expected to offer itself again. Whenever subsequently, during the pursuit, you come upon the enemy's rear guard formed up, you will be in column of route yourself, and by the time you have deployed and are ready to attack, he has again moved off; whereas at the end of an action you are deployed and formed in order of battle. No effort should be spared then to take advantage of one's position. In all our battles against Napoleon's troops, and lately against the Russians, we have shown ourselves incapable of reaping the benefit of victory. Wellington won many battles, but never delivered any very crushing blow to his opponent, *because he never pursued.* Waterloo is no exception, for the pursuit was effected by the Prussians.

Of course the C. of the S. will know all about the roads by which the enemy can retreat; he must select that by which to send the main body: the great object to be obtained is to get rapidly along with your cavalry or mounted infantry and H.A. in the same direction as the enemy, with the least possible resistance, in order to fall upon the flank of his main body and retard it, so that your infantry, following him up behind, can fall upon it.

The manner in which General Sheridan pursued the Southern army in its retreat, with what was called cavalry in America, but what was, in reality, only mounted infantry, and forced it to surrender, should be carefully studied.

Pursue with your main body upon the largest possible front, and whenever you know that the enemy has to pass through defiles, such as bridges or towns, spare no trouble to press him hard.

Alas for the army that has no cavalry, or is very weak in that arm! Its pursuing power is small.

Every available quadruped should be pressed into the service for the purpose of carrying infantry in pursuit; everything should be made to

give way to furthering it. A battle cannot be won every day, and the general who, having won one, fails to reap all due advantages from it because he has wounded to look after, or because his men are tired, should never be employed again.

The staff have a busy time in pursuits, for the great difficulty is to feed your army. Of course the enemy will burn and destroy all supplies that he leaves behind him, and every day takes the pursuers farther away from their base of supplies. In Europe, in future, there will be generally rail-roads running parallel with all lines of operations, so that a pursuing force can be fed by them.

Marshal Saxe says of a general sent in pursuit of a beaten army, "Il faut poursuivre sans cesse, toutes les manœuvres sont bonnes alors ; il n'y a que les sages qui ne valent rien."

A pursuing army must bivouac, no matter what the weather may be.

Retreats.—The retreat of one army before another will be considered under two heads :—

1st. As merely a change of position to the rear, effected by one or two armies facing each other, and in close proximity.

2nd. The retreat of a beaten army closely pursued.

The Articles on this subject, and on "PURSUITS," apply both to armies and small detachments.

1st. An army in presence of another, wishing to retreat, should, above all things, endeavour to conceal its intention from the enemy. To do so efficaciously, a general should begin by concealing it from his own troops.

The egress of all country people from your lines should be stopped.

The inventive genius of a general is displayed upon such occasions. An English general of the present day is in the most unfortunate position in this respect, being surrounded by newspaper correspondents, who, pandering to the public craze for "news," render concealment most difficult. However, the post and telegraph will always be in the general's hands, so he can lay an embargo on the mails whenever he wishes it, without its being known for a long time ; or he can, by spreading false news among the gentlemen of the press, use them as a medium by which to deceive an enemy.

There have been many instances of an army getting clear away from the presence of another without its being discovered for a day or two.

The general should take the smallest possible number of his staff and heads of departments into his confidence. The C. of the S. will make all the necessary arrangements, and have instructions for each general officer who is to command a column written out, stating the number of columns in which the army is to retreat, the roads by which each is to

march, the exact time at which they are to be at certain places, &c. Means must be taken to prevent all communication between the outposts and the main body, and for having it spread abroad among the latter that the enemy has retreated.

The parks of stores and provisions in rear should commence moving about sundown: the baggage should be collected a couple of hours afterwards and commence its retrograde movement. Rumour should always say, "upon the best authority," that this is being done to allow greater freedom in pursuing the enemy, &c., or that they are only being sent a mile to the rear, where they are to halt until the army moves off, when they will follow it. Much will depend upon the state of the roads, their number, the general topography of the country, the season of the year, and the age of the moon, as to the hour when the troops should begin their march.

If possible, it is better that they should move about a couple of hours before daybreak; they will then have got sufficiently to the rear before it is light, so that the dust occasioned by their march may not be visible from the enemy's position.

It will be for the G.O.C. the rear guard to play the game of brag as long as he can.

He should always have everything ready for his march, so that if attacked in force he may retire fighting in good order. His weakly men should have been sent to the rear with the main body of the army.

If unmolested, he will begin his retreat early, leaving only cavalry outposts in front of the enemy. If he has any mounted infantry, they should take the place of all infantry piquets.

These outposts should not retire until forced to do so.

The cavalry and mounted infantry outposts, aided by a few guns, and by a force of cavalry if the ground is open, can then retire slowly before the enemy.

Whenever a force of any description or strength is stationary for more than a day, its C. of the S. should put on paper the arrangements for its retreat, and write out in his memorandum book the orders to be given to each O.C. a column, so that if sent for in the middle of the night by his general, and told to arrange for a retreat in the morning, he should have little to do but assemble the generals of divisions, or brigades, or C.Os., according to the composition of the force, and read over to them the orders for the movement, entering into verbal explanations of anything that they did not clearly understand. It is most necessary that as many divisional S.Os. and B.Ms. as possible should be present.

The staff arrangements should indicate exactly the rendezvous for each column, naming for this purpose some well known natural feature, or such and such a mill, church, cross-roads, &c. The time and order for the with-

drawal of the outposts to be clearly stated and explained to the F.O. for the day, or whatever officer is in charge of them. In retreats of this kind, everything depends upon the order and silence with which they are executed ; and that such are attended to, depends upon the manner in which the staff duties are carried out.

2nd. *The most difficult of all military operations is the retreat of a defeated army before a pursuing enemy.* The only hope of safety lies in the conduct of the officers and men who form the rear guard. Their duties have been already considered.

When, during an action, the G.O.C. imagines that things are going against him, he should at once direct his C. of the S. to make the preliminary arrangements for a retreat. This must be done most quietly, alleging any motive but the real one for the movements executed. The first thing is to get away the baggage, sick, wounded, and reserve supplies, &c. They should be despatched at once to the rear, by as many roads as possible, each column having its own orders.

It is taken for granted that they have been started off a good hour at least before the actual moment arrives for a retreat of the army. Before then, it is to be hoped that the force destined to be the rear guard may be already in the nearest defensible position suitable for it that is to be found in rear, the artillery belonging to it retaining only one line of waggons, sending the other to the rear.

The peculiar circumstances of the engagement must determine the order in which the several divisions will retire. The movement to be more or less in echelon. It may sometimes be necessary to cover the first movement to be made by a general or partial attack, or by a cavalry charge.

If the ground is so open that batteries can retire anywhere over it, all the available artillery must open fire protected by all the cavalry. When obliged to fall back, every alternate battery should limber up, and trot 400 or 500 yds. to the rear and then come into action, those in rear limbering up in their turn and trotting the same distance to the rear of those who had previously retreated and formed up, and so on. As soon as the rear guard can get away from the gripe of the enemy's infantry, it is all tolerably safe, for its own cavalry and artillery, assisted by infantry as required, can make a good fight against the two former without infantry, as the enemy must break up his force into columns to follow with any speed. Strong lines of skirmishers should be formed in rear, through which the columns will pass : these, aided by strong batteries, placed on all the commanding ground, will generally suffice to hold an enemy in check for some time. No opportunity should be lost whereby his advance can be checked. Villages that lie on his road must be set on fire, bridges destroyed, &c. A tree felled across a roadway may check an advance for 5 minutes, and 5 minutes under such circumstances may be worth millions of pounds to the nation concerned.

During a retreat, the troops must always bivouac.

The arrangements for blowing up bridges should be made by the main body, for if left to the rear guard to do, there may not be time for it to do the work efficaciously.

It does not follow that if the staff is good, the retreat of a beaten army will always be carried out successfully, but it is certain that it must quickly degenerate into a disorderly flight, unless the staff is of the first order.

Positions.—Having given in detail the principal sanitary considerations which should weigh with an officer in selecting positions for encampments or for the occupation of troops for purposes of defence, &c., the military considerations may now be dwelt upon.

An officer is either sent to examine certain positions, or else to find positions suitable for a force of a certain strength.

One frequently comes upon positions which, to the uninitiated, appear of great strength from their inaccessibility, &c., which are at once condemned as useless by the experienced S.O., owing to the absence of wood and water (they being of first importance in all positions), or from some other serious defect in them.

Every position should afford a depth of 500 or 600 yds. upon which all arms can manœuvre.

Free communication from right to left and from front to rear are essential; positions cut up transversely by deep gullies, rivers, or other obstacles, are objectionable. Good roads in rear, to retreat by in case of necessity, the more the better, are essential; without them no general should take his troops into action.

A front of fortification after Vauban, before he gave such prominence and development to the ravelin, is an exemplification of what a position should be. It should be a series of curtains flanked by strong projecting natural bastions. In the first case an officer has to consider the number and description of troops the position is calculated to hold to advantage; as a rough calculation it may be taken as 1000 men to every 150 yds. for small positions.

This is calculated for two lines and for a force with an ordinary proportion of guns. It is, however, greatly dependent upon circumstances, for the different parts of a position require to be held in different strength: for instance, steep places that cannot well be attacked, and open glacis-like ground, forming as it were the curtain to bastions situated on either flank, by the fire from which it is well swept, require but few defenders, whereas ground easy of access, particularly when it forms if not the key, at least an important tactical point, requires to be occupied in force. For extensive positions, allowing for a reserve of about $\frac{1}{5}$th of the force, from 6000 to

8000 men will be required for every 1000 yds. of open ground, calculating for an army with about $\frac{1}{6}$th of its whole force as cavalry.* In the second case, he has to find a position suited to the development of the force for which he is seeking it, attention being paid to the peculiarity of its composition, so that it be favourable for the action of the arm which is in preponderance: each arm should be placed so as to afford mutual support. A position that is admirable for 20,000 might be an absurd one for half or double that number. One that is good for infantry and artillery alone, might be useless if there is also a proportion of cavalry, and so on. For an army of two army corps and a reserve brigade of cavalry, a front of about 5000 to 8000 yds., according to the natural strength of the ground, for the stronger it is, the more extended may be the front occupied.

To find the nnmber of infantry deployed in two lines that will fit into a given number of yards, multiply that number by 6; for paces multiply by 5. This makes no allowance for skirmishers in front, or for reserves. A deduction of 10 per cent. should be allowed for intervals; as, however, it is very seldom that infantry will be in action without guns, it may be taken for granted that the infantry removed from the lines to make room for the batteries will be ample for skirmishers and a small reserve. The numbers already given, viz. 1000 yds. for every 6000 or 8000 of all arms, will generally be a fair calculation, allowing for a reserve, &c.

Cavalry in one line requires one yard to each file, with intervals of about 12 yards between squadrons.

Artillery in line requires 95 yds. to each field, or H.A. battery, with intervals of 19 yds. between each, or between them and other troops.

The frontage required by infantry is 2 ft. per file, with intervals of 30 paces between battalions.

Infantry can take up a position anywhere, and its fire will always be effective; posts scarped towards the front capable of holding 100 or even 50 men, and having a great command, may sometimes be of material advantage during an action, particularly if they are about 100 yds. in advance of the general front; as an advancing enemy not liking to have such on his flank, will try to take them, and will lose men accordingly. For the general line of infantry, however, it is advisable that the ground be such as to enable them to assume the offensive at any moment, the slope not being greater than 10°; the position at the Alma occupied by the Russian infantry, in the vicinity of the battery stormed by the light division, was nearly perfect, as it resembled a glacis with a serious obstacle below it, which destroyed all formation in crossing. If the Russians had been strong enough to have assumed the offensive, and charged down the hill upon our men

* *At Waterloo the English and French had both over* 12,000 *men to the* 1000 *yards, and at Gravelotte the proportion was still greater.*

when they were broken and mixed up together, the result might have been serious.

For artillery the first requisite is that the ground be hard and firm, with a slope of not more than 4° ; it is advisable to post it so that the limbers and waggon should be near at hand and yet protected from fire.

For cavalry, firm open ground devoid of ditches or fences is the best.

Cavalry cannot charge down hill effectively at a slope greater that 5°.

Positions are of two kinds :—

1st. Those where it is intended to accept a decisive battle, and

2nd. Those which it is only intended to hold for a short period, until your own forces have had time to concentrate, or until you have forced the enemy to concentrate all his forces to attack you ; or, for merely checking the enemy, as would be the case with strong rear guards in retreats.

Waterloo and Talavera are specimens of the former, Quatre Bras and Busaco of the latter. Elevated ground in some part of the position is most useful for enabling you to perceive the enemy's movements to a considerable distance : positions where this power is afforded to the enemy are objectionable. It is of the utmost advantage that the ground should so dip, immediately in rear of the position, that the 2nd line and reserve can be kept out of view and protected from fire ; this will also enable troops to be moved from one flank to the other without the enemy's knowledge, which is of the greatest consequence, if it is intended at any moment to assume the offensive : for by it a large force might be massed upon one flank ready to pour down upon the enemy, when by a series of false attacks made upon the other he had been induced to strengthen it to the disadvantage of the wing about to be seriously engaged.

The protection of the flanks is a serious consideration ; one at least ought to rest upon some impassable obstacle, such as a deep marsh or river, or chain of inaccessible mountains, &c. Villages built of mud, such as there are in India, which cannot be burnt, or even large farmhouses, may be made strong points upon a flank, if properly fortified and held.

It is seldom that one finds a position of more than a mile in extent in a straight line ; there are sure to be salient points in it, that is portions of the ground jutting out towards the enemy like bastions. If these are strong by nature, or easily capable of being strengthened by art, they add immensely to the strength of a position, as they must be attacked and taken before the main line, forming the curtains as it were to such, can be approached. Villages and farmhouses somewhat in advance of the line answer the same purpose—La Haie-Sainte and Hougoumont at Waterloo, for instance.

In general, positions will either curve convexly or concavely towards the enemy, or be a mixture of both.

For purposes of defence, if the flanks are strong and cannot easily be approached or turned, the concave is the strongest, as an attacking enemy

must, in moving towards you, expose both his flanks to a pounding from the artillery safely posted with your advanced flanks.

If, on the contrary, the spots where your flanks rest present no feature of strength, and can be easily turned, it is better to have them somewhat retired, thus forming a convex front towards the enemy.

This will secure to you the advantage of short lines of communication, so that if a wing requires support, the reinforcement has only a comparatively short distance to go from the reserve.

An obstacle, not actually an impassable one, running somewhat parallel to the general form of the position, and about two or three hundred yards in front of it, adds greatly to its strength. It breaks the enemy's formation in advancing, and consequently throws him more or less into disorder, affording you opportunities for assuming the offensive by charging him in front with the bayonet, or in flank with cavalry. It must be remembered that all such obstacles as high banks, hedges, and deep gullies running parallel to your front that afford cover to an assailant, are most dangerous; if they cannot be avoided, care should be taken that a raking fire of artillery is brought to bear upon them, or else they must be cut away, so as to be seen into by infantry fire. The river at Alma broke up our force dreadfully when crossing in line, but the high bank which screened us on the Russian side enabled the line to re-form whilst sheltered from fire.

Obstacles that cut up one's own line are above all things to be avoided; but those that are perpendicular to the front, and cease at our first line or within 100 yds. in front of it, strengthen the position by cutting up the assailants into distinct bodies, incapable of mutual support; a counter-attack under such circumstances has everything in its favour.

Positions with wooded ground in front of them, under cover of which the enemy can form his columns of attack, should always be avoided. The same remark applies to high ground, the reverse slopes of which cannot be observed.

Beresford very nearly lost the battle of Albuera from having a hill to his right front, behind which Soult massed his column of attack without being perceived. Positions should be as nearly as possible at right angles to the general line of retreat, which should cover that line well.

If there is but one road to retreat by, it should run from nearly the centre of the position.

Positions are consequently to be looked for on lines of communication where they are crossed at right angles by small streams or low lines of hills. A very common locality for them is with the front along a stream, which runs into a large unfordable river or into the sea, upon which one of the flanks rest. Such were the positions at the battles of Prague and Alma.

It must be remembered that no position is worth much for an army unless it affords the power of assuming the offensive at all periods of a battle.

GRADATIONS ADMITTING OF MANŒUVRES (M. LEHMON).

Up to 5° "Gentle."	10°	15°
Infantry. May move with order, and has down hill the most effectual fire and charge. *Cavalry.* May move with order, and charge effectively either up or down hill. *Artillery.* Has a more effectual fire down than up hill.	*Infantry.* Its close movements become more difficult. *Cavalry.* Can only canter down hill: the charge possible only up hill. *Artillery.* Moves with difficulty up hill, and requires the drag down hill; its effectual and constant fire ceases.	*Infantry.* Cannot move any considerable distance with order: their fire up hill without effect. *Cavalry.* May still trot up and walk down hill. *Artillery.* Moves with great difficulty: its fire totally ceases.

GRADATIONS THAT MAY BE ASCENDED AND DESCENDED SINGLY.

Over 20° "Steep."	25°	Over 30° "Very steep."
Infantry. Cannot move in order, and can fire only singly with effect. *Cavalry and Artillery.* May still ascend at a walk, and descend without order, and that only obliquely.	*Light Infantry as before.* Light cavalry may ascend one by one obliquely, and descend in the same way, but with much difficulty.	*Light Infantry as before.* Light cavalry may ascend obliquely, but with great difficulty, and when the slope is of soft earth. Impassible for infantry in close formations, and on steeper slopes, i.e. up to 45°: single men can only climb with difficulty.

Occupation of a Selected Position.—We shall now suppose that a good position for an army of 2 Army Corps and a Reserve Brigade of Cavalry, of about 8000 yds. in extent, has been found by the S.O. sent out for the purpose, and that the C.-in-C. intends to accept battle there.

It may be advisable to march there at once and await the arrival of the

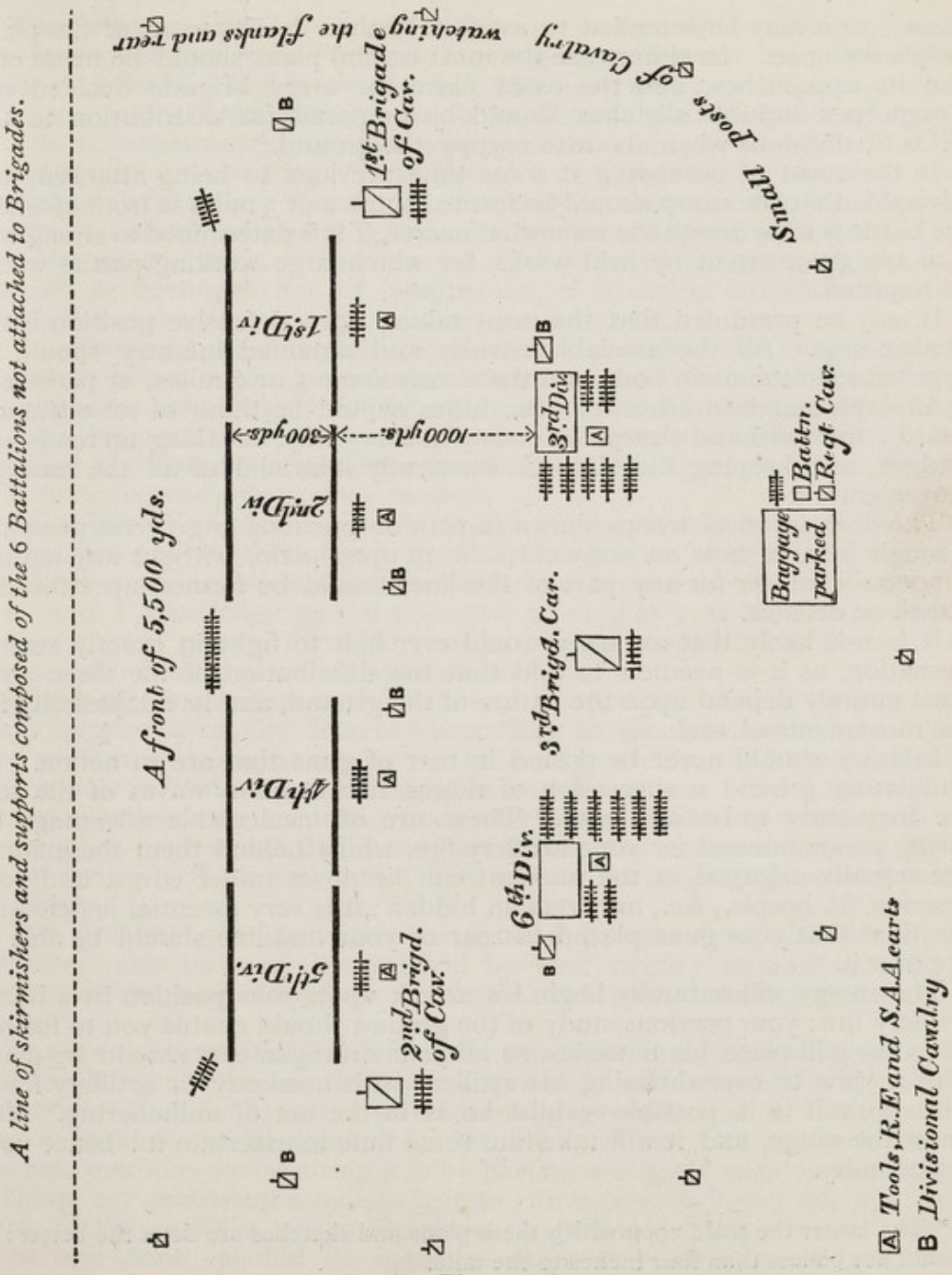

A line of skirmishers and supports composed of the 6 Battalions not attached to Brigades.
A front of 5,500 yds.
5th Div.
4th Div
2nd Div
1st Div
300 yds.
1000 yds.
2nd Brigd. of Cav.
1st Brigade of Cav.
6th Div.
3rd Brigd. Cav.
3rd Div.
Baggage parked
Battn.
Regt Cav.
Small posts of Cavalry watching the flanks and rear
A Tools, R.E and S.A.A carts
B Divisional Cavalry

Fig. 24.

enemy, or it may be intended to await a further development of his plans before doing so. In either case the most careful plans should be made of it and its approaches, and the exact place for every brigade decided on. Rough pen-and-ink sketches should be prepared for distribution to the G.Os.C. divisions when about to occupy the ground.*

In the event of occupying it some time previous to being attacked, it is advisable that the camp should be formed some 2 or 3 miles in front of where the battle is to be accepted; somewhat nearer, if it is determined to strengthen it to any great extent by field-works, for which large working parties would be required.

It may be presumed that the army taking up a defensive position is the weaker side. All the available cavalry and mounted infantry should be kept between the main body and the enemy some 5 or 6 miles, or perhaps a good day's march in advance. Its duties should be those of an advanced guard; to retard and annoy the enemy in every way, breaking up roads and bridges, and keeping the C.-in-C. constantly informed of all the enemy's movements, &c.

The disposition of troops shown in plan on previous page gives generally a rough idea of how an army corps in an open plain, without any natural supports whatever for any part of the line, should be formed up either for attack or defence.

It is not likely that an army would ever halt to fight in exactly such a formation, as it is needless to add that the distribution of the three arms must entirely depend upon the nature of the ground, and its adaptability for the movements of each.

Infantry should never be posted in rear of guns that are in action. In undulating ground a succession of ridges, like so many waves of the sea, are frequently to be met with. These are of incalculable advantage by giving you command for your artillery fire, whilst behind them the infantry not actually engaged at the moment can lie down under cover, and your reserves, fd. hospls., &c., may remain hidden: it is very essential in defensive positions that your guns placed in rear of your first line should be able to fire over it.

The enemy will naturally begin his attack upon your position by a heavy artillery fire; your previous study of the ground should enable you to foresee where he will place his batteries, so all your arrangements should be made with a view to overwhelming his artillery with musketry or artillery fire—with both if it is possible—whilst he is in the act of unlimbering. You know the range, and it will take him some time to ascertain it: hence your opportunity.

* The larger the scale upon which these plans and sketches are done the better: it should not be less than four inches to the mile.

Your plans should be devised with a view to forcing the enemy to divide his forces, so that you, perchance, acting upon interior lines, should by means of skilful combinations meet him everywhere with at least equa strength, whilst upon decisive points your force shall be preponderating. To do so effectively, you must occupy some portions of your defensive position with a small force, using the pick and shovel to counteract your numerical weakness. Where the steepness or marshiness of the ground render it difficult of access, a line of skirmishers may be sufficient to hold it. No direct attack, no matter what may be its strength, should ever succeed in turning a line of infantry out of a shelter trench in front of which there was no cover within about 300 yds. of it.

No scheme for the occupation of a defensive position can be good when provision is not made for counter-attacks at some points of the line: it requires true military genius to decide properly the when and the where. It often happens that even an ill-planned, ill-timed, offensive return by a flanking movement is of great service if conducted vigorously, for it seldom fails to embarrass an attacking enemy.

As a rule, you may generally expect the most serious attack will be made upon one or other of your flanks. The nature of your position, the approaches to it, the distribution of the enemy's army in the theatre of war, and a knowledge of the objective point that your adversary wishes to secure, will generally enable you to determine with tolerable accuracy upon which flank that attack will be made.

Under all circumstances the flanks of the position should be protected from surprise by cavalry detached according to the direction of the roads and configuration of the country. It should be well to the front, and cover the utmost extent of ground with its patrols, always careful to keep up communication with the main body, and prepared at any moment to advance upon the enemy's flank and harass it in the event of success, or to hang upon his flank and retard him in case of a general retreat being necessary.

The greatest possible extent of ground to the right and left of the position must be carefully watched by your cavalry to warn you of, if not to prevent, any endeavours on the enemy's part to overlap or turn your flank.

The arrangements for the defence of positions have not undergone great radical changes in the way that those required for offensive tactics have done.

If one of your flanks rests upon no strong ground, and is therefore the one most likely to be selected by the enemy as his point of attack, one of the best methods for securing it is by posting a brigade or division in direct echelon, say about half a mile to its rear; thus posted, it can fall upon the flank of the enemy's troops attacking the exposed flank, who, assailed in front and flank, should be made to suffer very severely. If you have

mounted infantry, a large proportion of it should be with this retired echelon. The bulk of your reserves in defensive positions generally, can be of most use to you on one or both flanks with a view to making a serious counter-blow when the enemy has fully developed his attack.

If there are any impassable obstacles, or any that are very difficult to pass, such as a small stream, deeply-scarped ground, or a marsh, the guns of position should be placed behind them, and when acting purely on the defensive, they afford admirable positions for the artillery generally. They cannot be got at by the enemy, so they do not require any troops to be specially told off to take care of them, and the enemy's fire, if the least short, plunges harmlessly into such obstacles.

The localities and circumstances can alone determine the position to be occupied by the *impedimenta*. The carts, waggons, &c., should be parked at some convenient place in rear, well out of fire; the officers of the A.S.C., together with the police and the provost establishments, must be responsible for their order, and above all things guard against individuals straggling away from the main body. Purely military stores should always be parked separately.

It must be an understood thing that the baggage is never parked, so that in the event of a retreat it has to begin its retrograde movement by marching through a village, crossing a bridge, passing along a narrow causeway, or other defile. Plenty of wide openings should be made from fields where baggage, &c., is parked, leading out clear to the main roads, by which an advance or retreat must be made.

In distributing the troops along a chosen position, some parts of it will require to be held by much greater numbers than others. If the steepness or the marshiness of the ground at any point renders it difficult of access, a line of skirmishers may be sufficient to hold it.

The commander must determine which are the important parts—the keys, as they may well be called—of the position; such parts must be occupied in force with reserves near at hand. A commander should for the moment imagine himself in the enemy's place, and arrange in his own mind what he would do, if it were his luck to be the assailant instead of the defendant; reflections of this nature will cause him to realise his weak and his strong points, and enable him to make his arrangements accordingly. He should then set to work to strengthen himself artificially. A few hours' work bestowed on a village or on a substantial farmhouse may turn the scale in your favour. If time permits, parapets to screen the gunners, at least, from musketry fire, should be thrown up: each army corps has its troop of R.E. carrying tools for such work.

The strength of garrisons of all such villages or houses depends upon the flanking fire brought to bear upon them from the main line, and upon the facility of supporting them when hardly pressed.

When such posts are in front, it is essential that supports should easily reach them, the more under cover, and out of view of the enemy, the better.

Posts of this nature add immensely to the strength of a position, but as the enemy must take them *coute qui coute*, one must be prepared for the toughest struggle for their possession. If taken and held by the enemy, they give him a *point d'appui* from whence he can launch out suddenly on the main position, or they will at least afford him a cover from which to annoy you ; so they must always be held to the last, and garrisoned by the best and steadiest men. If several small villages or farmhouses come into the line of the position, it is always better to retire the line of infantry, so as to run from the rear of one village to the rear of another—in other words, to be the curtains to the bastions formed by the villages. The same remark applies to any redoubts or other field-works it may be considered advisable to erect at important points along the front line.

If time permits, all villages immediately in rear of the position that are within easy artillery range of an attacking enemy should be destroyed, and larger openings made through them for the free passage of troops. Unless this is done, the enemy's shells are certain to set them on fire, which must inevitably occasion much confusion, and interrupt the free communication of troops and ammunition.

In the defence of villages forming part of a position, it must be remembered that the great development of modern shell fire has altered the conditions under which their defence—especially in its earlier stages—can be effected. To place a strong garrison within a village that can be well battered by the enemy's guns, would be to deliver the men over to demoralisation if not to destruction. The bulk of the men intended for the defence of such villages must be kept under cover outside them until the enemy's artillery fire becomes more or less masked by his own infantry advancing to attack it. The real strength of all such villages lies in the flanking fire of your own batteries and upon the facility of supporting them when hardly pressed. Here and there in some villages possessing deep hollow roads or streets, groups of men may from the first be advantageously posted within them, but to attempt any general occupation of the houses and garden walls in the manner formerly done, would be madness. The force allotted for the defence of a village forming part of a position in which battle is to be accepted, or to be occupied by an attacking army for the purpose of covering an exposed flank whilst the attack was being delivered, may be conveniently told off into 3 equal parts : the 1st, to construct and to occupy (as long as they can be held) a line of shelter trenches round the front and flanks of the village, and distant from its houses and garden walls about 40 or 50 yds. : all existing hedges and ditches to be utilised as far as possible for this purpose. This section of the defenders must throughout the attack do their best to keep down the fire of the enemy's artillery by volleys, the

distances to all points within 3000 yds. where guns could be well posted having been previously ascertained and notified to all officers taking part in the defence. As soon as the enemy's infantry deploys to attack, the heaviest possible fire must be kept up upon it. All Os.C. companies in these shelter trenches must make arrangements for the retreat of their men when necessary within the village by openings fixed upon, and if necessary, constructed beforehand, avoiding as much as possible the main entrances to the village and the principal streets.

Between the shelter trenches and the outskirts of the village, places should be found or constructed where small supports can be safely posted for the front shooting line. These supports should not be in the village itself, and the proportion between them and the men in the front shelter trenches must depend greatly upon the extent to which good cover can be provided. 1000 men can occupy about 400 running yds. of shelter trench, and also furnish the necessary supports.

The second portion is to be the garrison of the village, and to strengthen it as far as time permits. As soon as the enemy concentrates any powerful batteries upon it, this garrison must remove to the points previously selected, where it will be best sheltered from this artillery fire: in many villages it will be necessary for it to withdraw behind the village to obtain the necessary shelter. The moment the enemy's infantry approaches near the village, and his artillery fire slackens or ceases in consequence, this garrison should occupy the place in the manner previously determined upon, each captain of a company leading his men by the route he had fixed upon, and had previously explained to his officers and all ranks under him.

The 3rd portion will form the Reserve to be drawn up under natural or artificial cover in rear of the village. In the event of the enemy assaulting the shelter trenches on the flanks, this reserve may have a good opportunity for an offensive return, taking the enemy in flank; but generally this reserve will be kept to assist the garrison when the enemy, having stormed the shelter trenches, has forced an entrance into the village itself. A counterstroke delivered by this reserve without the village just as the enemy had entered its outskirts, if made vigorously, will have a very telling effect.

It is seldom desirable to place guns in villages except they are very large, with wide streets, and have large open spaces within them: artillery can be used to much better advantage outside them. Indeed, it is essential that their flanks, and if possible their front, should be swept by powerful batteries from other parts of the main position, whose fire should be directed upon the enemy's guns until his infantry attack is well developed, when it should be turned exclusively on the attacking troops.

The result of many a battle has turned upon the struggle for possession of a village, and such will be the case again in all wars. If the defence is ably and bravely conducted, the assailant's loss must be very great, no matter

what may be the result ; but if the village, by its general plan, position, surroundings, and the nature of its buildings, is one that lends itself naturally to a prolonged defence, the defenders have so many advantages on their side, that they should blush for shame if they do not remain masters of it.

When driven from your shelter trenches and the first line of defence round the immediate outskirts, your interior line of defence, if properly prepared and occupied, ought to give you an immense superiority over your enemy, who can no longer make use of his artillery. Your walls and houses will have been carefully loopholed, and flanking defence provided for, so that he cannot show himself in the streets or lanes, and must resort to the methods described under the head of street-fighting, and work as best he can with heavy loss from house to house. As long as the soldierlike spirit of your men can be maintained, the advantage will be all on your side ; but the success of his attack upon your outer line, the remembrance of the awfulness of the converging fire he brought to bear upon the village in the first instance, and the dread of being cut off and made prisoners, too often exercises a heavy influence upon the spirit of the defenders, and causes them to relinquish the struggle just at the moment when all the positive advantages of the position had become yours.

The formation of each division into 2 lines with its own independent reserve has many advantages. It renders the command of each general of division more compact, as it is easier to exercise control over troops deployed in two lines and occupying a front of about 1100 yds. with a depth of some 200 or 300, than if deployed in one line, and occupying twice that front.

Brigades in the same division become more attached to one another as they mutually support each other in turn.

This system, however, has the disadvantage of granting to subordinate generals the power of using the second line and the reserve at their own discretion, which some are prone to do too early in a battle. We all know of the repeated messages Wellington received during Waterloo from different general officers praying for support ; his answer was always the same, 'You must do your best and hold the ground,' although at that moment he had reserves at hand that he might have used. This use of reserves, or even of the second line at too early a period of the day, is the most dangerous of all faults ; and divisional generals ought to feel that their second line is their reserve, and the only one they can look to for support. In deciding when and how to use your reserves, remember that the worst use you can put them to is to fritter them away piecemeal. Whenever it is necessary to use it, the circumstance ought to be immediately reported to the C.-in-C. Brigades ought not, except under most peculiar circumstances, to be divided part in the first and part in the second line.

The senior S.O. with each army corps will point out to the P.M.O. the

positions for the Fd. Hospls. All good buildings in rear, that are well out of fire, should be made available for wounded men.

In conclusion, it can also be added, that all arrangements made should have constantly in view the object to be obtained by fighting, and that under scarcely any circumstances is a position worthy of the name that does not afford facilities for assuming the offensive at any moment, nor are the arrangements creditable unless everything is prepared for doing so. As these arrangements must, in every instance, be made by the staff, great is their responsibility. Every arrangement should be made in the C. of the S.'s pocket-book, previous to the action, for the two results, i.e. victory or defeat. He should have all the details carefully written out, so that, at any moment, he could give, almost without any reflection, orders in either case: this is all the more necessary for retreat, as then everything depends upon regularity and precision; if there is confusion there must be loss, if not disaster.

Disposition of Troops for the Attack of Positions.—The use of arms of precision has rendered necessary a modification of the tactics which were so successful for purposes of attack at the beginning of this century, it is therefore urgently recommended to all officers to examine carefully the tactical system adopted by the Prussians in their late offensive battles.

Let us suppose an army marching to attack an enemy who is known to have taken up a strong position.

The army, as usual, is to be preceded by advanced guards on all the roads made use of. (See Article on "MARCHES.") They should be very strong in artillery, to open fire as soon as the enemy's position is approached within range.

The operation should be considered under two phases:—

1st. The army has halted within sufficiently easy distance of the enemy to make a march of from 5 to 10 miles with the intention of attacking as soon as it arrives, as the allies did at the Alma.

2nd. It has halted at too great a distance for that purpose, so it marches up to him, and bivouacs for the night, to attack next morning, as Napoleon did at Waterloo.

It occurs sometimes that two armies are marching one after the other with an interval of from 6 to 10 miles, the advanced guard of one being in constant contact with the rear guard of the other, and that the army in rear is most anxious to bring the other into action; they may have marched in this manner with partial skirmishes for several days, when unexpectedly, in the middle of some march, the retreating force is found halted, and drawn up to receive battle.* Under such circumstances, with

* *The battles of Busaco and Salamanca are good examples.*

an enemy who had not previously been beaten, when the contending forces exceeded 20,000 each, it is useless commencing a battle late in the day, for one cannot expect to win a decisive battle and be able to follow it up before night sets in.

It is usual, therefore, to spend the evening in making all preliminary arrangements for the next day's fight. Under these circumstances, the arrangements are those described as No. 2; but should the enemy be demoralised from previous defeats, or other causes, he ought, as a rule, to be attacked whenever he turns to show fight; under such circumstances the arrangements are those described in No. 1.

In the first instance it is taken for granted that the staff have learnt from spies, maps, reconnaissances, &c., a great deal of the enemy's position, whether and how he is entrenched, how his flanks are posted, &c.

The point in the enemy's position the capture of which promises to afford the most decisive results should be selected for attack. The art of war is to get your troops there with the least possible exertion to them by the shortest route, and in the formation that is best calculated to develop most highly the power of each arm employed. The general direction of the march before the actual encounter is a strategical question, but the selection of the point for attack in an enemy's position may in some instances be decided upon exclusively tactical considerations. Every S.O. should at all times know with tolerable accuracy the time his brigade, division or army corps will take to deploy into fighting formation on the centre or to a flank. The configuration of the ground, the nature and direction of the roads and paths, so influence this calculation, that for each special operation a new one should be made, based upon the actual effective strength of the divisions, &c.

The nature of the country and its communications must determine the mode of advance; but it should resemble as closely as possible the order in which it is intended to fight, covered by a screen of cavalry, or by a line of moving outposts as an advanced guard.

There should be no hesitation on their part, for they must sweep away everything between them and the enemy's position.

During the march as many S.Os. as possible should be in advance. It is advisable to make a few prisoners, who should be at once questioned.

The more roads used the better, as less time will be taken in deploying. If the country is uninclosed, like the Crimea or India generally, the advance might be in columns at deploying distance.

The nearer you approach the enemy the more essential closing up towards the front becomes. The infantry and artillery should march on roads as much as possible, the cavalry marching through the fields.

In some instances, where it is known that there are bridges to cross, or other obstacles that may require work to be done, it may be necessary to

send on all the royal engineers with the advanced guard. As all offensive battles must be begun by a heavy artillery fire, the great bulk of your guns should be near the head of your columns.

As soon as the enemy has been discovered in position, the advanced guards of the several columns in which the army is advancing to attack should deploy into fighting order, all the available artillery opening fire, the batteries from the heads of the columns joining those already in action with as little delay as possible. Under cover of this artillery fire from one-half or two-thirds of all your guns, the infantry deploys, and the C.-in-C. makes his reconnaissance of the enemy's position. As many S.Os. as can be spared, scattered along the front and getting as near the enemy as they can with safety, availing themselves of all commanding ground in his vicinity, can materially assist their chief in ascertaining how the enemy's position is occupied, &c. &c. All information so obtained should be communicated to the C.-in-C. without delay. The enemy's weak points must be sought for, and a clear decision arrived at as to the localities, the possession of which would so endanger his retreat, that he would have to fight at a disadvantage to recapture them, or to fall back to save his communications, or the occupation of which would so cut his line into two or more distinct portions, that one of them might be effectually crushed before he could reinforce it in time to save it. Upon this decision will depend the formation that each division will have to assume, according as each arrives in presence of the enemy. It is essential that all deployments should take place well beyond effective range of the enemy's batteries.

The 1st line of infantry, composed of a brigade from every division (as shown in sketch on p. 345), formed into three lines (as described at p. 370), will engage the enemy along his entire front: the 2nd and 3rd lines, composed of the other brigade and of the odd battalion of each division, will be in quarter columns at deploying distance, or in such other formation as is best calculated, according to the nature of the ground, to screen it from the enemy's fire. The 1st line will thus have 3 battalions, the 2nd 2, and the 3rd, or Reserve as it may be called, will have 2 also. The distances between these lines may be considerable—say 1000 yards—at first, but they should be decreased as the action proceeds.

In future, owing to the long range of all arms, attacks upon the centre must be very exceptional: the flanks will be the points to aim at. The flank to be attacked having been selected, a gradual extension of front in that direction should be initiated, false attacks being made upon the other flank. In all flank attacks and wide-turning movements, especially those made to distract the enemy's attention from the real point aimed at, the assistance of cavalry and mounted infantry is most valuable.

It is very necessary to give to Os.C. battalions, brigades, divisions, &c., a general line of direction for their movements in attacking an enemy in

position; if the nature of the country does not enable you to indicate a road, a valley, river, &c., for this purpose, a compass direction should be given. In a close country it is very desirable to do this also for all supporting columns or troops, as they are likely to lose sight of the men to whom they are the supports.

As artillery cannot, henceforth, owing to the deadliness of infantry fire, be in line with attacking infantry, it is very desirable that the configuration of the ground opposite the selected point of attack should enable you to maintain an artillery fire upon the objective points up to the last moment before making the final and decisive charge with your infantry, and that a similar advantage should be denied to the enemy. Whenever you can secure this double advantage, you have many chances in your favour that, *cæteris paribus*, ought of themselves to secure your success.

As stated in many other places in this book, all attacks must in future be made by the skirmishing line, which should be constantly reinforced, each reinforcement pushing the line on nearer and nearer the enemy, until at last you have established within striking distance of him a force having all the strength of a regularly-deployed line, without any of its stiffness or slowness of movement. Such a skirmishing line, formed here and there by a few files only, at other points, where a dip in the ground affords shelter, by several companies, taking advantage of every little inequality of surface in front to push on nearer and nearer to the enemy's position, will soon find some chink in his armour, some weak point from which he will recede, and thus enable you, by working in there, to take the stronger parts in flank. This operation should be assisted by every available gun that can be brought to bear upon the enemy's infantry and cavalry. The configuration of the ground can alone decide the extent to which artillery can assist in such attacks, for unless there is rising ground somewhere, either immediately in rear of the attacking infantry, or on either flank, from which the batteries can keep up a well-sustained fire upon the particular point to be gained possession of, without interfering with the movements of the infantry, artillery cannot now-a-days directly assist in such an operation. It may by a well-sustained fire upon the enemy's forces in other parts of his position—the nearer the point to be attacked of course the better—prevent reinforcements being sent from distant parts of his line to the threatened quarter, but it can do no more. As described farther on, in the article upon the "EMPLOYMENT OF ARTILLERY IN ACTION," batteries cannot now be safely taken nearer than 900 yds. to the enemy's musketry fire: they cannot, as formerly, accompany attacking columns during their advance, for the purpose of opening fire within canister range of his lines. There is much nonsense talked at present about the increased necessity for artillery; and some officers, who are intelligent upon most points, would have us double the number of guns in

our divisions, forgetting how difficult it is to obtain positions for numerous batteries when acting offensively, from which advantage can be reaped from them. Artillery may assist to win, but cannot of itself win a battle; a battle can only be gained by infantry seizing upon the enemy's position, the fruits of victory being secured by an active cavalry, mounted infantry, and H.A. pursuit. Troops acting on the defensive would be generally so posted as to suffer little loss from artillery fire, which, except when directed upon columns or closely formed up troops, has a much greater effect upon them by its terrifying influences than by the actual injury which it inflicts.

Constant pressure upon the rear of the skirmishing line must be maintained by pushing on companies after companies, till at last its very strength impels it forward—the exact moment for doing so to be decided by a senior officer actually on the spot: one in the rear cannot tell when the proper moment for such a charge has arrived; one must be in actual contact with the enemy, and in the midst of the men about to charge, enabling you to feel the pulse of both sides, as it were, in order to know and appreciate clearly when the moment has arrived for rushing upon the enemy. At the distance of about 200 yards in rear of it there should be a line of supports of such strength that they should, when deployed, form or nearly form a regular line. In order to be very strong for this attack, it will be necessary to weaken your line elsewhere. This requires care, and can best be accomplished safely by false attacks, or demonstrations made by attacking from such weak points, so as to prevent your enemy, if possible, from following suit: indeed, your success may entirely depend upon being able to deceive him; so when you have decided upon the point of attack, you must use all your cunning, not only in order to conceal your intentions from the enemy, but by well-devised artifices lead him to expect their opposite. Your attack being successful upon the selected point, your whole line should press forward, unless you can hope, by pouring in troops through the gap made in the enemy's position, to take his troops elsewhere in flank and rear, and so make large captures of prisoners; in that case it would be better to hold him to his ground by a well-sustained skirmishing conflict in his front, whilst your successful troops operated upon his flank.

Such, in the author's opinion, is a brief outline of what attacks must be in future, and if he is correct, an entire change in our system of skirmishing and in our offensive tactics is absolutely necessary.

If, however, during the march you come upon the enemy in position, as the French did upon the English at Busaco, or that in advancing to attack, you meet the enemy marching to attack you, as the French did the Austrians at Solferino, more time will be required to deploy and make all arrangements for attacking. The first thing to be done is for the advanced guard to take up some defensive position, as it is assumed to be some four or five miles in front of the main body; positions sufficiently strong for this

purpose are to be found everywhere, for before it can be seriously compromised, support will have reached it. The general commanding should at once hasten to the front to make his reconnaissance of the enemy. Having done so, he must send out his orders to the several divisions, informing them where they are to deploy, &c. It is evident that all such dispositions must entirely depend on whether it is intended to await the enemy's attack, or attack first yourself, and in this latter case, upon the point of the enemy's line that it has been resolved to attack. On the ability with which this has been selected depends whether the results will be great or insignificant in the event of success.

When it has been decided to await the enemy's attack, it will remain to be considered whether it is better to reinforce the position taken up by the advanced guard with the main body, or to withdraw the former to a position taken up by the latter.

During every phase of an action, officers should do their utmost to collect the men of their companies, regts., brigades, &c. It is easy to lose sight of your men, and they scatter whilst fighting so very quickly if not closely looked after by their officers, that the more frequently and assiduously they are swept together as companies, &c., the more effective will be the force under the general's hand. Fresh troops are very much required at the end of an action to enable the success to be followed up. Without a keenly followed-up pursuit you may be successful, but you will never be victorious. Men who have been fighting for hours, and fighting very likely on badly filled stomachs, are too tired to pursue, and are very probably out of hand, from battalions being mixed one with another. However, if you have no fresh troops at hand you must pursue with those you have: don't spare your men at such a critical moment. Many a well-planned and successfully carried-out action has led to no result, because the G.O.C. thought his men too tired to pursue. One of a general's difficulties lies in deciding upon the number of men he will preserve intact during an action for pursuit when it is over: he may cripple himself so by doing this whilst the action is in progress that he may fail in taking the enemy's position, which, after all, is the primary object of all his movements.

The attack of villages included in an enemy's position.—Every effort should be made to turn the enemy out of such villages without having to make a direct attack upon them. A concentrated fire of very large batteries upon them whilst their flanks and rear are threatened by turning movements, may sometimes be effective, especially when the village is on the extreme flank of the enemy's position. Wide-turning movements, however, occupy a great length of time during an action, and it is very difficult to ensure the attack being made at the necessary moment, or to calculate with any certainty upon the exact time when it will be delivered. It will therefore be for the G. O. C. to decide between the chances and risks always inseparable

from such turning movements, and the very heavy losses which he knows he will have to encounter in a direct attack upon a large and well-defended village.

The first necessity for the success of such an attack is an overwhelming and a converging artillery fire, that will literally destroy the place, set it on fire and prevent any garrison remaining in it, and that will search out with its shells every corner in and around it where troops can find ordinary cover. The shelter trenches should be rained upon with shrapnel, and the enemy's batteries capable of affording it any assistance overpowered completely by the superiority of your fire. This means that you should be greatly superior in guns, and this I may say is, in these affairs, the first necessity of success. Unless you can secure this superiority, all other things being equal, it will be better to avoid attacking the village. If the ground lends itself to the possibility of employing a body of infantry to pour a long-range rifle-fire upon the village and its shelter trenches without interfering with the advance of your attacking infantry, this effective means of demoralising the defenders, of preventing their movements and of silencing their guns, should not be neglected. All cover between your batteries and the village should be occupied by your infantry as soon as possible, and a heavy fire kept up from it, whilst groups are pushed forward as near as possible to the enemy's shelter trenches or other defences, and as much as possible round their flanks with a view to enfilade them. It is advisable that these parties should have entrenching tools, so as to increase the cover they find, and to make it capable of holding larger numbers. Every arrangement must be made for an excessive expenditure of ammunition, the reserve of which must be pushed forward as much as can be done with safety, and every soldier before engaging in the fight should have 100 or, if possible, 150 rds. of ammunition on his person. The nearer your encircling line of skirmishers can be pushed forward, and the greater the cover they can obtain or construct, the easier will be your final assault: this should be made by fresh troops in attacking formation, pushed forward simultaneously and concentrically from all the neighbouring points of your own position as soon as the enemy's artillery fire is sufficiently silenced. The Germans divide the force assigned for the attack on a village into $\frac{1}{6}$th for the first stage, i.e. for the distant attack, $\frac{2}{6}$ths for the close attack, $\frac{3}{6}$ths for the final assault, and the remaining $\frac{1}{6}$th as a reserve. The reserve should join the troops forming the distant attack as soon as those allotted for the close attack have passed them, as it is very seldom that the nature of the ground will allow a musketry fire to be maintained over the heads of attacking troops.

When the final assault is made, the whole force engaged must push quickly on, all joining in the cheers of the assaulting troops. Every endeavour should be made under the influence and the excitement of this converging assault to drive the enemy completely from the village, the farthest side of

which, from which the enemy has retreated, being at once strongly occupied, and all cover on its flanks being at once taken possession of, from which the flanks of the enemy should be vigorously assailed in the event of his endeavouring to retake the place. It is of the utmost consequence that there be no hesitation on your part during the first moments of your success, lest the enemy should be allowed time to recover from the moral effect your charge has created: you must push him out of the village at once, if you can, for if he continues to occupy the internal defences he may have prepared, your further proceedings will be necessarily slow and costly in life. You can no longer make much use of your artillery; but if you have only succeeded in obtaining possession of part of the place, you should try to so post some batteries outside it as to crush those parts of the village in which he still holds out, and do your best to threaten his retreat by pushing infantry round one or both flanks, to occupy any cover there may be in the rear.

If you succeed in driving him from the village by your final charge upon it, any cavalry you may have at hand should then come into action upon the retreating enemy; then is the cavalry officer's opportunity, and a few squadrons under a dashing leader may spread such disorder amongst the retreating enemy as to remove all chance of a counter-attack upon the village.

Employment of Cavalry in Action.—As has been laid down in the Article on "POSITIONS," the first essential is, that cavalry should be placed on ground where it can act freely.

The trot is the true manœuvring pace for cavalry; if changes of position, and the advance preliminary to charging are made at the gallop, the horses are blown, before that moment, when brought into actual contact with the enemy, they should be able to exert their greatest speed.

The ground should be hard, level, and free from hedges, ditches, ravines, woods, or fences; nothing is more trying than vineyards, over which no cavalry can gallop. The debated questions of arming and equipping cavalry, and of its general organisation, are foreign to this subject. Whether our cavalry is to be changed into mounted rifles, or to remain as it is at present, assisted by special corps armed with long-ranged rifles trained to fight on foot, it will be, in the opinion of the writer, an unfortunate day for the English general who is called upon to fight an enemy who has a proportion of good cavalry, whilst he himself has none, being deprived of them in pursuance of some cleverly stated theory.

Without cavalry, it is really impossible to obtain information of the enemy's doings, or to keep up your communications efficiently. Cavalry can be, however, of but little use, unless the officers and N.-C.O's. are well educated in reconnaissance duty. I regret to say that ours is sadly deficient in this knowledge.

The cavalry arm should consist of young men ; an old man, as a rule, is out of place in its ranks, either as an officer or as a private. It wants the dash and fire of youth ; age brings caution, and with it, hesitation.

Time is the great element in all battles ; but, with cavalry, minutes are nearly as important as hours are to infantry.

The use of cavalry may be briefly stated as :—

1st. To charge upon first coming into the enemy's presence, for the purpose of gaining time, whilst the infantry deploy and a sufficient force is got into position to keep the enemy in check.

2nd. For charging cavalry or infantry, if possible in flank, that had been repulsed in their attack upon infantry, so as to complete their rout, and take prisoners.

3rd. To cover the retreat of infantry repulsed in its attack upon the enemy's position, and either by charging, or assuming a threatening aspect, to prevent it from being followed, as done by the Russian cavalry at the battle of Tchernaya, and by the Austrians after Sadowa.

4th. To check a serious attack from infantry upon the position, by forcing it to form square, either by charging, or by threatening to do so.

5th. Charging batteries that cannot otherwise be silenced. This should only be resorted to when they can be taken somewhat in flank, or when they are but weakly supported.

6th. Grand charges in force upon infantry. Unless the infantry has been well shaken by a heavy artillery fire, or is of an inferior quality, or is taken at a disadvantage, such as in the act of deploying, or some other manœuvre, these grand charges are but waste of men and horses, if made against infantry armed as at present. Circumstances may, however, render it necessary to make this sacrifice for the purpose of gaining time.

7th. To disperse and cut up lines of skirmishers that had ventured too far into open ground ; two or three squadrons are enough for this purpose.

8th. Supporting the flanks of columns pushed forward to attack, and so protecting them from charges of cavalry.

9th. Taking up the position vacated by such columns of attack, or filling any gaps that may occur in the line during an action, or at first whilst the troops are getting into position.

10th. Being victorious, to pursue an enemy *à outrance*, allowing him no time to rally, or even to breathe after his defeat. See Article on "PURSUITS."

The duties enumerated under these ten heads comprise what may be termed the fighting uses of cavalry ; and although very recent examples of each can be cited, may serve more as warnings of what to avoid than as models to be copied. The days are past when battles were to be won by charges of imposing masses of horsemen, but the necessity for having with every army a large mounted force is as great now as formerly. The front of

a manœuvring army should be covered by a screen of cavalry detachments, from which patrols and scouting parties should spread out like a fan. See Article on "SCOUTING," page 299.

11th. Furnishing detachments, patrols, and scouting parties to the flanks, front and rear, to guard against surprise, to obtain information of the enemy's doings, and to screen your own from his observation.

During engagements cavalry should be withdrawn from view and fire as much as possible. Infantry can always find more or less shelter from fire by lying down, and the smallest slope in its favour screens it; but with cavalry it is otherwise. It should be in rear of the infantry, and as little exposed as possible. Its speed enables it to be so placed, and yet be always available, for it can reach the front line before an enemy marching from his position to attack it can do so.

All reasoning soldiers know that a single man on foot is better than a single mounted man, both being armed alike; indeed, it is rather a matter of doubt in the writer's mind if a man on foot with a long stout stick could not baffle the best of dragoons on horseback, armed only with a sword. But there is always an "if" in such questions; a large proportion of men on foot get flurried when they see a man on horseback charging down upon them with a bright sabre flashing in the sun, and the moral effect of a large number of such men charging in a formed body is much greater in proportion; the very noise of the horses galloping has a terrifying effect that frequently goes home to the heart of infantry, particularly if it has been at all shaken previously by artillery fire. The writer has witnessed more than once the dread entertained by good infantry for cavalry when in action. This must be familiar to all officers who have commanded skirmishers, or their supports when advancing under fire. Let there be the slightest suspicion of cavalry charging, let but a few horsemen show themselves in the vicinity, and I have always found it have a most unsteadying effect upon the men.

Doubtless a good deal of this arises from our system of drill, by which our men are constantly practised in forming square to resist cavalry. The writer saw three battalions armed with rifles form square, by order of their brigadier, to resist a horde of Tartar horsemen, who were cantering up towards them, although it was known that their principal weapons were bows and arrows. It is a favourite argument with those who, basing their opinion on theoretical notions, think that cavalry is a species of anachronism, to point to the smallness of the numbers actually killed by that arm in action. If the same calculation were made regarding artillery, it would be found that the actual loss it inflicts upon the enemy is in no proportion to the high value put upon it. Its moral effect is powerful; it frightens far more than it kills. Infantry when repulsed must ever be more or less susceptible to the influence of a well-timed charge of cavalry upon its flanks or rear.

In all cavalry encounters with cavalry, the side that is able to bring up a fresh reserve when his opponent has exhausted all his, will, as a rule, win the day. No body of cavalry, small or great, should ever charge without a reserve ; even in the event of a single squadron having to charge, half a troop kept in reserve, to charge when the confusion, which is inseparable from all charges, was at its height, will turn the scale in your favour if the enemy has neglected to take a similar precaution.

It has also become an axiom that the same squadrons can seldom be got together for more than one grand charge in a day ; theoretically this sounds strange, but experience has proved its truth.

For this reason a large proportion of the cavalry should be held in reserve up to the last possible moment ; and, if practicable, kept fresh for the pursuit, to follow up the broken enemy, or else for the final *coup de grâce*, when it is desired to overwhelm the enemy, who is already supposed to be somewhat unsteady.

The moral effect of cavalry increases in geometrical ratio to its numbers. It should never be frittered away during an action to fulfil objects that could have been attained equally well by the employment of infantry.

The collection of great numbers of cavalry into masses, after the fashion of Napoleon, is not now recommended. In the newly-approved organisation for our army, the cavalry is divided amongst the divisions and army corps ; a regiment to each of the former, and a brigade to each of the latter. The G.Os.C. divisions and army corps will therefore always have at their disposal enough cavalry to let slip upon an enemy becoming disagreeably adventurous, or whose tactical errors had rendered him open to attack. The opportunities for the employment of cavalry in small bodies are frequent in even the best regulated battles, but they are very fleeting : it is therefore essential that the O.C. the cavalry of divisions, &c., should always accompany the G.Os.C. them, so that when an opening for the advantageous use of his arm occurs, he may receive his orders at once, and by galloping back, or sending an orderly officer back at that pace, bring up his men in the nick of time, and catch the enemy *in flagrante delicto*, before he has time to rectify his mistake. The superior speed of cavalry enables a general to cull in this manner fruits from an action which would be beyond his reach if he had but infantry only under his command.

The O.C. the cavalry ought to be of a quick, zealous temperament, always eager for a chance to employ the arm under his orders : he ought to be the Prince Rupert of the army ; he should be young, active, a daring rider himself, and always foremost in a charge ; he should pride himself upon his position, and try to make the humblest trooper feel likewise ; he should, above all officers in command, 'covet honour' like a true sinner ; he should be a man prompt of decision, and prepared at all times to act upon his own responsibility.

Cavalry should be distributed on the flanks, or at parts of the line where it can act rapidly. The cavalry in reserve to be in rear or at places where it could be most efficaciously used, remembering that it takes from three to four hundred yards from its starting-point to that of collision to require the swing required for a telling charge.

Cavalry can only fight in line; to charge in column is to expose a deep formation to fire, whilst its value is only in proportion to its actual front. The sooner we arrive at the formation of rank entire the better.

In charging infantry, the distance between the first and 2nd lines should be about 200 yds., and the same between the 2nd and 3rd. In charging cavalry, these distances should be about 450 yds.

The preliminary movements of all arms, before the actual collision with an enemy, should be made well out of fire; this applies more forcibly to cavalry than to the other arms, for having no fire, and its only action being the charge, if charged whilst performing any change of formation, it will certainly be dispersed. A daring leader will under such circumstances charge at the head of any body that may be at hand, no matter how small, and by so doing, help and give time to the main body to form and charge also.

Like infantry, the weak part of cavalry is the flank.

For the employment of cavalry after an action, see Article on "PURSUITS."

The employment of cavalry to obtain information, to guard the flanks and rear from surprise during an action, to make raids upon railways, &c., is treated of in the Articles on Scouting, Outposts, Patrols, Advanced Guards, &c.

In conclusion, it should be instilled into the mind of every cavalry soldier that his arm of the service is invincible, and more than a match under all circumstances for infantry or artillery, either singly or in masses. If he thinks otherwise, the sooner he exchanges into the infantry the better. Every cavalry officer should be a fanatic upon this subject. All should remember the old cavalry proverb, "Commend your soul to God, and charge home."

There is no excuse for cavalry soldiers being made prisoners as long as their horses can gallop.

The first and most important duty of a cavalry soldier is to take good care of his horse at all times.

Mounted Infantry.—The Dragoon of 150 years ago has now no representative in our army: he was a foot-soldier on horseback; he had the fighting, training, and arms of a light infantry soldier, and the rapidity of locomotion belonging to the hussar. Such is the man for outpost, advanced and rear guard duties, and, in conjunction with really good cavalry, for patrol and reconnaissance work. Galloways, or even mules, if horses are not to be had, will do for mounted infantry, so the creation of this force

cannot interfere with the supply of horses for the cavalry and artillery. In level countries, a small proportion might be carried on light carts. This force could be raised at any moment by calling for volunteers from the infantry. The proportion between mounted infantry and cavalry might be, I think, three or even four to one, for all duties except those enumerated under the first seven of the ten heads that in the preceding article I have divided the purely fighting uses of cavalry into. When we have again to take the field, it is to be hoped that our cavalry, the finest in the world, may be supplemented largely by mounted infantry.

Employment of Infantry in Action.—Infantry is the backbone of an army. Campaigns can be carried on without cavalry or artillery, but nothing serious can be effected without the aid of men fighting on foot. At the end of a war it will be found that, putting sieges out of the question, the actual damage done has been by infantry. It is its fire that kills and wounds, and its charges that win and defend positions.

If it is very good, it can compensate for inferiority in the quality and numbers of the cavalry and artillery. If bad, and you are opposed to a good steady infantry, make it a war of marches and manœuvres, engaging in daily little affairs until you have brought your infantry up to a fair standard of excellence.

Infantry should, when stationary, always lie down, both for the purpose of concealment and of shelter from fire.

The four ways in which British infantry have been hitherto accustomed to fight are :—

1st. As skirmishers, both in attack and defence.

2nd. In position in line, with their fire, for defensive purposes.

3rd. An advance in line to attack an enemy, such attack ending by a bayonet charge.

4th. In square to receive cavalry.

Skirmishing.—Formerly specially instructed men were required for this work, but now no infantry is of any value in the field unless it can skirmish well. It was a noble trade that of the light infantry soldier, and an army that had really good light troops was indeed happy : it could sleep at night in security, and could march at its ease, safe from surprise at all times. In action, the enemy's sharpshooters were kept by it at a respectful distance, whilst his gunners were harassed at their guns, their horses shot, every joint of his armour tried, and the weak places thoroughly probed by a searching fire ; his plans discovered, the position of his reserves made known, and all his columns approaching to attack riddled with bullets.

Formerly a line of skirmishers was used in action to clear the way for the attacking lines or columns in its rear, but henceforth it must be itself the most important part of the attacking line, and upon it will fall the brunt of

every battle. Skirmishers must learn to forget the old lessons they were taught as to their special functions in action ; they must rely to a very great extent upon themselves to capture positions, and not look entirely to a formed line in their rear to do so. The days when a stiff deployed line of men, shoulder to shoulder, could advance under fire, full as they are of glorious memories for our army, can never come again, and the officer who would now dare to attempt such an operation under the fire of breach-loading rifles should either be tried for murder or lodged for life in a lunatic asylum ; it behoves us, therefore, not only as an army but as a nation to lay down new rules for the guidance of our infantry in action, and to alter our drill so that it may be strictly in consonance with them. The normal formation of infantry for battle used to be in three lines, 1st line, 2nd line, and reserves, the front being covered by a line of skirmishers, with their attendant supports and reserves, the 1st line and the 2nd being of equal strength. Henceforth the 1st line, of the same relative strength, will be divided at the beginning of an action into at least three formations, the front one being skirmishers, that behind it being supports to be sent forward to reinforce the skirmishers from time to time as required, and the third being the main body of the 1st line. In order to prevent confusion as far as possible, it is most desirable that, when the supports have been blended into the skirmishing line, battalions, and even companies, should be as little mixed up as possible. This is a tactical problem to be worked out by those skilled in drill. A certain amount of confusion must ever be attendant upon an operation of this nature. In reading of the advance in line of English infantry during our most celebrated battles, we hear much of its steadiness, and but little or nothing of the great disorder that accompanied it ; but all soldiers who have taken part in such an operation know well that disorder is inseparable from it when attempted under fire. In confessing that we shall have to grapple with disorder in the manœuvre by which alone it is contended we can in future successfully assail an enemy's position, we do not therefore admit any new element in the operation, although we may have to deal with it under somewhat less advantageous circumstances than formerly. In an army, the less there is of harmony existing between its regulation tactics and the tactical requirements of the age, the greater will ever be the confusion attending its infantry attacks. Having recognised that disorder will be the never-failing attendant upon an attack made by skirmishers, let us set to work to practise our men in the operation until we have reduced that disorder to a well-understood system, until order is evolved from it. To practise men in nothing but 'steady drill,' where noise and confusion is impossible, is not the best way to prepare them for the disorder in which they will most certainly find themselves, even after the most successful charge that is made under fire. Men who have been drilled only in charges made with mathematical precision and death-like silence are

prone to be appalled by the din, uproar, and confusion of a real onslaught. Never having been taught to contend against it, or even to realise it, they are dismayed by its unexpected presence. A ringing cheer is inseparable from charging—I do not believe it possible to get a line in action to charge in silence—and, were it possible, the general who would deprive himself of the moral assistance it gives the assailants must be ignorant of human nature. It encourages, lends nerve and confidence to an assailant: its very clamour makes men feel their strength as they realise the numbers that are charging with them. Nothing serves more to strike terror into a force that is charged than a loud ringing cheer, bespeaking confidence. As it is impossible to charge in action without noise, our mimic charges at Aldershot cannot have too noisy an accompaniment, for they would then be all the better practice for officers and men to reform in good order amidst great confusion.

The introduction of breech-loading rifled small-arms, and of rifled artillery firing shrapnel at great ranges, have altered the tactical formations of infantry, especially for offensive operations; so much so, that for an army to attempt what we did so lately even as at the Alma, would be to insure its annihilation. No final instructions for the guidance of our infantry in action having yet been issued, I shall dot down here a few general ideas on the subject, assuming that every one now considers as obsolete the fighting tactics of Frederick the Great, which, improved by the Duke of Wellington to suit the arms of his day, are still alone to be found in our Field Exercise Book. In those days the fire of the individual soldier was not a factor of importance in the problem to be worked out; the effect of men fighting in a formed body, shoulder to shoulder, was alone considered of value; and the tendency of all drill and tactical instruction was to make men rely upon their united strength as a highly disciplined body. Now, the great object of all military teaching is to develop the power of each breech-loading rifle, and the independent action of the soldier who carries it, to the fullest possible extent.

In defensive operations the influence of the new arms is not felt very much beyond the fact that 100 men holding 100 yds. of front in any position now, make it far stronger and more difficult of approach for an enemy than if it were occupied by 342 men armed with the old musket, in two ranks, each file covering 21 in. of frontage. The effect of our infantry fire at present is so great, that it has reversed the relative defensive value of ground; for whereas formerly, the close ground that most abounded in cover was generally regarded as very strong, whilst the open portions of a position that were easy of access were looked upon as weak, the very reverse is now the rule. Large open down-like spaces free from woods and hedges, that can be swept from both flanks by a heavy musketry and shell fire, require but few men to occupy them, as no troops could live to cross

them ; on the other hand, the close country abounding in copses, banks, and covers of all sorts, that was formerly considered so strong that it required but few defenders, is now the locality where an attack is most likely to succeed. It is not that it has lost one whit of its actual strength by the new order of things, but open ground being now almost tabooed to the assailant, he is forced to attack those points where alone his troops in skirmishing order can hope to approach their enemy without being mowed down by a fire delivered from troops sheltered from injury either naturally or by means of rifle trenches. The use of a strong force of skirmishers in front of the actual line selected for defence is not now required, and might only lead to the loss of the men so employed. A small number of the very best shots should alone be employed in advance of the actual position, and unless under some very peculiar formation of ground, even these few men should rejoin the main line, when the enemy had reached within 500 or 600 yds. of it, lest they should hamper its fire. It must never for a moment be forgotten, that a passive resistance can lead to no conclusive or even telling results : the officer commanding a position to be defended, who does not largely provide for assuming the offensive at many places, and during many phases of the action, is ignorant of war.

The normal formation for troops occupying that portion of a defensive position from which it was intended to assume the offensive as soon as the attacking troops had reached from within about 50 to 100 yds. of it, should be, I think, a first line consisting of one man to every yd., each company deployed for this purpose keeping a section about 20 yds. in rear, or as near the first line as cover could be procured or provided for it. These supporting sections are merely for the purpose of supplying men to fill up gaps in the first line caused by casualties. Behind this again, if possible not more than 50 yds. from the first line, but well covered from fire, should be a line two deep, with bayonets fixed, and ready at any moment to jump up, and running over the first line to charge the attacking enemy. I know that it is the opinion of the best German authors at present, that the side acting on the offensive has the best of it, but I humbly submit, that with a British battalion distributed as described above, four companies having three sections each in the front line under cover (occupying a frontage of 300 yards), and with four companies behind them again, ready to charge as soon as the enemy reached within charging distance, that twice, nay thrice its number of the very best troops in the world would be easily destroyed by it. Picture to yourself the shattered condition in which two, or even three battalions advancing to the attack would reach within charging distance of the first line that from behind good cover had been firing on them at ranges that had been previously measured and marked on the ground. Of course, this manœuvre is easier to describe than to carry out satisfactorily in an action, but the same is the case to

my mind ten times over as regards the operation of carrying a line of skirmishers over open ground by successive rushes to within charging distance of the enemy's position. I do not believe it possible for a man who has never himself led skirmishers in action to dogmatise upon what they are capable of doing, or to lay down rules for manœuvring them under fire as if they were so many pawns on a chessboard. It is not enough for a man, say as a S.O., to have seen the operation, he must himself have led men up 'the deadly breach' to enable him to realise what men will and what men will not do, or even attempt. It is not intended to assert that such an offensive movement is impossible, especially if the space to be traversed affords plenty of cover, but all who have led men in a charge when exposed to heavy fire, will I think agree with me in saying, that the operation can never be successfully carried out, unless the defenders have been demoralised and beaten into that most unhappy state of stomach that invariably precedes a general stampede.

In the distribution above given, the troops in the first and second lines should be under the same C.Os. ; the reserves, to be detailed either by divisions or army corps (according to circumstances), should be about 600 or 800 yds. in rear of first line, and posted so as to be as much as possible under cover and out of sight.

The one great difficulty in carrying out these defensive tactics is for the general to choose the right moment for charging, as the success of the operation depends greatly upon the offensive being assumed exactly at the right time.

To await in the open an advancing enemy, and depend upon driving him back by your fire, is to court danger. The writer is aware of the Hythe theories, that go to prove how an advancing line would be annihilated ; but firing at a target is a very different affair from firing at a thick line of skirmishers advancing steadily towards you, who keep up a heavy fire all the time. In all such attacks there is a moment when the defendant must charge, or be defeated.

Experience in war teaches the general to feel, as it were, from the pulse of his men when that moment has arrived. Happy is the man who knows when to say, 'Up, Guards, and at them!' There is no salvation for him who cannot do so. The opportunity passes in the twinkling of an eye, and if not seized on at the right moment cannot be expected to return.

In the foregoing argument it is assumed that the artillery fire is equal on both sides ; for although the assailant may have most guns, still they will have to come into action under a heavy fire from those of the defensive side, they will be firing at unknown ranges and without cover, all of which circumstances will be reserved in favour of the artillery of the defence.

For offensive operations, the great problem to be solved is, how can

you get within infantry charging distance of your enemy without being destroyed, or so reduced by losses that any any attempt to charge home would be folly. Upon this problem all the great military minds of Europe are now intent. In general features, it may be safely said that the system that all will adopt will be similar, although of course the peculiarities of race and of military traditions will naturally impart a national individuality to each.

It is unnecessary to give figures illustrating the destructiveness of breech-loading fire delivered from behind cover to prove that it would be impossible for infantry in line, two deep, each file occupying 24 inches of front, to march up to any position, no matter how brave that infantry might be; the proposition is self-evident to all who will give the subject a moment's thought. The result of the Prussian attack upon St. Privat, and of other similar operations at the beginning of the 1870 war, proved that an infantry attack over open ground is a useless waste of life, until the defenders have had their courage crushed out of them by an overwhelming fire of artillery and musketry. To attempt such an operation nowadays in line or in columns would be madness: the only other formation is in skirmishing order. Much nonsense has been written in endeavouring to throw odium upon this formation, because it is described as 'loose.' A man who knows what skirmishing is, and who has himself taken part in it under fire, is well aware that all skirmishing must be loose, but to be well done it requires the best-drilled soldiers. To teach a man to march past as if he were part of a wall is comparatively easy when compared with teaching one to be a really good skirmisher. Most men will admit that henceforward our manœuvres under fire must be made in open, or in other words, in skirmishing order. Does it not therefore behove us officers of all ranks to work hard until our men are really the best skirmishers in the world? Are we doing so? If not, are we not preparing for ourselves and for the nation a great disaster when next we have to meet a European enemy in the field?

I shall not attempt here to go into the vexed question of the manner in which our skirmishing order of battle is to be formed; we must await the issue of official orders upon the subject: but in the mean time my advice is, let all C.O.'s spare no time or trouble in making good skirmishers of their men, in teaching them the art of cover, in impressing upon them their real strength, and how little even the smallest knot of men or the thinnest skirmishing line has now to fear from cavalry.

They should be taught by their captains the art of advancing by rushes at full running speed for about 50 yards at a time, these advances to be made by echelon of subdivisions.

The men should be practised by battalions in charging when in a skirmishing, and therefore a loose line that had been successively reinforced,

until there was about a man (not a file) per yd.: these charges to be practised over the roughest ground, and through woods when possible, being invariably accompanied by a ringing cheer. The men should have their arms at the trail, for of all the devices to prevent men from charging well and with enthusiasm, that of making a man bring his left hand across his stomach to help the right, in clutching the rifle, is most ridiculous.

My own belief is that the time has arrived when infantry should work in single rank, and that each man should have at least 30 in. of frontage allotted to him at all times in line. It would teach our men self-confidence, and wean each from that system of always leaning for support upon a man behind him: it would also allow of all our manœuvres and drill formations being performed with much greater ease to the individual soldier. Drill is now more essential than ever in the formation of an army; but instead of teaching a man complicated evolutions that may have a fine theatrical effect in Hyde Park, but which are about as useful to a soldier in action as a knowledge of the hornpipe would be, let us drill him day after day, and if necessary all day, in the manœuvres of battle, until he is proficient in them.

The disorder that resulted upon infantry attacks during the wars of 1866 and 1870 arose mainly from a want of harmony between the "Regulation" tactics of the armies concerned and the tactical requirements of this age of breech-loading rifles.

In the distribution into lines of an infantry force, whether a brigade, division, or army corps, for an attack upon an enemy in position, I would recommend the proportions to be about one-half for 1st line, one-third for 2nd line, and one-sixth for a reserve, i.e. in the respective proportion of 3, 2, and 1. The first line at the opening of an action should be again re-divided into three lines, as is the rule at present for battalions employed as skirmishers, one-fourth of it being thrown forward as skirmishers to cover a space about as wide in yards as half the total number of men in the 1st line: thus a battalion of 1000 rank and file acting in the first line would cover a front of about 450 yds., 250 men being thrown forward as skirmishers, 250 kept as supports in small columns, or at places in fours, or in line according to the nature of the ground, and 500 held in similar formations in reserve. The deployment of infantry from column of route into attacking order should be carried out before it can be injured by the enemy's artillery fire: the distance therefore depends greatly upon the nature of the country, for if quite open, the deployment ought to be effected at about 2500 yds. from the enemy's position. The supports should be about 300 yds. in rear of the skirmishers, as artillery fire aimed at the skirmishers is not likely to hurt the supports at that distance in rear of them; the nearer they can be kept to them, however, as long as there is good cover, the better: the main

body of the first line to be about 500 or 600 yds. in rear of the skirmishers. The officers commanding companies in all these three lines must lead their men in the formation best suited to obtain from the ground the utmost amount of protection from fire that it is capable of affording, the field officer seeing that a general alignment is roughly kept by all. This system of forming the companies according to the ground they are moving over is a necessity, especially from the moment that each successive line reaches the supposed limit of what is now commonly known as "the zone of unaimed musketry fire," namely, at about 1000 or 1200 yds. from the enemy's position. At this distance it will be necessary for all officers on horseback to dismount and leave their horses behind.

It is a moot question whether the supports should be composed of a portion of the companies in their front, or be whole companies; the writer is in favour of the former system, as it will to a great extent help to keep companies from intermixing.

The infantry fire of the defensive side begins to tell most seriously when the skirmishers reach within about 600 or 700 yds. of the enemy's position (the extreme limit of what is commonly known as "the zone of aimed musketry fire"). Thenceforward the advance must be made by rushes of about 50 or 60 yds. at a time from one cover to another, or if the ground is devoid of cover, the men must throw themselves on their faces at the end of the rush; this should be done by alternate companies. At this phase of the action the serious losses begin, and the officers commanding the supports must use their own discretion in supplying the places of those knocked over in the skirmishing line.

The skirmishers should continue to advance quietly, those who are lying down firing as quickly as possible whilst the others are making their rush forwards, and this must be continued until they reach from about 60 to 200 or even 300 yds. of the enemy, that distance depending very much upon the amount of cover to be obtained. Whilst the skirmishers are thus advancing, the main body or reserve of the 1st line keeps steadily pushing on, as best as it can, in line when such is possible, or by independent companies in whatever formation their captains may consider best, when the fire is too heavy for a line. By the time that the skirmishing line has reached the required distance from the enemy, all the supports will have been merged into it, and the main body of the 1st line ought to be within about 100 yds. of the skirmishers: it will then be for the O.C. to decide whether he will at once make his charge there and then, or wait until he has succeeded in bringing up the main body within a few yards of the skirmishers, taking care not to allow the main body to mingle with them, as it is essential to keep the main line from firing. It is to be hoped that when this phase of the action has been reached, the heavy fire of the skirmishing line may have made an impression on the enemy, and as soon as this impression has been

effected, every bugle should sound the advance and double,* and the officers, rushing to the front, should carry on with them the main line, the skirmishers joining with it in the charge. When a line lying down or under cover is engaged in independent firing, it is most difficult to stop the firing, and get the men to charge unanimously, it is therefore essential that the main body of the 1st line should not be allowed to fire previous to the charge. In many cases it may not be perhaps necessary to use this main body, as the skirmishing line, upon being reinforced by the supports, may be impelled forward by its own weight, especially as it is always possible in a long line of attack that the skirmishers may find some chink in the enemy's armour, some weak point from which he has a tendency to recede, and taking advantage thereof, may carry it with a rush. The combined action of the three arms in such an operation has been sketched out in the Article on "DISPOSITIONS FOR THE ATTACK OF POSITIONS," the foregoing being but a general rough outline of what is now almost universally accepted as the proper formation of infantry detailed for an offensive movement.

The formation of Battalion Squares to resist cavalry may be almost regarded as a thing of the past, for with the long-ranging arms of the day, to put your battalion into such a formation would be to give it over to destruction: small company squares, or groups of men standing shoulder to shoulder, and availing themselves of any hedges, trees, or any other obstacle there may be at hand, can now hold their own well against any number of cavalry.

General Remarks regarding Infantry in Action.—Above all things, never allow your men to fall out to pick up wounded men: that duty must be performed by the ambulance corps, aided by the bandsmen of regiments, who for this purpose should follow close in the track of the attacking lines. At any rate, the wounded must take their chance till the operation is finished; they should remember that the wounded of those who win are generally well looked after, whereas those of the vanquished side generally fare badly. As every man who falls out to look after the wounded reduces the chances of success, it is especially their interest to prevent men from doing so.

The issue of every fight depends upon the behaviour of the infantry, and their conduct depends upon the company's officers, who are of all others the most important body of men in an army.

In that final moment of actual conflict, the result is in their hands. Drawn from the gentry of England, their courage has never been impugned, not even by the most radical of newspapers. Hence, in a great measure, our unvarying success in infantry and cavalry charges. It is at such times that a man's mettle is shown. The company officers have a

* *We are sadly in want of a bugle sound for the 'charge.'*

busy time of it in action. They must be careful that their men do not waste their ammunition. This is now all the more necessary, from being armed with breech-loaders.

Immediately after charges it is most essential that they should re-form their men at once, and not permit them to go beyond the further limit of the wood, village, &c. &c., that formed the objective of their attack.

Our battalions on war strength are henceforward to be over 1000 bayonets: our existing system of drill is not applicable to those of more than 500, or at most, 600 men, as it is based upon the idea that the C.O.'s voice can be heard by every man in the battalion when deployed: apart from the fact that it is physically impossible for one man's voice to command 1000 men in the bustle of action, the rigidity and consequent slowness of all movements effected by our system of drill when applied to battalions of such strength renders it inapplicable to warfare under its newly assumed phase. The one great idea of C.O.'s has been, hitherto, "*to keep their men well in hand*," and that all companies should move off at the same moment by word of command from the colonel.

Our cavalry drill has always been in advance of that laid down for our infantry in this respect, inasmuch as it was left to the captains commanding troops and squadrons to place their men in the new position of formation they had been ordered to take up. Our rigidity of movement looks very pretty in Hyde Park, but is unsuited for war: it was copied from the Prussians, who used it, as we did also, to excellent purpose where the effective and destructive range of musketry did not extend beyond what a soldier could run over in charging, and when not more than one, or at most two rounds, could be delivered by the defenders during the time occupied by such a charge. I think we shall again have to follow that nation in their system of tactics, adapting them to the peculiarities of our soldiery, but letting our men "*go*," instead of always endeavouring to keep them "*in hand*."

It used to be said of us that we were the only nation that could fight in a two-deep line. In such a formation we charged and overthrew Napoleon's finest troops. We have now to go a step farther, and to teach our men to charge with the bayonet in skirmishing order, trusting that the same pluck which enabled us during many consecutive years to annihilate by our line charges the best European troops, may enable us henceforth to do the same by means of our superior skill as marksmen, and by the irresistible dash of our skirmishers.

EMPLOYMENT OF ARTILLERY IN ACTION.—The introduction of rifled guns into the service has increased the range of artillery; but as the limit of vision still remains unchanged, this alteration has not increased the distance at which artillery can be used effectively to the extent that is sup-

posed by many. To open fire beyond the limit at which the effect of your fire can be ascertained by good sight, aided by telescopes, is merely to waste valuable ammunition ; that limit is about 3000 yds. as an effective maximum, although, of course, will range up to 5000 yds. The maximum of effective range in yards for the undermentioned guns is as follows :—

	At Columns.		At a Line.
40-pr. B.L. guns (Armstrong's)	2800	..	2500
9-pr. M.L. ,, ...	2500	..	2000
12-pr. B.L. ,, ...	2500	..	2000
9-pr. B.L. ,, ...	2000	..	1500

From the experience of recent wars we learn that fire cannot be maintained from a battery exposed to infantry fire, so guns, unless screened from view by either parapets or the natural configuration of the ground, should not be placed within 900 yds. of the enemy's infantry ; if during the course of an action the enemy's infantry succeeds in reaching to within that distance of a battery, the gunners of which are not screened from view, it should retire beyond that range. The duties of artillery in action are, to begin the fight ; to maintain a heavy fire upon the enemy's troops whilst yours are taking up the positions assigned to them ; to overwhelm with its fire the portion of the enemy's position that has been selected as the point of attack, so as to shake the courage of its defenders, and facilitate the advance of your infantry ; to extricate any portions of your force that may have become temporarily compromised ; to co-operate in pursuit, and to protect the retreat of beaten troops. Formerly when guns were taken up to within a few hundred yards of the enemy's position, it was easy to lay them with precision for short distances ; but to do so at long ranges is a different matter, requiring time and very great nicety, as the exact distance has to be ascertained. The fewer the movements executed by a battery the longer it will be in a position to inflict damage upon the enemy, for it is a recognised axiom, that guns are useless when limbered up. It is therefore of great consequence that good positions should be found for the artillery before the action begins, and that when posted there, it should not be moved unless the enemy succeeds in bringing a musketry fire to bear upon it, or that in being driven back, he retreats beyond its range. A few hundred yards either backwards or forwards makes but little difference in the effectiveness of fire from rifled guns. In selecting these positions for your artillery, it is desirable that the ground in its immediate front should be as unfavourable as possible to the enemy's artillery fire ; for this reason soft cultivated land, marshes, precipices, or any steep escarpment, such as the banks of a canal or the side of a railway cutting immediately in front of the guns, is a great protection to them. Although it is a mistake

to place the guns on such a high position that their shot strikes the ground below at so great an angle as to lodge there, instead of ricocheting, yet it is essential that they should have sufficient command over the space by which an enemy can approach to see clearly all his movements, whilst they from being on high ground present only their muzzles to his view, their waggons and horses being entirely screened from his observation. It is absolutely necessary that every portion of the ground in front of your position should be raked by batteries to the right and left, as well as swept by a direct fire. The effect of artillery fire is more moral than actual: it kills but very few, but its appalling noise, the way it tears down trees, knocks houses into small pieces, and mutilates the human frame when it does hit, strikes terror into all but the stoutest hearts. Artillery should be used either in very large batteries, or the fire of many batteries placed at intervals should be brought to bear upon one point at a time; previous to attack, a concentrated fire from all the available guns should be brought to bear upon the spot selected as the objective point. At the battle of Gravelotte, where the Prussians were the assailants, over 90 per cent. of their killed and wounded had been hit by the chassepot bullet, whilst only 6 per cent. were hit by artillery fire. This should be constantly impressed upon the minds of your infantry soldiers.

In defensive operations it is desirable to place batteries in those parts of your position that may happen to be naturally strong, the flanks of which particularly are secured by existing obstacles from cavalry attacks.

If the fire of infantry and artillery is to be effective at one and the same moment, commanding positions must be selected for the latter, from whence its rifled guns can play with accuracy and safety over the heads of the infantry moving below them.

Except from the attack of infantry skirmishers, the front of artillery may be considered secured by its own fire, but its flanks are especially weak.

When it is necessary to have an escort with a battery, it should take up its position on the most exposed flank, keeping well to the rear under cover; when the battery moves, its escort moves with it. If there is, near a battery, any cover in which the enemy's skirmishers could lodge themselves, it should be occupied by the escort. When obliged to change position, batteries should move as rapidly as possible. Field Batteries now carry five men on the gun and limber, and have one mounted N.-C.O. with each gun. They can therefore, on an emergency, take at a gallop sufficient men into action to commence the service of their guns. It is hoped that the off horses of every gun team may carry a gunner, as was always the practice in the Bengal H.A. If this were done, Fd. Batteries might change positions in action at as fast a pace as the ground would permit, and have their full complement of men available. The quicker such changes are executed, the shorter is the time that the guns are useless. For this reason, when H.A.

are retreating with cavalry before an enemy, the changes of position to the rear should be executed by the guns at the fastest possible pace, the cavalry retiring, as laid down in Regulations, at a walk, but never faster than a trot. The same rule should be followed in cavalry advances; the H.A. should gallop forward and unlimber within easy range of the enemy, the cavalry not moving until the guns had opened fire, or unless it was found that they were getting nearer the enemy than they were to their own cavalry. In order to reap the greatest possible benefit from the H.A., the cavalry should keep as far to the rear of the guns as possible with due regard to their safety, until their fire having told upon the enemy, it should charge to take advantage of the disorder and confusion they have occasioned. The artillery fire should be kept up as long as it is possible to do so without danger to the advancing cavalry, and when obliged to stop, the guns should remain unlimbered, ready to re-open should our charge be repulsed; if it has been successful, they should limber up and gallop forward to seek for some fresh position from whence to pound the retreating enemy.

It is laid down by the best modern writers upon Artillery, that at every phase of an engagement the action of one particular arm of the service is most important. At one moment it may be the enemy's cavalry, at another his artillery, and so on; but whichever it may be that you have to dread most at the time, upon it your artillery fire should be concentrated. Before infantry were armed as at present, artillery in action was chiefly used by both sides in counter-battering, as it was supposed that if the enemy's artillery fire could be reduced and kept under, your infantry might advance in comparative safety to try its strength against that opposed to it. It is the infantry fire which is now to be dreaded most; so, as a general rule, it is upon it that artillery fire should be brought to bear most. This rule applies with greater strictness to offensive than defensive operations: in the former, the one great object is to annihilate and strike terror into the infantry defending a position by the loss inflicted upon it by your guns; in the latter, as the infantry may be safely left to take care of itself, and may be relied upon to drive back from its front all assailants, the bulk of your guns may be most profitably employed in pounding the enemy's artillery, so as to distract its fire from your infantry. Of course, if it is found that the enemy's columns are pressing on, and that he is massing troops for an advance, his attacking forces assuming then the most prominent importance, should receive most attention from your artillery, as already laid down.

It is sometimes necessary to commence an action by opening fire from all the guns available at the moment, in order to keep the enemy at a distance whilst the lines are being deployed, and the troops are getting into their positions. It is sometimes used also in changes of front or position during an action to cover the movement.

If by any unfortunate circumstance a gap occurs in the line, and the enemy seems intent upon taking advantage of it, a large number of guns deployed to fill it up may save the army from disaster. To cover the retreat of lines or columns that have attacked and been repulsed, the fire from a large number of concentrated guns is the best protection.

Artillery in action should always have the greatest possible front.

When guns are charged by cavalry, the gunners should stand to their guns to the last moment. When the cavalry are close, they must, according to circumstances, take refuge, lying down close outside any infantry squares that may be formed near them, or under their guns. It is a pity that all men of gun detachments have not revolvers ; with them they might easily hold their own against cavalry from under their guns, the limbers having retreated for protection to the nearest infantry. Swords are a useless encumbrance to artillerymen.

In offensive operations, the ground in the vicinity of the point to be attacked must be swept by a heavy cannonade from a mass of batteries, previous to the attacking force being launched forward on its mission. The heaviest possible fire should be maintained up to the last moment possible, and when at last the attacking forces have advanced into such a position as to impede the fire, the batteries should, if possible, be advanced into such other positions that they can reopen. It is at such moments that the devoted gallantry of artillery is truly tried, for in some instances it is necessary to sacrifice a battery to insure success. Surely there never has been a more noble feat of arms than that performed by a troop of French horse artillery on the 8th of September, 1855, when at a gallop it took up a position on what might be termed the glacis between the Malakoff and Little Redan, from whence it maintained a heavy fire upon the Russian columns endeavouring to retake the Malakoff, until the troop was actually annihilated.

In fine, the efficient employment of artillery in action depends upon that employment being *apropos*. Six H.A. guns opening a fire at exactly the proper moment will be of greater use, and have a greater effect upon the final result, than twice that number merely pounding away, without any special object.

Gassendi says, in writing on Artillery in action, " Les derniers coups sont les plus décisifs, ils feront votre salut peut-être, mais votre gloire surement."

Passage of Rivers.—To cross a wide and unfordable river with a large army, even when unopposed, is a tedious operation, requiring nicety of detail. It is almost needless to say that every exertion should be made to have as many bridges as possible. In drawing up the memorandum for general orders, the C. of the S. should go into minutiæ, stating the hour at

which each corps is to pass, and the manner in which it is to do so, also the position it is to take up at the far side. A staff officer will remain in charge at each end of each bridge, having a small guard under his orders. No collection of men, carts, or animals to be allowed within a couple of hundred yards of the bridge-heads on the far side, and no crowding on the bridge to be permitted. No one but generals and S.Os. to be allowed to go back over the bridge until all are over. The men to be cautioned not to keep step in crossing temporary bridges. To cross a river whilst an active enemy is on the other bank demands a well-designed plan, ably carried out in all its details by an efficient staff. Stratagems should always be resorted to, and the enemy deceived as to the point of crossing, in such a manner that a strong brigade or division should be across before any organised resistance of large numbers can be offered to it. Much depends upon the breadth of the river. If it is not wider than about 300 yds., and a re-entering angle, with the banks higher on yours than on the enemy's side, has been chosen as the point of passage, the front and flanks of the force first thrown over the river can be so protected by musketry fire that nothing can prevent you from crossing. The first thing to determine is the most advantageous position for the passage ; the configuration of the river to be such that batteries established on the near bank can command the ground on the opposite side. Long re-entering loops, that are frequently to be found upon sluggish rivers, are invaluable for this purpose, as it stands to reason that no enemy in force could remain in them under the cross fire that would be brought to bear on him. A small river flowing into the large one on your side, some short distance above where it is intended to cross, is of great use, as in it the rafts to form the bridge—and indeed, if the current is not rapid, the greater part of the bridge itself—can be put together without creating any alarm, and floated down to its position. Long wooded islands, with the main channel between them and you, leaving the channel to be passed over from them to the enemy's bank a very narrow one, are of great advantage in enabling you to lay your bridge and cross over in considerable numbers before the enemy can concentrate. At the point selected the banks should be free from marshes, so that wheeled carriages can get down to the river, and if possible there should be deep water close to the banks. If not, arrangements must be made beforehand for laying out trestle piers to such a distance that the boats or pontoons can float and not ground when laden. A narrow belt of timber along your bank is a good screen behind which your army may assemble without being seen. It is desirable that the bridge when laid should be screened by the banks, or by rising ground or woods, from the enemy's view and fire. (See Article on "DISEMBARKING IN FACE OF AN ENEMY.") The two operations are very much alike. The enemy having been deceived by false reports and by demonstrations upon distant points, it is taken for granted

that the army is to cross at a point carefully selected and secretly surveyed by a staff officer. The width of the river to be carefully measured, and the bottoms examined to see that there is good holding for the anchors. If the enemy has a bridge over the river, defended by a tête-de-pont on your bank, this renders the operation much more difficult, as he can pass over and attack you in rear whilst you are crossing. It will then be necessary to watch his bridge-head with a strong corps, and perhaps make demonstrations as if you intended to assault his works. In framing the orders for the passage of a river, the C. of the S. will see that the head of the column should reach the spot selected as soon as it is dark. The columns intended to make diversions upon other points, in order to draw attention there, should arrive at their destinations a little before, taking care that they are seen by the enemy. When it is dark, a good deal of noise should be made with hammering and talking; and if it can be done safely, a few men put across to keep up a musketry fire upon the enemy's patrols, piquets, &c. The strictest silence to be maintained where the operation is really being carried on, and the rafts put together. A battalion of the best light infantry to be ferried across at such points that it can cut off the enemy's piquets if there are any there, and extend in skirmishing order in a semicircular form, both flanks resting on the river. The troops first over should consider themselves as an advanced guard, and be guided by the instructions laid down under that head. They should fire as little as possible during the night, endeavouring rather to take prisoner all patrols or outposts that interfere with them. A proportion of boats should be employed in carrying across reinforcements whilst the bridge is being laid. As soon as one is finished, the others must be commenced as quickly as possible. As soon as a brigade is over, strong working parties, carrying their arms and tools, should pass over, and, under the direction of R.E. officers, and as many sappers as can be spared from the bridges, set manfully to work to entrench the position. The R.E. who is to design the works should pass over with the first that cross, having a few sappers with tapes to mark out the lines. Batteries of heavy guns will be placed at points previously fixed upon, to open fire at daybreak, if necessary, along the front and flanks of the position taken up by the forces that had crossed during the night. The extent of ground occupied on the opposite bank should be enlarged every hour as more troops cross. If necessary, the horses of cavalry and artillery can be swum across. If a hundred horses are taken over by the bridge and collected on the opposite bank, others can be driven into the water in flocks, taking care to allow no gap, but to keep up a continued stream of horses. When this has been established, it is easy to induce them to enter the water and swim across to the others on the farther side. One-half or two-thirds of the men of each troop should previously cross in boats or by the bridge, to receive the horses on the far side, each man carrying his arms and valise. When

there is a bridge, the horses should be swum over near but below it. When cavalry pass a floating bridge, they should dismount and lead their horses. The writer was Q.M.G. of a force that had to cross a rapid river in face of the enemy, there being no bridge equipment, and only a few canoes. Some 2000 horses were swum across as described above, with the loss of only an old one, that could not stem the very rapid current. It would have been madness to have allowed British dragoons to attempt swimming their horses over such a river. When the emergency of circumstances require the attempt to be made, the men should undress and hold on by the manes or tails while crossing, never touching their horses' heads, and guiding them by splashing water at their heads on the side from which you wish them to turn. If the enemy concentrates to fight, the baggage and parks, &c., should not be crossed over until he is driven away.

Previous to a force crossing a ford of any size, rows of stakes should be driven in, showing its exact limit. If the current is strong, ropes should be stretched from pole to pole, and mounted men posted along its upper limit, to break the force of the stream. Torches or lanterns should be used at night to mark the line of crossing. When the stream is strong, the men should pass in the broadest possible front, locked arm-in-arm: if also deep, each rank should be several paces from the other, for if a column passes in close order, it serves to dam up the stream, and so deepen it. When the current is rapid, boats should be kept plying about near the dangerous places, to pick up any one who may be swept away.

Defence of Rivers.—If your enemy is as strong as you are, and he has the means of crossing anywhere along a front of 20 or 30 miles, he will do so if he wishes, but you ought to make him pay dearly during the operation.

The better your arrangements for defending the river, the more it will cost him. Indeed, if he makes mistakes, you can inflict such injury upon him that he may be only too glad to get safely back. Suppose an unfordable river separates you from your enemy, which he has the means for crossing anywhere for a distance of 30 miles—that is, 15 miles above and 15 below where the main line of communication, whether road or railway, crosses it. Of course, if you had time, the bridge there would be well covered by a strong tête-de-pont. To attempt to guard every point where he can cross would be to render yourself weak everywhere, so the best general plan is to keep your army concentrated in a central position, establishing good lateral communications with your flanks. The entire length of the river must be well watched by your patrols, and arrangements made beforehand, so that when all your outposts have been driven behind the river you can still have means of communicating with your spies on the opposite bank, and keeping yourself well informed of the enemy's movements. Strong detachments should be posted halfway along the exposed distances on either flanks, the strength of which

must depend on the size of your army. Telegraph wires to be laid down from one flank to the other at some distance from the river, so as not to be easily cut by the enemy, and night signals to be established as well, to render you independent, even supposing the wires have been destroyed. 3 guns fired at half-minute intervals, to be repeated 3 times, with intervals of 5 minutes between each time, can be heard safely at distances of 3 or 4 miles in ordinary weather. Beacons set fire to upon elevated ground will convey the news that the enemy is crossing at certain points. The officers in charge of posts where these signals are to be made should have their instructions regarding them in sealed envelopes, to be opened only when they have positively ascertained that the enemy was crossing. This would prevent any chance of its becoming known what those signals were to be. The commander, from his central position, should be ready at all moments, by means of his transport carriages and bât animals, to convey a strong body of infantry quickly to support his detachments in any direction. The latter should at once proceed to the point of crossing, and vigorously attack the first body of the enemy that crosses over. The crossing will most probably be attempted on a dark night, when such an attack is likely to succeed ; for if troops that have just crossed over are attacked in a determined manner they will fancy you are strong, and hesitate to advance over ground they know nothing of. Some time ago it was proposed to use a burning fluid made from some preparation of naphtha, which would burn on the water. If this could be poured on the water a few hundred yards above where the enemy was making his bridge, and set fire to it, it would not only burn his boats and bridge material, but throw such a light upon his movements that he would have to desist. If this fluid preparation is to be had, it should be experimented on before it is required for use. A commander having reconnoitred well beforehand all the ground over which the enemy has to move on the opposite bank, should keep in his memory the advantageous points for crossing, and, putting himself in the enemy's position, consider what he would do were he in his place. Having thought well over the matter in all its phases, he should fix on plans for all contingencies. His chief difficulty will be—when some night he receives notices from his outposts, at several points, that the enemy are preparing to cross in their vicinity—to weigh the several accounts and make up his mind as to the true point of attack. No amount of money paid to spies for secret intelligence should be spared to obtain early notice of the enemy's intentions. Large numbers of boats collected at any one point is an indication of the locality he means to cross at. Strict watch should be kept upon all reconnoitring parties sent out by him, so that the points examined by them should be known. If the inhabitants are friendly, it is half the battle. It is the duty of the troops who first reach the crossing-point to delay the construction of any entrenchments as much as possible, and to hinder that of the bridge. The locality in which it is

attempted, and the relative strength and morale of both armies, must decide whether an offensive movement from the tête-de-pont against the enemy's flank, as he attempts to cross, shall or shall not be made. If successful, it is ruin to the enemy ; but if not, it is ruin to you. To pass a river in retreat is similar, as a tactical operation, to that of retreating through a defile, for which see Articles on "REAR GUARDS" and "RETREATS."

Fortresses.—The general officer called upon to plan or to conduct an invasion, has to decide how the enemy's fortresses should be dealt with. A fortified place not actually barring his line of advance may be merely observed by one or more columns of less strength than the garrison, and which are intended to fall back upon reserves if attacked in force : or it may be observed by a force strong enough to warrant its accepting battle at any time if attacked, or by a weaker one occupying a position so strong, either by nature or made so by art, that the garrison would not risk an attack upon it. A corps of observation prepared at all times to accept battle would, within certain limits, neutralise the action of the garrison by preventing it from operating in some particular direction which it was especially desirable to keep free of all hostile troops, such as the flanks of your line of communication, &c.: or, lastly, a fortress may be effectively blockaded by troops occupying positions all round it, as Metz and Paris were in 1870, so that its garrison can have no influence upon the progress of the war beyond occupying the attention of the troops blockading it. A fortress may, however, so block your best line of advance, especially with regard to railway communications, as Metz, for example, in 1870, and Ruschuck in 1877-78 ; or it may be of such political importance as to constitute the objective point of the campaign, as Pekin did in 1860 and Paris in 1870, that its capture may be deemed absolutely essential to the success of the war.

A fortified place may be taken by a coup de main, by open assault after a more or less serious bombardment (as were the Takoo forts in 1860), by a siege more or less regular in the manner it is carried out, depending of course upon the strength of the place, and upon the relative military strength, courage, and scientific knowledge of the combatants, or by being starved out by a close blockade, as Metz and Paris were in 1870. The siege of Delhi, in 1857, and of many of the strong places in India during this century, are good examples of irregular siege operations.

Blockades.—The manner in which Paris and Metz were blockaded in 1870 should be carefully studied for information as to how great fortresses can be effectively blockaded by an army of about the same numerical strength as the invested garrison. The German lines round Paris were about 46 miles in length ; but by a judicious use of the electric telegraph, by the establishment of good and easy lateral communications between the several brigades and divisions employed, and between them and their fortified posts in front, and their base in rear,

and by the construction of abatis, entanglements, and other obstacles, and the careful strengthening of all parts of the positions occupied by field works, by a careful planned system of outposts and patrols, the investment was effectively maintained by less than 200,000 men (the besieged garrison was of about the same strength), or say about 4000 men to each mile of the investing circle. When the garrison is an army, its object will naturally be to break through the blockading circle by a great concentration of troops upon one point, whilst the enemy's attention is drawn, by false or partial attacks, to other localities many miles off. The difficulties of effecting such a concentration without being perceived by a watchful enemy are very great, for in most localities it will be seriously impeded by suburbs, gardens, and the enclosures so generally common in the vicinity of large cities. To maintain a good system of corresponding with some one within the place by means of small balloons, carrier pigeons, or trusty messengers, is one of the best methods for counteracting the power of the initiative possessed by an invested army. The concentration necessary for an ordinary sortie can be easily arranged without attracting the besieger's attention, but that required to enable a blockaded army to break out should not be possible if proper watch is kept by the investing army, and if its commander knows his trade and is duly alive to the power which money, properly expended on spies and traitors, gives him for obtaining early information, not only of the enemy's doings, but also of his plans, intentions, and resources. The blockading line of fortified positions is necessarily so far from the invested place, that it is now extremely difficult for the army attempting to break-out through it to avoid exposing one or both of his flanks to a serious counter-stroke. Every arrangement should be made beforehand by the blockading army for the delivery of these counter-attacks on the enemy in his endeavour to force a way out along all the possible lines for doing so. It is the great retaining power given by B. L. R. arms to troops acting for the time on the defensive in carefully occupied and fortified positions, that enables armies to be now successfully blockaded by about equal numbers.

In occupying the line selected for the blockading army, the rules which apply to the occupation of a defensive position should be remembered. There is always a temptation to hold posts in advance of the actual line that it is intended to defend to the last extremity. To give way to this feeling may lead you into serious trouble: as a rule, those advanced positions, although they may be strong in themselves, should only be occupied by weak outposts intended to fall back on the main position in the event of a really serious attack in great force. Divide your line of investment into zones and sections, each having its allotted force and commander, taking care that the line of division between such sections of defence is not a road or other usual, or even probable, line of approach to the position. The whole question, however, depends upon the blockader's prearranged power

of concentration upon all the lines along which the blockaded army could possibly deploy and break out.

It is of the utmost importance to cut off the invested force from all communication with the outer world. Every effort should be made to capture or destroy all balloons sent off: all pigeons flying from or towards the place should be shot. The beds of rivers or streams from the invested place to be carefully dragged, and every other possible search to be made for sunken or buried telegraph wires.

Sieges.—The operation in connection therewith may be divided into—1st, the investment; 2nd, reconnaissance of the place to decide upon point of attack; 3rd, opening and carrying on the trenches until ready for the (4th) assault.

For small places, the besieging army should be about 3 times the strength of the garrison; but for very large fortified towns, such as Antwerp, Metz, &c., from $1\frac{1}{2}$ to $2\frac{1}{2}$ times the garrison is ample. Much will of course depend upon the relative military value of the opposing troops. The siege of Sebastopol was begun by an army inferior in numbers to the Russians available for its defence.

1ST. THE INVESTMENT.—It is of the utmost importance that the commander should keep his intention secret, so that it should be a surprise, and the enemy found unprepared. The movements of the army should apparently tend towards some other object in a totally different direction, when by long forced marches the several corps intended for this operation should appear simultaneously before the place, driving in all outposts at once, and cutting off all detached parties that may be out foraging, &c. All the available cavalry, mounted infantry, and H.A., should be used in this operation, and if well handled, the movements of the investing force should be kept concealed from the enemy.

It demands the very nicest arrangements as to time (to be made by the C. of the S.); in the routes given to the several columns it must be laid down imperatively, that, come what may, each column is to be in the locality, if not in the exact spot, each evening that is indicated in the route.

This route should be copied into the pocket-books of the O.C. each column and his S.O., and this should be done so that, if it fell into other hands, no one could divine it to be an order of march. No other copies of it are to be made. If each day's movements were written upon pages in different parts of the book and lettered, the first day being A, the second B, and so on, any one reading the book would only find at different parts of it descriptions of various places with the best positions for encampment, &c.

The true object of the movement should only be known to those two officers, but a false one must be found, and when within one or two days' marches of the place, excuses must be found and made the subjects of

general conversation for having deviated from the previously announced intention, the true one being denied up to the last day.

There is no operation that can test the efficiency of the staff more than this one.

2nd. THE RECONNAISSANCE OF THE PLACE must be effected by driving the garrison well within the works, when a close inspection of them and the ground in their vicinity can be made. There are but few places in Europe of which some plans cannot be had; the roughest will be of the greatest assistance in coming to a decision as to the point or face to be attacked. The C.R.E. having made the minutest possible inspection of the works, will draw up a plan of attack, which he will, if necessary, explain in detail to the commander.

The mode of conducting this operation is described under the head of "1ST CLASS RECONNAISSANCES."

For all subsequent operations of the siege, it is most important that staff and R.E. officers should study the almanack well, and keep before them the hours of sunset, sunrise, and of the moon's rising and setting, so that all possible advantage may be reaped of every hour of darkness.

3rd.—OPENING AND CARRYING ON THE WORKS.—Soldiers are apt to think that during a siege the engineer should alone be the directing element: it is a great mistake; he can only form the plan, but almost the whole of the details for carrying it out must devolve upon the troops, and consequently the staff, if they do their duty, have lots of work. Apart from their duties in camp, which have already been fully gone into, it is their duty to see that the communications between divisions, and parks and trenches are properly established, and that the reliefs of the trenches are duly carried out at the hour, and in the manner appointed. A staff officer should conduct each relief to the trenches, and hand it over to the S.O. on duty there. The guard of the trenches should be about three-fourths of the strength of the garrison. The camps should be sheltered from view of the place, at about 2 or 3 miles distance from it, according to the nature of the ground. The nearer they can safely be placed to the trenches, the better; as every extra mile to be marched over is of great consequence to hard-worked men. The R.E. and R.A. park must be above all camps screened from its view and fire; their position must depend upon the roads, as it is well to have them near the main line of communication running to the rear and towards the centre of attack. If none exist in the latter direction, one should be laid out as soon as the position is taken up. It is also essential that roads, or at least tracks, marked by a line of large-sized stones, should be laid out from the parade-ground of each division to the spot where the reliefs enter the trenches. It is well sometimes to erect cairns of stones in prominent positions along their track as land-marks.

The magnitude of the siege must decide whether the trenches are to be commanded by a general, brigadier, or colonel, and also as to the staff that should attend; as regards the latter, I am of opinion that the officer or officers required for this service should have no other duties to perform. Say that three have been named for this service, one to be always in the trenches; I am sure that the army would reap incalculable benefit from this arrangement.

A line of electric telegraph should be laid down between army Hd. Qrs. and the parallel nearest but one to the enemy, where ought to be the Hd. Qrs., as it were, of the trenches.

The names of all F.Os. to do duty with the guard of the trenches each day and each night, and the exact strength of the latter, with full details, should be notified some hours before they reach the trenches to the S.O. on duty, who, acting under the instructions of the G.O.C. in the trenches for the time being, will detail the C.O. for each parallel and sap, and those that are to command the various working-parties. The senior R.E. officer should be in the trenches with the general at least an hour before the reliefs arrrive, to explain what he wishes done, and the number of men he requires to do it. The working parties must then be told off by this S.O. for the various batteries, &c. In fact, every disposition of the men for each tour of duty should be laid down in a pocket-book some time before the relief arrives. The S.O. will meet it, as it enters the trenches, and without halting the men, as they pass down the first boyau or approach, will tell off the several corps. The strictest silence to be maintained by the reliefs going on and coming off duty, any remissness upon this point to be severely punished. It is most essential that every battery should have a signboard erected in it, giving its number in large characters, and if the trenches are extensive, finger-posts should be placed wherever parties could go astray, pointing out the way 'to No. —— battery,' &c. These little but most important things were never attended to before Sebastopol, because there was no organised trench staff. It is the duty of the staff to see that the men have means of obtaining drinking-water.

They will supervise generally the duties in the trenches under the general's orders, bringing to his notice all irregularities, &c. To do this well they should make frequent rounds of the trenches during their tours of duty; they must see that the conservancy of the trenches is properly attended to, and that a sufficient number of latrines in safe places are provided.

The dispositions for protecting the working party will be made by them.

The night that ground is first broken, the outposts of the enemy must be driven in. This will be done everywhere, opposite all positions occupied by the several corps of investment, and as it is taken for granted that it has been done for several previous days, it is to be supposed that the garrison remain in ignorance until the next morning of the exact front opposite which the trenches are to be opened: their attention may be drawn to another

direction by a few men being employed here and there along some 1000 yds. in making a noise with pick-axes, by occasionally showing a small light for a moment, and by constantly talking. It is easy in this manner to cause it to be believed that the trenches are to be opened there. When this has been done, the first parallel will be traced by the R.E. officers on duty, in the twilight, just before it is dark.

A covering party of about two-thirds of the strength of the garrison to protect the working party must be told off, to be partly composed of the troops employed in driving in the enemy's piquets. Strong parties must protect each flank of the working party; they should lie down under the nearest cover; the nature of the ground must determine the position of the covering parties, who should be placed also lying down about 100 yds. in front of the working party, having sentries posted again in front of them about another 100 yds. The reserves should lie down just a few yards in front of the working party. When these distances can be safely increased, it is advisable to do so.

The working party to consist of one man for every 2 yds. of work to be performed. A large number of S.Os. should be employed to conduct this party, and in order that there should be no confusion in placing the men in the positions they should occupy when at work, a rough division of it should be made on paper previously, a staff officer being told off to every 300 or 400 yds., who should accompany the R.E. in tracing it, and make himself well acquainted with the locality, so that when he joins the working party on their division parade-ground, he should have no difficulty in leading it straight to its appointed place. He should have put down some marks, such as a stick or a small pile of stones, to mark the right and left of the portion his party is to execute; previous to conducting them he should have made up his mind exactly as to the precise paths he intends to follow in leading them to their position. All working parties should enter that alignment on the same flank of their portion of the work, to prevent confusion, and then extend regularly towards the other, each man being 6 ft. apart; those to extend to the right should march from the tool depot left in front, and *vice versâ;* it is of the utmost consequence that not a moment should be lost, and that as soon as each man is placed he should at once commence with pick and shovel. These working parties should parade at the R.E. park, one or two hours before sunset, to receive their tools from the R.E. officer in charge of it, each man taking a pick and shovel. The working party that is to break ground should take no arms with them, as they are well protected by the strong covering party, and the first night they are not likely to be disturbed by sorties; all subsequent night working parties should be armed.

The usual tour of duty for a working party is 8 hours, but in the formation of the first parallel it is advisable to keep the first working party em-

ployed until an hour before daylight ; say that ground is actually broken at 8 P.M., by 4 A.M. a trench 3 ft. deep, 5 ft. wide, and 6 ft. long should be completed by every man ; it is advisable to arrange so that the night-working party should be relieved before daylight.

As soon as day begins to break, the covering parties must be withdrawn, their places being taken by a trench guard at the rate of one man to every two yards ; for as the working party have their rifles and are distributed in the same proportion, there will be, in case of a sortie, a man to every running yard of trench. Concealed in some undulation of the ground, about 500 or 600 yds. in rear, there should be strong reserves of infantry ; and upon each flank, well under cover, there may be a squadron or two of cavalry, if the ground is favourable for that arm. This is all the more necessary if any cavalry are shut up in the place. It may sometimes be expedient to keep some H.A. guns with these flanking detachments, or have them ready at a short distance in the rear.

The senior S.O. on duty every twelve hours should make a full report of all that takes place, during his tour of duty, to the C. of the S.

4th. THE ASSAULT.—The breaches having been reported practicable, or the fire of the place having been completely reduced and other favourable circumstances presenting themselves, the G.O.C. determines upon assaulting the place. The following are general rules that should not be forgotten in drawing up the order for doing so. Knowing the history of the 8th September, 1855, do almost everything in a manner exactly the reverse of what was then arranged for our assaulting detachments—I cannot call them columns. It is only by pushing on your masses to the point attacked that you can succeed. Remember that if your advanced parties capture the work, and are driven out from want of support, it is not the fault of the soldier, but of the officer who planned the operation. It is no time to talk of loss of life : if you fear, or cannot afford to lose numbers, try something else, but do not in mercy's name attempt an assault.

The commander must be in direct communication with the assaulting troops. He should, therefore, be in the parallel nearest the breach, or if trenches have not been opened, he should be under the nearest cover. The attacking forces to be divided into 3 portions : 1st, the storming parties ; 2nd, supports ; 3rd, reserves. Each of the first two to be equal to about half the garrison of the work to be assaulted ; the reserve to be equal to the whole or certainly three-fourths of the garrison, and to be well placed for following up the supports. The nature of the work to be assaulted must determine the number of assaulting columns and the manner in which the storming parties are to be divided.

It is most essential that attacks should be made upon several places at the same time, one or two only being real ones. The false ones should be at places far away from the others, and large numbers of men should be

shown to give them an imposing air. The real ones must have ladders if there are deep ditches, and a certain number told off to carry tools, as many of the latter as possible being engineers. Each column should have as many R.E. officers as possible with it. Each column to be composed of the largest possible organisation, so that battalions and divisions should be as little cut up as possible. Upon every occasion, have the party that is first to enter the enemy's works composed entirely of volunteers, and led by volunteer officers. If the result is a success, all the survivors of these volunteers should be rewarded and petted in every possible manner. If this is done at your first siege, the second made in that war will be an easy affair. When it is possible to do so, keep up the heaviest of artillery fires upon all parts of the work where it can be done without danger to your troops. A firing party should be thrown out right and left of the stormers, who should join the support when the place had been entered. Cram on your reserves close on the heels of the supports ; remember that the slightest check costs many lives, and that of all the reckless operations in war, a feeble assault, feebly supported, is the worst. If, as I said before, the advanced parties force their way in, and remaining there some time are subsequently turned out, it is a blot on the commander's escutcheon which should never be forgiven. The manner in which the garrison does its work must determine the hour of assault. The configuration of the ground and the size of your trenches will also influence it, for if you can get no other cover for your supports and reserves, you must assault at daybreak, so as to be able to get them in their proper places under cover of the night.

Escalades.—It is a rash operation to attempt to escalade an escarp over 25 in. in height ; the ladders when placed in position should always project at least 3 ft. above the ditch ; 2 sets of ladders are required, one for the descent into the ditch, the other for the ascent of the escarp. When placed in position, the slope of the ladders should not be greater than $\frac{1}{4}$. Our scaling ladders are made in lengths of 6 ft. and 12 ft. each ; 4 men can carry an 18-ft. ladder (about 100 lbs.) and 6 men a 24-ft. ladder (about 133 lbs.) Excellent scaling ladders can be made of common bamboo. The tips of ladders to be used for night surprises should be muffled ; troops to be employed in an escalade should be drilled to the work beforehand.

Siege Trains.—Counting the enemy's guns at 1 to every 15 yds. of those works whose batteries can bear upon you, the besieger should have 3 to every 2 guns of the enemy, and from 10 to 15 per cent. spare to provide against contingencies. We have 2 sorts of units from which siege trains are made up.

Heavy Siege Train—8 64-prs. ; 8 40-lb. and 14 8-in. Howitzers.
Light do. 10 40-prs. ; 10 6·3-in. R.M.L. and 10 25-prs.

Our guns are not yet fitted with overbank carriages ; if we attempt to carry on a siege with our present carriages we must lose heavily at our guns in consequence.

To begin the siege, 500 rds. per gun is wanted, but at least 3 times that number will be required for a siege of ordinary duration.

Defence of Places.—The duties of an officer appointed to command a fortified place are to make himself thoroughly acquainted with every inch of ground within 2 or 3 miles of the glacis (this is a duty equally binding upon all staff and R.E. officers under him), and to have fully detailed lists made out of all the warlike material. The C.R.E. to report upon the defences and of the work that should be done. The heads of all departments to send in reports as to their wants, and the means at hand of supplying them in case of a siege. Steps to be taken at once for remedying all defects complained of, and for supplying all their wants. As long as the enemy is still distant more than three marches, the troops ought to be encamped outside the works, the main body to be some miles off. This is a good precaution on the score of health.

The commandant and his staff should study the weak parts of the line of defence and endeavour to rectify them.

If there is a civil population, the police service should be most strictly carried out, and lists made of those that are to be turned out as soon as there is any prospect of attack. All allowed to remain to be forced to lay in provisions for the same length of time that the garrison is prepared for. The necessary sanitary arrangements can be carefully gone into, and an organised system established for putting out fires by a body of the civil population. The fire-engines to be inspected, and repaired if necessary. The best buildings to be prepared as hospitals. The water supply to be looked to, and measures taken for increasing it if there is any chance of its being interfered with by the besiegers. The provision of bomb-proof accommodation for the garrison to be reported upon by the C.R.E. Supplies of rough timber for this and other purposes to be collected from the country. All cover within a mile of the works to be destroyed. All suburbs and houses without the fortifications to be levelled. The civil population to be forced to assist in all these works up to the time when it shall be deemed necessary to force them to leave the place. Spare your soldiers up to the last moment, and get as much work as possible done by the non-combatants. The internal communication to be improved, and measures taken for destroying all those outside the place that can be of use to the enemy. As to gain time is the one great object of the defence, every little bridge destroyed that the enemy must repair adds so many days or hours to the existence of the place. If the provisions collected are in grain, preparations must be made for grinding it. If biscuit is to be

had, it should be kept as the last stand-by. Every endeavour should be made to draw upon the resources of the surrounding country up to the last moment, and to leave as little as possible there for the enemy. If there is no time or opportunity for collecting supplies from outside, all those in possession of the inhabitants and private individuals should be seized, so that equal distributions may be made to every one during the siege: unless this is done, some may be living luxuriously whilst others are in want if not starving. If this had been attended to, Metz might have held out longer, and the garrison of Lucknow would have been better fed. Distribute your magazines of powder and provisions as much as possible, looking to the eventuality of fires as regards the safe custody of both. The outpost duty should be well organised, as also the means of obtaining information of the enemy's movements by spies, &c. If the inhabitants are hostile, they must be disarmed, and the most careful watch maintained over their movements. The garrisons for all parts of the works and outworks to be detailed most accurately, and provisions made for sorties. As soon as the enemy penetrates to within three days' march of the place, his movements must be carefully watched by a small force, so lightly equipped that it should have no *impedimenta*, so that it can harass his advance as much as possible, and learn his intentions by a well-organised system of patrols. The best marksmen of the garrison to be employed in constant skirmishing with the enemy. The morale of the defenders to be maintained by every possible means; their honour and patriotism to be appealed to; the belief in succour from without to be instilled into their minds. When the enemy approaches, every advantageous position of ground to be obstinately contested, as long as it can be done without compromising either the safety or morale of the troops, the main body of whom are to be kept outside the works as long as it can be done with safety, and the efforts made to drive you inside them resisted in every possible way. When forced to retire within them, endeavour to ascertain from prisoners the enemy's intention; to find out the number of guns and their calibre in his siege trains; is he provided with scaling ladders; has he large stores of sandbags, gabions, &c.; what is his strength; what face he means to attack, and where he is encamped. Small reconnoitring parties can do much in this way. At night, an officer with a few men, knowing the localities—the very hedges even—can creep up near him. When the trenches are opened, the amount of energy to be displayed in sorties must depend upon circumstances such as the probabilities of being relieved, and the strength and spirit that animates the garrisons. If the siege is to be a long one, the energies of the defenders ought to be husbanded, lest by always having in the end to give way, they should become disheartened. However, the longer a bold front can be shown, and the longer you can maintain yourself beyond the glacis, the longer will you be respected by your adversary, and give confi-

dence to your people, and the longer you will be able to annoy the enemy. A few well-directed sorties that strike terror are of more avail than a series of partial ones which kill but few. As soon as the enemy's intentions are pronounced, the face attacked should be retrenched. The governor should remember that as long as resistance can be offered, he is bound to show it, and that if he fail in doing so, he is no longer worthy to be called an Englishman ; indeed, he deserves to be shot if he exhibits any weakness in this respect. When all hope is past, then, and not till then, is he justified in making terms, which he can generally secure upon fair conditions if his defence has been determined, and if he can show that he still has the means of holding out longer. Even at the last moment, if he still commands a disciplined body of men who are in good heart, he may perhaps hope to cut his way out and join his armies in the field. In doing so, if he can carry off two-thirds of the garrison that remained to him, it is well worth trying. The heroic defence of Genoa in 1800, and of Jellalabad should be read and remembered.

These memoranda are only intended for use when the besiegers are of a civilised nation. When they are Asiatics, or indeed any barbarous people, never surrender as long as you have supplies sufficient to support life ; when they fail, then the last act of the drama must be to cut your way out. Never surrender your arms and ammunition to such an enemy. As long as you are armed and keep together, you can manage to keep any number of Asiatics at a distance. The story of the faint-hearted and ill-advised garrisons of Cawnpore and Cabul should never be forgotten.

In attacking and defending places, all soldiers employed at night as sentries near the enemy, and the small parties or chains of skirmishers thrown forward to watch the enemy, should wear their grey greatcoats. Our coats, when new, are a little too dark, but when some time in use they are, next to the Indian Karkee and the Russian light brown, the best of all colours for night work.

Convoys.—The nature of the country and the width and character of its roads, the disposition of the inhabitants, the distance that the enemy is from the line of communications and the degree of enterprise that he may be given credit for, will decide the difficult question as to the strength and composition of the force to be detailed as guards for convoys of stores, provisions, or prisoners. If the waggoners' loyalty is doubtful, additional force will be required.

If the country is open and the inhabitants hostile, it is a difficult operation o conduct safely a large number of waggons for a number of consecutive marches, for if the enemy is strong in cavalry or mounted infantry, he will cut in upon your convoy at some weak point. Under all circumstances, the arrangements for the march and the halt at night should be made as if

the enemy were known to be near. Attacks upon convoys should be made on a flank whilst the head, delayed by some prepared obstacle, such as a broken bridge, trees fallen across a hollow road, &c. &c., is also engaged.

No matter what may be the force detailed, the O.C. it will, before starting, examine the carts, waggons, and animals, to see that they are in good working order. He should have from 2 to 5 per cent. spare waggons, according to the distance to be marched, and a supply of spare wheels, poles, shafts, traces, ropes, &c. The total number of carts should be divided into divisions of about 100 each, those being again subdivided into 4 sections of about 25. Each division, and if possible each section, to be in charge of a transport officer, who will have in his pocket-book an accurate list of the waggons and their contents, of the driven horses, &c., in it. The carts carrying the most valuable stores to be always at the head of the leading division. If there are any pack animals, such as camels, mules, elephants, &c., they should also be divided into divisions and sections, and should precede the wheeled conveyances, or if the nature of the country will permit, they should march on one or both flanks, leaving the road clear for the waggons. All should march upon the largest possible front. On most roads waggons can go two abreast ; they should have 4 ft. between them. In South Africa the waggons marched at times 4 and 5 abreast. To calculate the length of road your convoy will occupy, see Table in article on "MARCHES." The average breadth of waggons may be taken at 5 ft. In an ordinary country the rate of march is 2 miles an hour. The distribution of the force must greatly depend upon the length of the line of waggons ; but under all circumstances the O.C. it must especially avoid frittering away his strength with a view to protecting every part of the convoy, as by so doing he is strong nowhere : he must endeavour to keep his men together. It is a good rule, applicable to most circumstances, to divide your force into three equal portions : one-third being in the centre as main body and reserves ; one-third furnishing the advanced guard, and all detachments required between it and the main body ; and the other third doing the same as regards the rear. Infantry is more especially required with the advanced and rear guards, the main body of the cavalry or mounted infantry being with the main body, so that reinforcements can be rapidly sent from it to any point that is attacked. If the country is open, it may be advisable to divide the main body into two, one to march on each flank at about 200 yds. or 300 yds. from its ordinary position in the line of march. The same disposition would equally apply to all other bodies placed anywhere along the line of waggons when the country admits of it. If there is any suspicion as to the hostile disposition of the drivers, a strict watch must be kept over them by small parties of three or four mounted men told off to every couple of hundred yards. The front, flanks,

and rear should be well watched by small patrols of well-mounted dragoons, to a distance of from 2 to 3 miles. The advanced guard, composed of all three arms, should be about 1 or 2 miles in front. With it there should be a small party of pioneers or engineers, carrying tools. The rear guard should be close to the rear waggons. The O.C. the whole, as well as of the various parts, must remember that the object is to get the convoy over a certain extent of country without losing a cart or animal, and that they must only fight when they cannot accomplish their object without doing so. He may sometimes have to act offensively, to gain time for his convoy to pass a river or some other obstacle, or he may find it necessary to drive off small parties that annoy him with long-range fire; but having secured his object, he must not be led away by success to follow the enemy up. It is of great importance, that whatever fighting be undertaken, whether in attack or defence, that the march of the convoy should not be delayed thereby. If attacked in force beyond his power of resistance it will be for the commander to decide whether he cannot save a portion by sacrificing the rest. If he is overpowered, nothing remains but to concentrate all his force, and mounting his infantry on the horses taken from the waggons, make good his retreat, or in that manner cut a way through the enemy. All waggons breaking down on the line of march should have their loads distributed amongst the others, and should then themselves be set on fire.

The selection of good defensible positions close to water for the animals, and on firm, good ground that is easily accessible from the road you are marching on, in which to park the convoy for the night is of great consequence. Whatever may be the form which circumstances may require the park to assume, the guns should be at the angles, so as to sweep the faces. Natural obstacles, such as streams, should be selected to protect at least one of the faces. Strict watch to be kept at night over the animals and drivers, when there is the slightest chance of the latter being in the enemy's interests.

Convoys, especially of provisions, are but little required now in European wars, for the main lines of communication are along railroads, or rivers navigable by steamboats. However, in India, many years must elapse ere similar facilities can be expected. During the mutiny the writer took part in convoys where the carts alone extended 5 or 6 miles along the road, from which the enemy's cavalry was only kept at a distance by the great range of our arms, which told so much in our favour in an open level country.

In open countries like India or South Africa, the waggons should be formed in single rank in a hollow square formation, the axles touching, poles outwards, so as to be in position to march quickly when the animals were hooked in. The waggons should be formed up as shown in diagram.

It is a good plan to lock the wheels, and fasten the wheels of each waggon to those next to it. The men and animals to be inside the square; a

shelter trench to be formed along the outside close to the waggons, so that with men in or on the waggons, a double line of infantry fire can be obtained. If time and circumstances permit, the best form for the bivouac of a very large convoy of waggons is a large square laager with the waggons formed as described, to contain the animals, drivers and all non-combatants, having two small redoubts or works formed of shelter trenches at opposite corners, as shown in diagram. The faces of the laager are thus protected by a strong flanking fire. In India, when the convoy consists of camels, they should at night be formed into a hollow square, their legs tethered, their heads inwards, and their saddles and loads piled up behind them as a sort of rude parapet.

STREET FIGHTING.—To be considered under two heads: 1st, fighting to obtain complete possession of a city or town into which you have forced your way, but where the defenders are still prepared to resist; 2ndly, the suppression of insurrection in a city which you hold with a garrison, but where the population is hostile.

The fighting at Lucknow during the mutiny presented examples of both.

1st. It is of great importance to obtain a plan, no matter how rough, showing the streets and the position of the public buildings, and of all squares, or other open spaces where large numbers of the enemy can assemble. If possible, find out from spies where his main positions are, and the quarter of the town or the buildings that he has especially fortified as an interior keep, &c.

To open out one or more roads to this central position, or to some commanding point in its immediate vicinity, so as, if possible, to cut his forces into two or several parts, and prevent them from assisting one another, is the first great object to be attained.

Having selected the route or routes by which you mean to force your way, begin by seizing the houses on both sides. When a column finds its progress barred by barricades and the fire from the adjacent houses, every endeavour must be made to turn such positions, by using by-lanes, breaking through houses, and working a passage from one to the other, until you obtain possession of some point in their rear. The defence soon slackens when the retreat of the defenders is seriously threatened. As a rule, it is better to allow them a "bolt-hole;" for if all retreat is cut off from them, it is apt to make them desperate, and a few determined men who have made up their minds to die, may inflict immense loss upon the assailants in street warfare. If you do happen to cut parties off, open a parley with them at once with a view to their immediate surrender; give them any possible terms, sooner than fight them for possession of the houses they occupy.

If you are advancing in more than one column, open out lateral communication one with the other, wherever it is practicable to do so. Be most

careful in following up every advancing column with a long tail of supports, for if small bodies, such as the heads of these columns must ever be, become isolated in a great, unknown city, the men are apt to become uneasy and subject to panic, to which their success, and the fact, perhaps, of having penetrated a long distance without opposition, tends to make them all the more susceptible. Unless men, when fighting in a large city, see their rear well closed up by supports, they become uneasy and hesitating. Fighting under such circumstances is most bewildering work: you hear firing all round you, perhaps, and have to make face to the enemy in so many different directions, that it is hard to know sometimes which is your true front.

With the head of each column there should be a party of engineers, provided with hatchets, crowbars, and powder bags. A very strong door can be blown open by 10 lbs. of powder, even if barred and bolted. A rifle bullet fired into a lock will generally destroy it. If the roofs are flat or double, it is essential to make a way along them, when the houses are held by the enemy: if the roofs cannot be used, openings must be made with crowbars, from one house to the other in the uppermost story. In this manner a passage may be opened into the centre of a city without great loss; whereas if the columns are pushed through the streets without obtaining possession of the houses on each side, the losses are sure to be very great, and the operation has a demoralising effect upon the men.

2ndly. To suppress insurrection in a town in which you are garrisoned, it is essential to occupy such positions within it as will enable you to isolate the quarter which is the main stronghold of the insurgents. Having done so, endeavour to divide it up into sections, isolating them one from the other as much as possible. Never attack barricades, or positions, in cities with brute force, but by seizing upon houses or posts in their rear, or on their flanks, force the enemy to become the assailant. Much may in some cases be done towards bringing a hostile population to reason, by cutting off their supply of provisions and water.

WARS IN BUSH OR HILL COUNTRY WITH SAVAGE NATIONS.—As wars like those in Kaffir-land, New Zealand, and Ashantee may have frequently to be undertaken by our army, a few lines on the subject of bush-fighting may not be out of place here.

To carry out successfully and quickly a war against savage nations, something in addition to ordinary strategy in the general, and more than mere drill-book knowledge in the company officer and private soldiers is necessary; you must to a great extent adopt their mode of fighting, which is invariably well suited to the country they occupy; their tactics carried out by highly-disciplined, well-armed soldiers will generally be fatal to them, but you must strike hard and strike quickly. They never expect Europeans to venture into their fastnesses, and become demoralised if they find their

enemy as well able as they are to get through their bush, or to climb their steep and rugged mountains. Kaffir and Maori wars are to a great extent wars of stratagem and constantly varying tactics: surprises, ruses and treachery are the savage's most powerful weapons, and with some races night attacks are very common. It is, therefore, most desirable that their habits, customs and mode of fighting should be well known to every officer engaged. In grassy countries like Natal, the Cape, &c., beware of being burnt out; as a precaution against such a disaster, encamp on the banks of rivers, which protect you against fire from at least one direction, or halt only on the ground over which fire has already swept, or you can burn a strip yourself with care round your position. Against night surprises, your best protection next a most watchful look-out are obstacles, either natural ones, such as rivers, streams, marshes, precipices, &c., or artificial ones, such as entanglements made with wire, or prickly pear, thorny bushes, &c., planted like hedges. When attacked at night your men should lie down and fire volleys by word of command, but no individual file firing should be allowed; indeed, to reserve your fire as much as possible has an awe-striking effect frequently upon the night assailant, he does not know what you are at, and your cool indifference at his approach tends to frighten him, whereas if your camp is all noise and bustle, your evident confusion gives him pluck, and encourages him to attack boldly.

Always distrust Eastern and savage nations in war; allow no assurances on their part to cause you to relax your precautions in the least. This rule was found to be essential in the China war of 1860, and the ignoring of it in the first Afghan war, and at Cawnpore in 1857, led to disaster.

Savages who have any knowledge of British soldiers will not attack or fight in the open; they fly to mountains, forests or difficult country with the instinct of the wild animal. You can best meet their tactics by sudden, secretly-planned and rapidly-executed movements, if your troops are well disciplined and well in hand; such movements if executed during the night are doubly efficacious, but even if it be thought expedient only to attack by daylight, the operation up to the actual onslaught should be carried out under cover of night. Rapidity of movement and sudden unexpected attacks demoralise an undisciplined enemy. If you wish to fall upon him unawares, your marches must be made at night, in perfect silence, by little frequented paths, no fires to be allowed during temporary halts, and in some instances smoking even to be forbidden when in his vicinity.

In marching at night through forests or difficult ground, the head of the column should go at a slow pace, with halts every quarter or half hour, to allow of closing up, for in the dark the tail of even a very small force is very likely to lose the touch with the head unless the pace is leisurely, and the halts are frequent. Never omit having one of your best officers in rear of the column.

As savage, uncivilised nations generally occupy uncultivated territory, where but few or no supplies can be obtained, the enemy having most probably driven away his cattle to distant places of security, the commissariat question will generally be your greatest difficulty. Every one, officers included, employed upon short expeditions, in healthy and temperate climates, should therefore carry 4 or 5 days' biscuit and groceries, slaughter cattle being driven. No spirit ration to be allowed. In hot and in very mountainous countries, where it is essential that the English soldier should be laden as little as possible, one day's biscuit should only be carried, the commissariat supplies being carried on mules, which can practically be taken wherever infantry can go.

In planning a war against an uncivilised nation who have perhaps no capital, your first object should be the capture of whatever they prize most, and the destruction or deprivation of which will probably bring the war most rapidly to a conclusion. Thus the capture of their cattle and the destruction of their crops and of the grain stored in their kraals or villages in depriving them of food is most efficacious. Our expeditions into the hills on our N.W. frontier in India frequently result only in the burning of villages containing nothing valuable, and which are easily and quickly rebuilt: this is bad policy, for it enrages without seriously punishing them, whereas a raid into the territory of a hostile tribe just at the season when their crops are ripe can inflict serious loss by the destruction of their standing corn, &c. In the same way the capture of a Kaffir tribe's cattle soon brings that tribe to reason. With all savages to kill its warrior is, however, invariably the most efficacious policy, and it should therefore be regarded as of primary importance.

In marching through a savage country where the disposition of the inhabitants is uncertain, if the women and children have not been removed, you may generally assume that no attack upon you is contemplated; but if, on the contrary, none are to be seen, you must be doubly cautious.

It is not wise to send old battalions organised such as ours are to such wars. The savage in the bush has many advantages over the English soldier, and it is therefore necessary before entering upon a bush war to reduce them as much as possible. He has lived his life in the bush, and its loneliness, its dim light, and its being without paths does not startle him. Take him into the open, and brave as he may be individually, he becomes as scared as our men must certainly do when they find themselves in the bush under fire from a hidden enemy. Of all things I therefore consider it to be essential that the very best men in our army should alone be employed in such a war. Call for volunteers, and take 100, or perhaps 200, men out of as many battalions as may be necessary to make up the number of men required, select the best officers from each battalion to command their own men, and then select from the army generally the best field officers and

regimental staff. With battalions formed in this manner, your loss will be much less than if so many battalions are taken because they are first on the roster, and the war will be brought to an end in a much shorter space of time. As fighting in the bush ever resolves itself into a number of little battles between small parties of men, I would recommend that the proportion of company officers to N.-C.Os., rank and file should be 1 to 20.

The men should be armed with breech-loading carbines, and the Elcho sword-bayonet or the naval cutlass, made to fit the carbine, as in the navy. The men should be clothed in very dark grey or khaki (the colour of the uniform used in the Ashantee War was too light for a dense forest), and in other respects equipped as were the troops that marched to Coomassie. All officers and sergeants should be provided with pocket-compasses: before each action it should be stated in orders what the compass-bearing of the line of advance was to be. All fighting must be by sections, 3 sections of each company being extended and one kept in reserve. No crowding together must ever be allowed, and when the enemy is approached sufficiently near, he must be rushed at with a ringing cheer, if it is possible to get through the bush to do so. Most brave savages will hold their ground in a bush for ever, if you content yourself with firing at them from behind trees, but the savage knows well that when the white man runs in on him that it is time for him to bolt, When fighting in the bush upon any large scale (as at the engagements of Amoaful and of Ordahsu), where the fighting extends over a large area, and rages not only in front but on the flanks and in the rear, a great difficulty to be avoided is to prevent your men from occasionally firing in a direction that must hurt their own friends. The officers, with their compasses in hand, should be able as a rule to tell whether it was safe or not to fire in any proposed direction. Be most careful to guard your reserves of ammunition and other *impedimenta* well, keeping parties on its flanks in the bush, and having a strong rear guard to help those parties when required.

Our attempts to carry on Kaffir wars with Lancers, Dragoon Guards, Field Artillery and Infantry, dressed and equipped as they would be for a march past at home and commanded in a sort of slow, barrack-yard, field-day fashion, although strictly according to regulation, have never been satisfactory, and have more than once led to disaster. One of the ablest men who ever commanded against Kaffirs once told me that he was accustomed thus to estimate the enemies he had to contend against in the Cape Colony; the first and most serious difficulty was his own Artillery, then his own regular Cavalry, and lastly, the Kaffirs.

The effect of artillery is absolutely *nil* upon an enemy who does not fight in large or even in formed bodies, whose fighting line is a thin, very thin line of skirmishers without either supports or reserves, whilst it hampers

your movements considerably in forcing you to manœuvre only on ground where it can operate, and by the difficulty of protecting it when moving through wooded gorges, forests, &c. &c. In all these sort of wars, I regard it as essential that every gunner employed should be armed with a revolver. In a thick bush or forest country, like Burmah or Ashantee, rockets are likely to be as demoralising to your own men as to the enemy, owing to the eccentricity of their flight when they strike trees. This is not the case if you are moving over an open, and especially a level, district from which you can discharge your rockets into thickets or large patches of wood, which you wish to clear of the enemy. Hale's rockets, with shell attached, can be used in tolerably level and open countries with good effect, especially against horsemen. If the bush tracks are good, there is nothing better than the 5½-inch howitzer, but if the piece has to be carried by men or mules, the 7-pounder steel gun is far the best weapon.

Considerable method is required by all C.Os. in bush-fighting; if there is hurry, your force gets cut up into several parts without any connection between them, and it is difficult to collect them again for any concerted action. In no sort of warfare is it more essential to have a small reserve kept intact up to the last moment, for it is impossible to see what your enemy is about, or to know where he is until his attacks have actually developed themselves, and panics are more probable in a dense forest than in an open country.

Teach your men to go into the bush: there is no use in lying down and firing; the savage is perhaps better at that game than you are, your only safety is to go straight at your enemy whenever and wherever you see him; this demoralises the savage, and although you may lose a few men in the rush, your loss will be less in the long run than if you endeavoured to turn him out of his position by a heavy fire.

As the result of all actions in a dense forest depends upon the company officers, and on their fertility of resource, they must to a very great extent rely upon themselves and act upon their own responsibility: it is therefore most essential that all officers to be employed in bush-fighting should be carefully selected for that duty.

The conveyance and protection of your baggage on the march is a serious difficulty in all irregular warfare. To capture an enemy's baggage is one of the first objects of the savage warrior. Its quantity must be reduced to a minimum, by foregoing the use of tents and everything beyond the bare necessaries of life.

In drawing up schemes for small wars against an undisciplined or barbarous enemy, the arrangements for feeding your men will generally be your greatest difficulty. If you have at any period of the operations to halt for some time in order to bring up provisions, you give such renewed courage to the enemy as to make him often forget the success you had perhaps

already achieved; he imagines you halt from fear. It is much better to postpone beginning the campaign to a late period, so that you may be able to complete all your supply arrangements beforehand, and so be able to carry it through to the end without any subsequent halt, than to rush into it at an early date before everything had been prepared for carrying it out to the end without any pause during its progress. Nothing will demoralise the undisciplined enemy more than rapidity of movement and an unhesitating display of energy and a constantly renewed and prolonged effort on your part. If he on his part obtain a victory, its very success seems to exhaust him and render his subsequent movements slow. He halts to plunder or to rejoice over his victory, and is correspondingly dazed and panic-stricken if when you obtain a success it operates upon you in a different fashion, and quickens your movements and gives increased energy to the blows you follow it up with.

Hill expeditions in India.—It is scarcely necessary to say that the smaller the amount of your *impedimenta*, the easier will be the operation: the season of the year, condition of the crops, scarcity or abundance of water, the distance it is intended to penetrate beyond our frontier, and the probable length of time it is intended to stay in the enemy's country, will all influence the amount of stores you must carry with you. It has been calculated by the ablest of our officers skilled in these expeditions that the minimum proportion of native followers to fighting men (English and native) is 1 to $2\frac{1}{2}$ for an operation calculated to extend over from 10 to 30 days; these followers would be chiefly muleteers and dhooly bearers. All the native followers, bheesties included, should be given a military organisation, being divided into squads of about 25 men each under a havildar, there being a jemadar to every 4 of these squads. All, including officers' servants, should be armed with their native weapons of sword and shield, a proportion of the best being given pistols. In the hills the pack animals must, as a rule, march in Indian file, and in such order they require 1 muleteer to every 3 animals. For short expeditions no tents should be taken, but if any are considered necessary for the sick and wounded, the bell tent only should be used. In order that the men should be able to move easily in the hills, 40 rds. only should be carried in the pouches, and the greatcoats carried on mules, 30 coats packed in bed saleeta being a fair load for each mule. A towel and a piece of soap carried in the greatcoat being the only kit required by the English soldier, whilst the coat alone is all the sepoy wants. Woollen clothing, fitting loosely to allow full freedom of action to the body, should alone be worn by all ranks of Europeans. A regimental reserve of 100 rds. per rifle will be ample for most of these hill forays, if all are armed with the same weapon; if not, the reserve should be increased to 125 or even 150 rds. per rifle. In many instances it may be desirable to

divide this into a Regimental and a General Reserve in proportions of 1 to 2.

All officers, gunners, staff sergeants and others not carrying rifles to be armed with regulation revolvers. Many of our expeditions into the hills of India have failed to accomplish all that was aimed at: 1st, because the use of picked men was ignored, and every Tommy Atkins from Whitechapel, or Ram Bux from the Benares bazaar, because he had been taught the goose step, and dressed in the conventional garb of a soldier, was regarded as fully competent to face the Afridee or other hillman, who, a warrior by birth, was engaged in defending his own native hills, and fighting for all he held dear on earth; 2ndly, because the object aimed at was rather the capture and burning of villages instead of the killing of these hill warriors and the destruction of their crops and stores of food; and 3rdly, owing to the inordinate amount of baggage and native followers taken with each column. The Indian officer who has never carried on war outside of our Indian Empire is apt to imagine that the British soldier is an exotic that must be tended like a sickly school-girl, and that he must therefore have a rum ration daily, have tents and native servants to wait on him, being unable to "rough it" and bear the fatigues inseparable from hill warfare. The conveyance of rum on mules is very troublesome and difficult, and none should in my opinion be taken, the officers being forbidden to take wine; tea is easily carried, and that men can do the hardest work without any spirit ration is fully attested by the success of the Red River Expedition. None but S.Os. should be allowed to ride, so that one native servant for every 3 officers, or for the officers of each company of European infantry, should be ample. For some considerable time during the mutiny I had only one native servant for myself as a captain and for my 3 subalterns, and we did very well; our baggage consisted merely of one change of clothes, and the one servant cooked for all four of us. In most of the best-conducted hill expeditions I find that each regiment was allowed 2 servants for the mess, and that for the conveyance of baggage 1 mule was allowed to every 2 staff, or every 3 regimental offrs. In my opinion this is excessive, and that 15 lbs. per regimental and 25 lbs. per S.O., with a cooking canteen of about 22 lbs. for the offrs. of each company, or for every 3 or 4 offrs., should be ample. For the men's cooking utensils, one mule per company of British troops, 6 mules per Goorkha battalion, and 4 mules per battalion of all other native troops are necessary: the pots, &c., are carried in *kajawahs* (wicker-work panniers covered with leather), or in rope nets. For the conveyance of water from the valleys to the men manœuvring or bivouacking on the hills (in addition to the number of bheesties allowed in the plains by regulation), 4 *pukals* (cow-hide water-bags carried on mules or oxen) are allowed to each British company and 1 per battalion for hospital purposes, and 2 per native company are required. For expeditions of about 4000 or 5000 fighting men

two hospitals only should be allowed, one for Europeans and one for natives: the system of having a hospital for each battalion is not only foolish and extravagant, but by greatly increasing the amount of *impedimenta* to be carried and protected, it seriously hampers the movements and increases the difficulties to be overcome. The *dandy* is the only kind of ambulance suited to the hills in the opinion of Indian officers, but it is thought that in many instances cacolets might be used with advantage if mules of sufficient size could be obtained. The pole of the dandy should be of bamboo; each dandy requires 4 bearers (*kahars*). The proportion of dandies allowed is generally 10 per cent. for Europeans, and 12 to each native battalion, i.e. about 2 per cent. Axes, billhooks, and other necessary tools should be carried regimentally, one mule per battalion being allowed for their conveyance. When operating in the hills against border tribes, the initiative of attack should always be with us. When actually in presence of the enemy, all delays before attacking, even those entailed by making preparatory dispositions, they attribute to fear, and are emboldened in consequence: the Umbeyla expedition of 1863 is a good illustration of this. Mountain guns and small mortars can be used with good effect when the enemy takes up positions behind *sangas*. In all such expeditions the real fighting unit will be the company: our handy little companies give us a great advantage in this respect, which we shall lose if ever we are induced by the seductive tendency of imitation to adopt the system of large companies which had many, many years ago been introduced for economical reasons into the Prussian army. Captains of companies must use every endeavour to keep their men together, which, even with our small companies of about 100 men each, is no easy matter in a rugged, mountainous district; above all things, do not press or hurry your men, for men out of breath are useless for the final charge; this charge, when made, should be accompanied by loud cheering, sounding of bugles, &c. In all such operations endeavour to impress your savage enemy with the conviction that you despise him as an adversary, and that you are always only too glad to come to close quarters with him; at the same time, you must never omit to take every possible precaution against surprise, and always have a reserve in hand to meet any unforeseen contingency that may arise, for remember you are dealing with a courageous people who are born soldiers. I do not think that night turning movements with a view to surprises, and to getting behind the enemy so as to inflict really heavy losses upon him, have been tried as often as they should have been in our hill warfare in India. The hillmen themselves are much given to night attacks, so when you halt in the evening, your first care should be to make your position quite secure for the night; no precautions should be omitted; a force may be overpowered by numbers and destroyed without incurring dishonour, but if it be surprised, the commander should never be forgiven.

PART IV.

MILITARY BRIDGES.—It would be impossible to give in this little book an article on this subject that would be sufficiently explicit for an officer entirely ignorant of mechanical contrivances and the art of bridge-making. Every officer should read again and again the works of Haupt and Sir H. Douglas. With an army there will always be engineers whose business it is to understand bridge-making. All officers are, however, at times liable to be placed in positions where it may be necessary to cross streams or rivers when no engineers are at hand. There are but few countries that do not afford materials that can supply the place of pontoons, provided only there is some one who has the talent to avail himself of them. It is then that a "staff officer possessed of resource, with the energy necessary to use it properly, may be of more value to an army than the addition of an army corps." In countries where pine woods abound, the repair or construction of bridges is comparatively easy, as the straight poles of the "spruce," &c., are quickly cut and converted into trestles, &c.

Engineers who have had experience in colonies or new countries are more useful on service than those whose knowledge is chiefly theoretical, and whose practice is confined to old countries.

When large bodies of troops have to pass a river, and circumstances permit, three bridges at least should be made, one for infantry, one for cavalry, and a third for artillery, ammunition columns, and the train.* Columns of infantry, artillery, waggons, and cavalry should not be mixed together in passing a bridge.

Bridges should always be constructed at right angles to the stream.

Superstructure.—That in use with our new pontoon equipment form a roadway 9 ft. wide in the clear, and may be reckoned as weighing 80 lbs. per running foot of bridge. It is composed thus: 5 *baulks* (B B in sketch) of red Canada pine, 15 ft. 9 in. long, $3\frac{1}{4}$ in. wide, and 6 in. deep: weight of each 73 lbs.: the ends are halved and strengthened with iron plates. Nine of these baulks are used when the bridge is intended for the passage of siege artillery. The *ribands* (R R in sketch) are of the same scantling as the baulks. They are placed longitudinally over the ends of the chesses to keep them in their places, and are secured to the outer baulks by rack-lashings applied at every 4 or 5 ft. The *chesses* (C C in sketch) are the planks forming the roadway: they are of pine, 10 ft. by 12 in. by $1\frac{1}{2}$ in., and weigh when new 50 lbs., when old about 45 lbs. each. In calculating the buoyancy of floating bridges the weight of the superstructure must be care-

* This does not apply to ambulance waggons, &c., accompanying regiments.

fully estimated, for when rough, green material is used it will frequently weigh as much as 200 lbs. per running foot.

A roadway of 8 ft. wide in the clear will admit the passage of infantry in "fours," of cavalry 2 abreast, and of all description of military waggons in file. 9 ft. in the clear is, however, a much better and safer width, especially when there is any likelihood of a sway on the bridge. A width of 10 or 11 ft. will admit of mounted officers or orderlies passing in the opposite direction whilst a column of troops is crossing. To allow for a cross stream of traffic, the width in the clear should not be less than 16 ft. The width of roadway should not be less than 10 ft. for the passage of loaded camels, nor than 12 ft. if loaded elephants have to cross; 6 ft. will suffice for infantry in file, for cavalry in single file, and for field guns if passed over by hand; 1½ ft. will admit of infantry passing in single file.

Planks for the roadway (technically called chesses) of 1½ in. thick are sufficient for ordinary traffic. For heavy or continuous wheeled traffic, additional planks should be laid longitudinally over the roadway where the wheels pass.

In bridges where there are trusses joined transversely overhead, a clear space of 9 ft. in height is required for waggons and cavalry, of 11 ft. for camels, and 15 ft. for elephants.

Ramps at the end of a bridge intended for artillery should not have a greater slope than $\frac{1}{7}$th. If the ramp is long, the slope for ordinary traffic should not exceed $\frac{1}{4}$th.

A handrail should always be provided, especially for horse traffic: a single rope on each side will generally suffice.

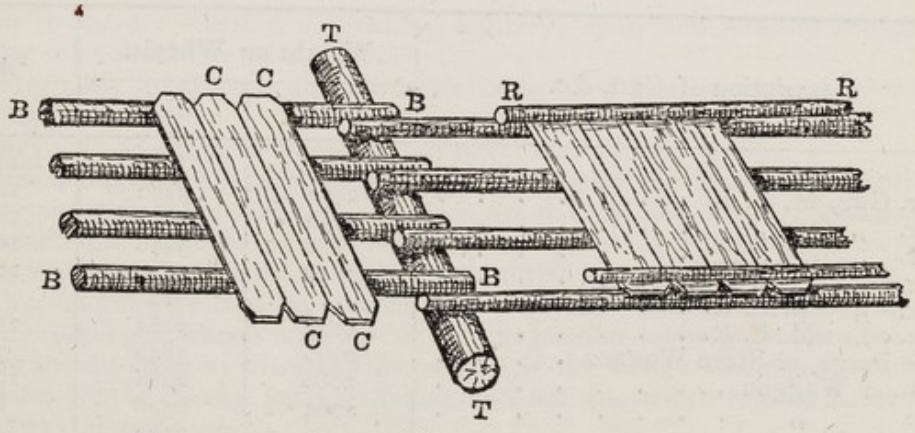


Fig. 25.

In this sketch the superstructure, except the planking of roadway, is shown as made with round, unhewn timber. The baulks (B B) must always be close enough together to support the chesses: they should have a fair

overlap, and be lashed together on both sides of the *transom* (T T) where they meet. In a bridge of more than 1 bay, if tapering spars are used for baulks, they must be arranged on each transom or saddle so as to be all "tips" or all "butts." The distance bridged by one set of baulks, i.e. the distance between any 2 transoms, or *saddles*, in boat or pontoon bridges, is called a *bay*. The bays of military bridges are generally from 10 to 15 ft. in length. Five sound deal baulks, 7 in. by 3 in., or 5 larch spars, $6\frac{1}{2}$ in. in diameter, will take infantry crowded in "fours" across a bay of 15 ft. For such a purpose the transoms, if of a circular section, should have a diameter of not less than 9 in. This superstructure can be used with all bridges. The rack lashings are not shown in sketch. If planking is not to be had, straight poles of from 3 to 6 in. in diameter, or two layers of strong hurdles, the ends breaking joint, may be used instead. Bamboos are frequently used most satisfactorily for this purpose in India.

In the superstructure for the Blanshard pontoons, the baulks were 14 ft. 2 in. by $4\frac{1}{2}$ in. by 3 in. : the chesses were 11 ft. 5 in. long, by 25 in. by $1\frac{1}{2}$ in.

Dead weight only produces half the strain due to a moving load. The following weights, *per lineal foot of roadway*, are caused by the passage (live load) of troops in marching order. *Infantry* in file or fours at proper intervals, 224 lbs. : in file crowded at a check, 280 lbs. : in fours crowded at a check, 560 lbs. : *cavalry* in single file 112 lbs. : in half sections, 224 lbs. : in file crowded at a check, 189 lbs. : and in half sections where crowded at a check, 378 lbs.

The following Table gives the weight of guns and other military carriages:—

Description of Gun, &c.	Weight on Wheels.		A.
	Fore.	Hind.	
	lbs.	lbs.	inches.
64-pr. Gun, M. L. R.	2464	9380	124
40-pr. ,, ,,	2632	5292	121
25-pr. ,, ,,	1708	3416	106
16-pr. ,, ,,	1848	2800	106
13-pr. ,, B. L. R.	..	..	
9-pr. ,, M. L. R.	1792	2184	106
G. S. Forge, or Store Waggon	2996	3836	72
Pontoon Waggon	1680	2688	120
Wire ,,	1764	2548	88
S. A. A. Cart	..	2128	..

The column A gives the length in inches from centre to centre of bearings of fore and hind wheels. The width of track is 62 inches for all these carriages, except for the pontoon and wire waggons, which have a track of 70 inches.

Unarmed men, crowded, averaging 145 lbs. per man, gives a weight of 110 lbs. *per square foot of roadway*, which is the heaviest weight that can be brought on a bridge under any circumstances in the field.

Elephants cannot be made to crowd together. When loaded with baggage an elephant occupies a space of about 99 square ft. (11 ft. by 9 ft.) Their average weight (including their load of 13 cwt.) may be taken as 72 cwt., of which $\frac{4}{10}$ is borne on hind legs, which are 6½ ft. from the fore legs. In calculation it must be assumed that a weight of 44 cwt. may be brought on to one foot of an elephant.

Elephants unloaded occupy a space of about 55 square ft. (11 ft. by 5 ft.) The weight of an elephant harnessed into the shafts of a gun may be taken at 66 cwt.; his hind legs are 5½ ft., and those of the leader 22½ ft. from the axle of the limber.

Camels, when loaded with baggage, occupy a space of about 70 square ft. (10 ft. by 7 ft.) Their average weight (including their load of 4½ cwt.) may be taken as 15 cwt., of which ⅓rd is borne on the hind legs, which are about 4½ ft. from their fore legs. It must be assumed that a weight of 10 cwt. may be brought on to one foot of a camel.

Pack bullocks, such as are used in India, when loaded with baggage, occupy a space of about 13½ square ft. (5 ft. by 2¾ ft.) Their average weight (including their load of 5½ cwt.) may be taken as 11½ cwt., of which ⅓rd is borne on the hind legs, which are about 3½ ft. from their fore legs. In calculation it must be assumed that a weight of 3½ cwt. may be brought on to one foot of a pack bullock.

Cattle for Commissariat purposes may be assumed to weigh each about 9 cwt., and when crowded, occupy a space of about 9 square ft. of standing room.

To each running foot of bridge must be added about 100 lbs. as weight of superstructure.

When troops are crossing suspension, military, spar, and floating bridges, the following rules should be attended to:—

Infantry must break step, and all music cease; and files or sections must not be closed up.

Cavalry will, as a rule, cross in file, but never faster than a walk.

Wheel carriages of all kinds, including field artillery and artillery of position, up to the 40-pr. rifled B.L., with trained horses, are to cross fully horsed; with unsteady horses, carriages must be passed over by hand. Taking out the lead horses and crossing with the wheel horses only is strictly forbidden.

Halting on a bridge is to be avoided. If it be absolutely necessary to halt on a pontoon bridge, gun wheels must rest as near as possible midway between two boats. Artillery should cross at increased intervals. If the bridge sways so as to become very unsteady, the column must be halted, and not allowed to resume its movement till the swaying has ceased.

If heavy guns or traction engines have to be passed over pontoon bridges, special arrangements will be adopted.

These rules apply to all suspension, military, spar, and floating bridges.

Officers will incur grave responsibility if they cross a bridge otherwise than in the way recommended by the officer in charge.

When any large bodies of men or large trains have to cross temporary bridges, it is essential that there should be a S.O. in charge of each bridge, and his orders must be implicitly obeyed by all ranks.

Cattle being liable to fright, should be driven over in small numbers at a time, the bridge being given up to them entirely for the time of their passage.

FLOATING BRIDGES can always be easily made over rivers when either boats or casks are to be had. An officer will know at once from the above data the amount of floating power his bridge requires; to it he will add the weight of the superstructure (generally about 80 lbs., for each foot of roadway 9 ft. wide), multiply the sum by the number of feet he intends the piers to be from centre to centre, and divide by the floating power of a cask, boat, log of wood, or whatever is to afford the floating power; the quotient will be the number of them required for each pier. For instance, a number of commissariat tierces are available; each contains 37 gallons, and as a gallon of distilled water weighs 10 lbs., the displacement may be put down at 370 lbs., deduct from it 58 lbs., the weight of the cask, and the result (312 lbs.) will be the floating power of each; allowing $\frac{1}{4}$th surplus buoyancy, each cask can support in bridge 278 lbs.

The bridge to be fit for the passage of field artillery must have a floating power of 525 lbs. per running foot; allowing for superstructure, the floating power required is, say, 625 lbs. a running foot. It is decided to make each pier of 20 casks placed in two rows, which will give it a length of about 21 ft.; the total supporting power of each pier will then be 5560 lbs.; divide that quantity by 625, and it gives 8 ft. 10 in., the distance that each pier must be from the other, measuring from centre to centre.

With a floating bridge there should always be a guard of skilled men on duty under an officer to repair accidents, bale out water, &c. &c. When casks are used, there should be pumps of tin small enough to be inserted through the bung, by means of which all leakage can be pumped out. These pumps are easily made.

In selecting the site for a floating bridge it is very desirable to choose one as near as possible to an existing road, especially if the banks are marshy or liable to inundation: to connect your bridge with the nearest hard road is often as heavy a piece of work as the construction of the bridge itself. If the bridge is to have defensive works thrown up for its protection, this factor must be taken into consideration when selecting the site, as a re-entering bend of the river is best suited for that purpose. Good holding-ground for anchors is essential; the close proximity of an island, or of a rock showing over the water to which the floating piers can be fastened by ropes, greatly helps the construction of a floating bridge. The length of

the piers should be at least twice the width of the roadway to secure steadiness, and they should be connected together at their extremities by *tie-baulks* or lashings. The waterway between the piers should never be less, and should if possible be more, than the width of the pier. Whether the piers be made of boats, casks, rafts, or of any other extemporized expedient, the *baulks or road bearers* (as they are often called) should not, except in the case of large heavy barges, be allowed to rest on the gunwales : they should rest on a beam, called the *transom* or *saddle*, which is placed longitudinally in the centre of the boat, cask, or other sort of pier made use of. When open boats are used, this saddle can generally be placed on the thwarts, which should be blocked up from underneath to bring the weight directly on the kelson.

Superstructure for floating bridges.—See general remarks on this head at beginning of article on bridges : the same rules apply to all military bridges.

For nearly all floating bridges it is necessary to construct piers from each bank, reaching out some distance into the water. To do so, the superstructure of the bridge is simply laid upon horses or trestles ; the former have 2 legs, the latter 4 or 6.

If the bridge is over a navigable river it may be necessary to make arrangements for the passage of boats through it, by arranging that one or two of the centre piers can be easily detached from the bridge and "dropped-out" when required, or half of the bridge may be arranged to swing to form the necessary opening.

THE PONTOONS used hitherto in our service are of two kinds, known as Blanshard's large pontoon and Blanshard's infantry pontoons. Both are cylinders of tin. The former is 19 ft. 2 in. long and 2 ft. 8 in. in diameter, and has hemispherical ends of 1 ft. 6½ in., making the total length of pontoon 22 ft. 3 in. ; it weighs 476 lbs. ; the displacement is 6735 lbs. The weight of superstructure for one bay is 986 lbs., 1023 lbs., or 1120 lbs., according as the interval between pontoons are either 8 ft. 4 in., 10 ft. 5 in., or 12 ft. 6 in., and the respective power of support per running foot of bridge is 581 lbs., 456 lbs., or 373 lbs. Two pontoons with their allotted superstructure, form a raft. A raft with superstructure for it, and the bay between it and another raft, is carried on one waggon (1560 lbs.) ; the whole weighing 4800 lbs., intended to be drawn by four horses, but requiring at least six. The infantry pontoon is a tin cylinder of 1 ft. 7 in. in diameter ; 12 ft. long with conical ends, making the total length 15 ft. 5 in. ; weight 141 lbs., displacement, 1640 lbs. ; the superstructure for one bay 200 lbs., making the supporting power of each pontoon 1300 lbs., or 200 lbs. per running foot of bridge. Five pontoons, with superstructure for

five bays, are carried on one waggon (1008 lbs.), the total weight of which with load is 2976 lbs.

Our new regulation pontoon is scow-shaped, and can be used either as a pontoon or as a row-boat; it is partly decked over: its length over all is 21 ft. 7 in.: width is 63 in.: depth, including coamings, 32 in.: weight about 900 lbs.: total buoyancy 13,000 lbs.: and tonnage for shipment, 9·685 tons. Each pontoon gives roughly 500 lbs. of buoyancy for each inch of immersion. They are placed in bridge at central intervals of 15 ft. Each is fitted with 4 rowlocks a side, and with 1 at each end for a steering oar. As a boat it can convey 16 men in marching order besides the crew of 4 (2 rowers, 1 bowman, and 1 coxwain). These 16 men should pack, 10 in the stern-well, and 6 forward: 4 minutes required to pack thus, and 3 to unload. A raft made of 2 pontoons can carry 60 soldiers across a river, either by warping or rowing: 6 men required for its crew. The *Superstructure* has been already described. The new *Pontoon train* is in units of 20 pontoons and 4 trestles, with which a river 120 yds. wide can be bridged. (The establishment of a pontoon Troop is given at page 49.) Waggons up to a weight of 5½ tons can be safely taken over such a bridge. Each pontoon waggon carries 1 pontoon and 15 ft. of roadway: each trestle waggon carries 1 trestle and 15 ft. of roadway. The newest pattern of these waggons weighs when empty 1828 lbs. each: tonnage for shipment without pontoon, but with superstructure, 7·502 tons. All the R.E. waggons are fitted with springs; the track of all their latest pattern waggons is 62 in: of the old pattern and newest pattern pontoon waggon it is 70 in. The pontooners can travel in the pontoons when loaded on the waggons.

The Berthon collapsible boat is now used for light infantry bridges: it can be used either as a boat or as a pontoon. The pattern adopted is, when open, 9 ft. long and 4 ft. wide: with each there are a pair of ash oars, four thole pins, 1 bottom and a removable thwart or seat: when folded up, these stores are fastened together and to the boat by 3 leather straps: the boat with the above-mentioned stores weighs about 109 lbs. and can be carried, slung to a bamboo or pole, by two men. The superstructure for one bay can also be carried in a similar manner by two men: its total weight is about 97 lbs.: it consists of, 1 composite plank, 49 lbs.: 1 trestle-saddle, 9½ lbs.: 1 anchor of galvanized iron, 15½ lbs.: 2 hemp 1½ in. cables 20 fathoms in length each, 20½ lbs.; 4 copper guys (to hold the trestle-saddle in its upright position in the boat), 1½ lbs.; and 3 straps, 1 lb. (to lash all these stores together into one bundle for convenience of carriage). *The composite plank* which forms the roadway, is 8 ft. long and 18 in. wide: it will support a weight of 10 cwt. at centre without breaking. This bridge equipment is in units of 12 boats each: each unit can bridge a stream 100 ft. in width. The canvas skins of the boats are waterproofed as follows:

1½ lbs. hard yellow soap, cut into thin shreds and boiled in 6 pints of water till well dissolved : mix in by degrees while the soap solution is hot, 20 lbs. of English spruce ground yellow ochre, add 2 lbs. of patent driers, and 2½ lbs. of best boiled linseed oil. Another good waterproof composition for cotton or canvas is : bees-wax, tallow and pitch in proportion of 2 parts by weight of bees-wax, 2 of tallow and 8 of pitch : melted over a slow fire, not allowed to boil, and kept stirred.

CASKS, RAFTS, AND BRIDGES.—The buoyancy of casks is ascertained by the following rule formula, $5\ C^2\ l - W$. where c is the circumference of the cask in ft. halfway between the bung and the extreme end : l is the length in feet, exclusive of projections, measured along a stave : and W is the weight of the cask. Or add together the area of the head, the area of a circle on the bung diameter, and the geometrical means between those areas : multiply the sum by one-third of the length of the cask (all these measurements to be in inches), and the result is the number of cubic inches of water displaced ; divide by 1728, and it is in cubic feet ; multiply that by 62·5 (number of lbs. in a cubic ft. of water) and the result is the weight in lbs. of the water displaced : subtract the weight of cask and you have its buoyancy. For example, a cask whose bung diameter is 25 in., head diameter 21 in., and length 31½ in. ; the area of the head is $21^2 \times \cdot7854$, that of the bung section $25^2 \times \cdot7854$, and the geometrical mean between those areas is $21 \times 25 \times \cdot7854$. The formula will therefore be

$$\frac{(21^2 \times 25^2 \times (21 \times 25))\ \cdot7854 \times 31\cdot5}{3} = \frac{(441 \times 625 \times 525) \times \cdot7854 \times 31\cdot5}{3} =$$

$$\frac{1591 \times 24\cdot74}{3} = 13120\cdot4 \text{ cubic in. of water displaced, and } \frac{13120\cdot4 \times 62\cdot5}{1728}$$

= 474·5 lbs. weight of water displaced. In many instances the number of gallons that a cask holds is known ; the buoyancy is then easily ascertained by multiplying that number by 10 (the number of lbs. weight in a gallon of water). The available buoyancy should only be calculated as $\frac{9}{10}$ths of the actual buoyancy, $\frac{1}{10}$th being allowed for leakage. It is seldom that one can obtain on service sufficient casks for the formation of a bridge across a wide river, but they are excellent adjuncts when the number of pontoons or boats is insufficient ; they form admirable rafts, and are so easily and safely transported, that for all wild expeditions, where transport is a matter of great difficulty, they are very commonly used by us. The larger the cask the better, as the weight will be smaller in proportion to the buoyancy than when small ones are used.

Casks bear grounding on mud better than boats, few of which will stand the weight of a movable load when grounded.

The following Table gives the dimensions, weight, and buoyancy of the casks most commonly in use in England.

Name of Cask.	Gallons.	Bung Diameter.	Length along the cask.	Circumference at ¼ length.	Weight empty.	Actual buoyancy.
		In.	Ft.	Ft.	lbs.	lbs.
Leager	170	38·5	4·52	9·33	252	1736
Butt	108	33·3	3·97	8·09	174	1125
Puncheon	72	30·7	3·20	7·57	140	773
Hogshead	54	28·6	2·76	7·05	119	567
Barrel	36	25·3	2·42	6·23	88	382
Half Hogshead	26	22·7	2·12	5·61	65	269
Kilderkin	18	20·3	1·18	5·02	49	185
Small Cask	14	18·3	1·76	4·49	32	146
,, ,,	6	13·8	1·37	3·40	20	60
Powder barrels { Whole barrel	..	17·5	1·58	4·26	28·5	115
Powder barrels { Quarter ,,	..	14	1·07	2·99	8·5	39
Commissariat Vats. { Ton	..	40	3·2	9·96	95	1477
Commissariat Vats. { ¾ ton	..	32	3·2	8·69	74	1134
Commissariat Vats. { ½ ,,	..	31	3·3	7·75	67	903
Commissariat Vats. { 4 ,,	..	27	2·5	6·61	51	499
Water Cask	..	..	..	..	..	50

Piers of casks should never be less than 20 ft. in length. They are formed in two ways; either placing the casks on their sides or on end, the casks fastened together either by lashing, or by spikes of wood or iron. Whenever

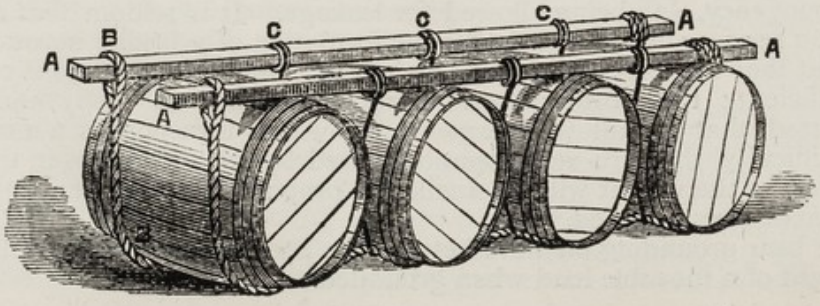


Fig. 26.

rope is to be had, it is much the best mode of fastening. For the first method, the casks are placed in a row side by side with the bungs up, two

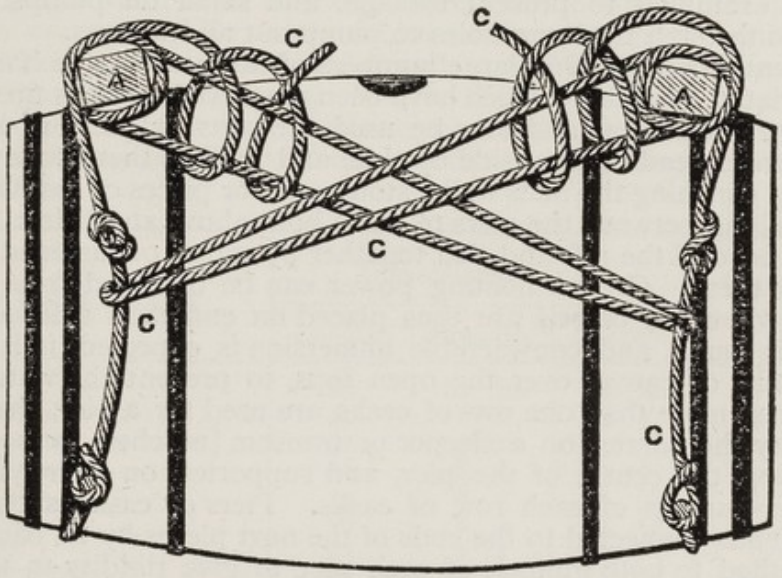


Fig. 27.

pieces of wood (about 4 or 5 in. × 5 in.) called gunnels (A, A) are laid along them about 4 in. from each end. Slings (B, B), of 2½-in. rope are passed under the casks from end to end of the gunnels; one end of the sling should have an eye-splice, or should have a loop large enough for the end of the gunnel to pass through it (to be made as shown by knot 5 at the end of this article). The other end, being drawn as tight as possible, is given a round turn over the gunnel and fastened by two hitches, as shown in knot 7. Between every cask there are lashings called braces (C, C, C) of 1½ in. rope, 18 ft. long: there should be an eye-splice at one of the ends, by passing the other end of the brace through which it is fastened to the sling. If there is no time to make this eye-splice, the brace must be fastened to the sling by a common running knot, taking care to have a common single knot on the end before making the running one. At about 1 ft. 5 in. from the sling a common figure of 8 knot, D, D., single knot is to be made. The accompanying sketches show how these braces (C, C, C) are then applied to bind together the gunnels (A, A) casks and slings (B, B).

When enough rope is not to be had, the gunnels must be nailed or spiked to the barrels, poles or scantling being placed below the barrels in the same way as the gunnels are above them, also spiked into the casks; the ends

allowed to project a little, and fastened with rope to the ends of the gunnels above. The use of spikes or nails in floating bridges is always to be avoided if possible, as they do not admit of sufficient play. The hoops should be frequently examined to prevent leakage, and small tin pumps should be made to go through the bung holes to pump out all leakages.

It frequently happens that large numbers of casks are to be had from the commissariat, the heads of which have been destroyed, used as firewood, &c. These have no bungs, and can be used for rafts or piers of bridges by placing them on end in rows side by side, and nailing them together where they touch, clinching the nails well ; stout poles or pieces of scantling should be nailed along between the rows of casks both above and below, their ends projecting beyond the raft and tied together by ropes, or fastened by planks nailed over them. Greater floating power can be obtained from the same sized raft when the barrels are thus placed on end than sideways ; but if the water is rough, and considerable immersion is expected, it is advisable to nail planks or canvas over the open tops, to prevent the water washing over. When more than one row of casks are used for a pier, the baulks of the roadway should rest on a sleeper or transom [notched to receive them] placed along the centre of the pier, and supported on short cross-pieces uniting the gunnels of each row of casks. Piers of casks should always have their ends connected to the ends of the next pieces by tie baulks, which must be lashed to both gunnels of each pier to give rigidity to the bridge. The baulks should overlap so as to rest also on both gunnels, and they should be lashed together at their overlap.

BOAT BRIDGES.—The boats available for rafts or bridges should be classed according to their dimensions, and their floating power determined. The tonnage of vessels is found as follows: L = length of keel between perpendiculars in feet—the breadth ; B = breadth in feet of broadest part. The tonnage $= \frac{L \times B \times \frac{1}{2} B}{83{\cdot}55}$. This only applies to large-decked vessels. For small craft and open boats, it is better to calculate the area of several sections of the boat below the *safe-load-line*, to obtain the cubic contents in feet of the space you can safely depend upon for buoyancy, upon multiplying which by 62·5 you have the number of lbs. of water displaced, which result, minus the weight of the boat itself, will give you the available buoyancy in lbs.

If you can put the boat into the water, the same result is easily obtained by loading it with unarmed men to the depth it is considered safe to do so. Multiply this number of men by 150 (the fair average weight in lbs. of ordinary soldiers), and the result will be the buoyancy in lbs. upon which you can safely depend. Or you can, when the boat is afloat, easily calculate the number of cub. ft. contained in the space between the waterline and

the safe-load-line, which, multiplied by 62·5 (the weight in lbs. of a cub. ft. of water), will give the safe available buoyancy in lbs. Open boats should not be immersed deeper than within 1 ft. of the gunwale even in the calmest water: in rough water or in a strong current or tideway, a still larger limit of safety is necessary. Boats should be anchored stem-on to the current, and should be slightly down-by-the-stern: in tidal rivers the boats should be placed alternately stem and stern.

The following table gives the dimensions and weights of boats used in our Navy, and may be useful in roughly determining the weights of other open boats.

Name of Boat.	Dimensions over all.			Weight in lbs.
	Length.	Breadth.	Depth.	
	ft.	ft. in.	ft. in.	
Launch	42	11 0	4 3	8400
Pinnace	32	9 0	3 3	4088
Do.	26	8 4	2 10	2926
Barge	34	8 2	2 9	2520
Cutter	30	8 0	2 8½	2016
Do.	23	6 11	2 6	952
Jolly Boat	25	7 3	2 6½	1092
Gig	30	5 6	2 2	518
Do.	22	5 6	2 2	518
Galley	32	5 6	2 2	1008
Whale Boat	27	5 2	2 1	728
Dingy	12	5 2	2 1	378

When the boats are of several sizes, the largest should be used where the current is swiftest, so as to allow having the greatest space possible between the boats there; it is advisable also to have the first and last boats large ones, as they ought to be less liable to great immersion for convenience in getting heavy carriages off and on them, to and from the banks or fixed portions of the bridge. In laying the flooring, the centre baulk of the roadway should be a little abaft the centre of flotation of the boats, so that their heads may rise a little to the current. In the passage of rivers by floating bridges, it is almost always necessary to construct the shallow portions nearest the bank with trestles, so that the casks or boats may have sufficient depth of water.

For good waterproof compositions, for cotton or canvas, and for the canvas skins of boats, see p. 411.

RAFTS OF TIMBER.—In a wooded country rafts are easily constructed,

and can be safely used where the current does not exceed 6 ft. per second, say four miles an hour. The sizes and description of the timber must determine the number of layers there should be. They must be put together in the water, each layer being placed at right angles over the one beneath it, and holes 2 in. in diameter bored at the points where they cross; the holes are bored through all the upper layers, and halfway down into the timbers of the lower ones. Pins of some hard wood cut to fit these holes, each having a wedge applied to a split in the end, are then passed through these holes and hammered, so that the wedges on reaching the bottom of the holes are forced into the stake, fixing it securely.

If timber used in rafts is not tarred or well coated with paint or varnish at the ends or where branches have been cut off, its weight will be increased about $\frac{1}{6}$th after a few days' immersion.

The cubic contents of round timber is found as follows: G is the means between the girths at both ends in feet and decimals; L is the length of log in same; $L(G^2 + \cdot07958)$ = cubic contents in feet.

The weight per cub. ft. of the following descriptions of timber is—

——	Cubic Feet Green.	Loss per 100 lbs. when Dry.
	lbs.	lbs.
Elm	58·5	37·6
Oak, from	58·74	33·15
Oak, to	69·5	31·1
Spanish Chestnut	54·6	30·6
Walnut	57·5	33
Poplar of Provence	50·96	..
Acacia	51·25	9
Larch, from	42·06	26
Larch, to	53·68	28·5
Spruce	50·2	42
Pine	51·08	47·3
Fir (white pine)	33·2	24
Poplar (American)	49·68	38·2

Any of these weights deducted from 62·5 (the weight in lbs. of a cub. ft. of water) gives the buoyancy of a cub. ft. of that timber. The floating power of a log is therefore to be ascertained thus. A spruce log is 30 ft. long, and has a mean girth of 2·75 ft. : $30(2{\cdot}75^2 \times {\cdot}07958) = 30 \times {\cdot}6 = 18 =$ number of cub. ft. in log. The weight of a cub. ft. of that timber when cut green is 50·2 lbs., which, deducted from 62·5, gives it a buoyancy per

cub. ft. of 12·3 lbs., and that result multiplied by 30 (length of log. in ft.) = 369 = its total floating power.

The timber for rafts should be floated, if possible, to the spot required. Ammunition waggons, with the boxes taken off, do well for carrying logs when required. It will always be a question of time whether in wooded countries it is most advisable to form bridges of logs, which require an immense amount of material, or of rough punts, which require comparatively but little material, but more time to make them.

Ferries.—Boats, or rafts made of boats, barrel piers, &c. &c., are often used to ferry considerable bodies of troops over rivers. I have seen very good rafts made of chatties for this purpose in India. These punts or rafts may be either rowed, poled, hauled across by a rope from bank to bank (this can only be done in narrow rivers of not over 50 or 60 yds. wide, and then only when there is not a strong current) or they may be hauled across by a hawser passing over the raft on rollers, or through hawse-holes made for the purpose in its sides or ends. If a wire-rope be stretched across from bank to bank, so as to be at its lowest point at least 3 or 4 ft. above the highest flood level, the ferry boat or raft may be fastened to it by a short line secured to a large ring working loose on the wire-rope, or to specially constructed running gear provided with pulleys so as to reduce the friction. The raft can then be easily hauled backwards and forwards by a line secured to each bank of the river, no matter how swift the current may be.

Flying bridges.—The principle of the flying bridge is the same as that of the schoolboy's kite, or of the fisherman's "otter." Long, narrow, deep, and heavy boats with vertical sides are most powerfully acted upon by the current; when possible "lee-boards" should be added to increase the action of the stream upon the raft; the raft, if possible, should consist of two boats or two barrel piers. The boat or raft must be kept obliquely at an angle of 55° (B D E in sketch), to the stream in all sorts of flying bridges. This is effected by means of a V-shaped line, A C D, like that of the kite to which the string is fastened; it should be about three times the boat's length, the ends being taken in or let out as required to secure the raft being always at the required angle with the stream. It is a good plan to have a mast fixed in the raft or boat, from the head of which a line extends to the bight on the cable at C, for the purpose of keeping the cable out of the water. One arm A C of the V being nearly twice as long as the other C D, the apex C being the point of union with the running gear on the overhead wire cable, or with the cable moored in mid stream. The accompanying sketch illustrates the mode of using flying bridges. The velocity of the current must be at least 2 miles an hour to make the raft act successfully, and straight reaches of a river should be selected as most free from irregularities of current. (See page 297 for the mode of calculating the velocity of a river.) Landing-stages on each bank should be constructed of

such a length as to secure a sufficient action of the current on the raft immediately when it is "cast off," and to prevent it "hanging" as it nears the bank; it is a good plan, when the force of the current near the bank is not strong enough to move the raft, to buoy out a line from the landing-stage into swift water in the raft's track, by means of which it can be hauled into shore when the action of the current ceases to act upon it. As a precaution, all flying bridges should carry an anchor and cable to let go in the event of moorings giving way.

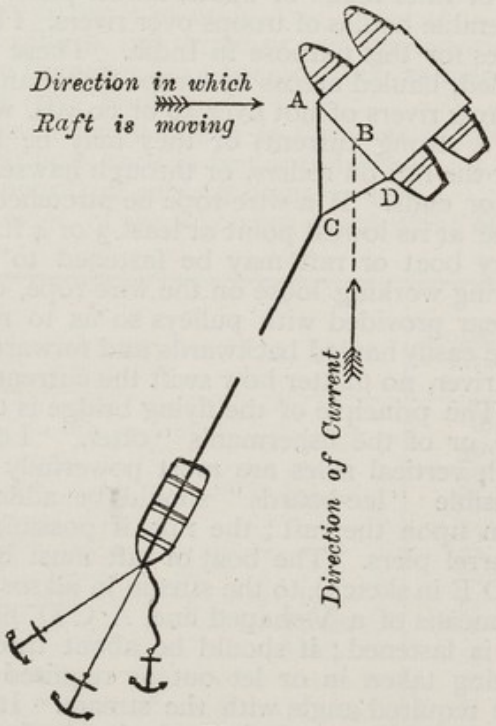


Fig. 28.

The principle of the flying bridge can be applied in several ways. A raft attached to an overhead wire cable or to a hawser, as already described in the foregoing remarks upon Ferries, can be propelled across a swiftly-running river if it be kept at the required angle with the current. This method is employed with advantage in India and in South Africa on rivers of 400 yds. and under in width. The method common on the Rhine and other European rivers is to have a swinging cable, the length of which should be about $1\frac{1}{2}$ to 2 times the breadth of the river. When the stream is

wide the cable must be supported on intermediate boats or buoys, to prevent it from impeding the motion of the raft by dragging in the water. If the river is wide, boats should be used, the cable being fastened to a mast, proportioned to the size of the boat, placed close to the bow. The boat nearest the up stream end of the cable should be moored with 3 anchors, as shown in sketch, the mooring cables being about 10 times the depth of water in that spot. Heavy anchors should be used if available. When there is a sharp bend, nearly approaching a right angle in the river, the end of the swinging cable can with advantage be secured to the bank near the angle, in a line with the middle of the stream where the flying bridge plies. If two cables of the required dimensions are available, and anchors of sufficient weight are not to be had, the up-stream end of each may be secured, one on each bank: the raft starting from the right bank swings to the cable fastened to the left bank, carrying over with it the down stream end of that secured to the right bank: having discharged its cargo on the left bank, it is then hauled up 50 or 100 yds., as the case may be, to the landing-stage on the left bank opposite that from which it started on the right bank, and starts thence to make its return trip, swinging from the cable secured to the right bank and carrying with it the end of the cable secured to the left bank. This method renders necessary the construction of four landing-stages when there is a cross-traffic from both sides.

To pass a light line across a river is very often necessary as a preliminary to the construction of a bridge. The simplest plan is to send it over by means of a strong swimmer, but this may be dangerous where there are alligators. It can be easily done by means of a large-sized fisherman's otter, made of a deep 2 in. board of about 6 ft. long and 1 ft. wide, weighted so as to float vertically.

Anchors.—There are two sizes in use with our new pontoon equipment, weighing 112 and 56 lbs. respectively. For large barges and in very swift or tidal streams heavier anchors should, if possible, be made use of.

Substitutes for anchors.—A wheel with the tire and felloes taken off, having small triangular pieces of hard wood nailed to the ends of the spokes, and a good strong spar of tough wood on the axle forming the shank, is a tolerable substitute for an anchor; one wheel should be reversed when two are used. Stones must be packed round the shank by means of wicker-work. A harrow well laden with stones answers fairly. When time and circumstances are favourable, piles can be driven obliquely above the bridge to hold the cables; 2, 3, or 4 should be driven in one behind the other, according to the force of the stream; a strut should run from the foot of each to the head of that in front of it, which should be notched to hold it; 2 or 3 pickaxes set upon the same shank, laden with stones, make admirable grapnels for small craft, particularly if an iron crowbar can be substituted for their wooden handles. A barrel with the head removed and stout

pointed stakes driven at right angles to one another through holes bored in the sides near the bottom, and projecting from them about a foot, having the cable fastened round these stakes where they cross inside the barrel, makes a good anchor; the barrel should be filled with stones, and have the head replaced or nailed on, to keep them in. Any strong box may be treated in the same manner. A good anchor can be easily formed thus: take two stout poles 6 ft. long, pointed at the ends, cross them in the centre at right angles, and lash them firmly to the end of the cable; build up on this foundation a cone of basket-work with a diameter of 3 ft. and a height of about 4 ft., filling it with stones or gravel as you proceed; at the apex where the cable passes out bind all together.

If there are railways near, the rails and other iron available will supply good materials for make-shift anchors. Nets filled with stones are very effective on rocky bottoms.

Cables.—Those supplied for our pontoons are of 3 in. hemp, the breaking weight of which, when new, is 3 tons. The best hempen ropes are said to lose from 25 to 50 per cent. in strength after about 6 months' use. With each of our pontoons there are 2 cables, each 180 ft. long, and 59 lbs. in weight.

Cables and ropes of all descriptions are distinguished by the number of inches in their circumference. When L is the length in fathoms, and C the circumference, the weight in lbs. $= (L \times C^2) \cdot 26$. Their breaking strain in tons $= C^2 \times \cdot 28$ for hempen ropes, and for common cables $= C^2 \times \cdot 2$. The safe working strain in cwts. is the product multiplied by 3.

The length of cable should always be at least ten times the depth of the water in which the boat, &c., is anchored, and seldom less than 90 ft.

Anchoring of floating bridges.—The cable should be attached to the ring of the anchor by *a fisherman's bend*: see article on *Knots* (post). It is very necessary to mark the position of the anchor in the river: this is easily done by fastening a small buoy to it. The buoy supports a small $1\frac{1}{2}$ in. rope, or "tripping-line," which is fastened to it by a *fisherman's bend*, and round the flukes of the anchor close to the crown with a *clove hitch* and with two *half-hitches* round the shank. This will enable the anchor to be "tripped," if there should be any difficulty in raising it subsequently. As a rule, there should be an up-stream and a down-stream anchor to every second pier of a floating bridge. If anchors are scarce, one may be made to do for two piers, especially on the down-stream side, by attaching the cables from two piers to one anchor. When regular iron anchors are used, before heaving them overboard see that their stocks are fixed properly. Timber rafts and cask piers bring as a rule a greater strain on anchors than boats or pontoons. The anchor should be taken out on a raft or boat and dropped over at the required place. For short bridges, if rope is plentiful, breast-lines at an angle of not less than 45° with the bridge should be passed both up and

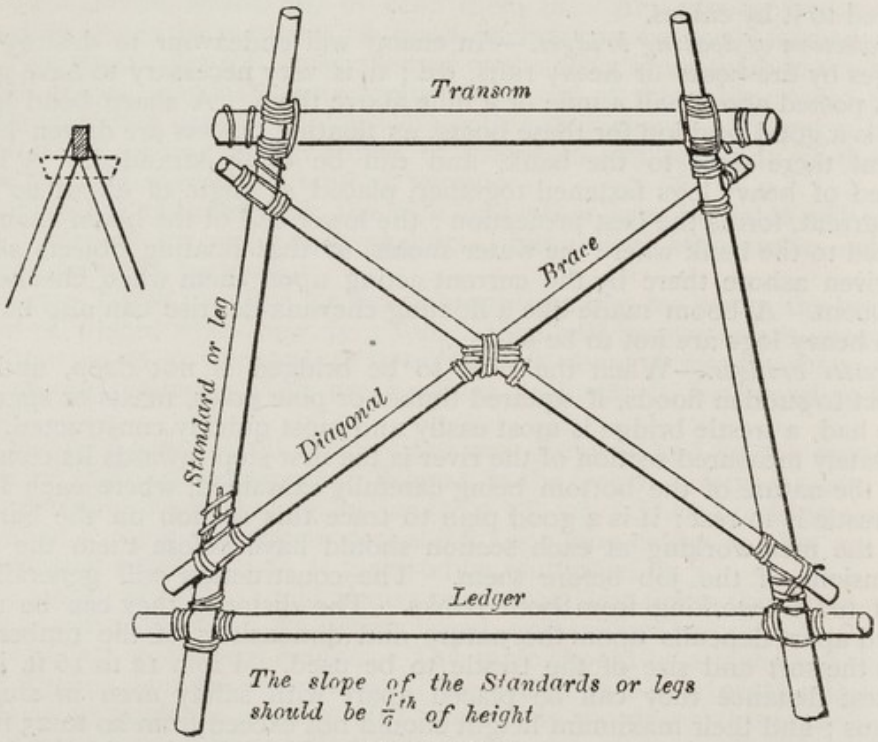
down-stream from the rafts to secure objects, such as trees, &c., on shore. If the current is rapid, or the river subject to flushes, too much care cannot be taken in securing floating bridges. If a strong hawser or a wire rope is to be had, it should be stretched across the river above the bridge, and the piers secured to it by cables.

Protection of floating bridges.—An enemy will endeavour to destroy your bridges by fire-boats or heavy rafts, &c.; it is very necessary to have guard boats posted about half a mile or a mile above them. A sharp bend in the river is a good position for these boats, as floating objects are driven by the current there close to the bank, and can be easily stranded. A boom formed of heavy logs fastened together, placed at angle of about 20° with the current, forms the best protection; the lower end of the boom should be secured to the bank where the water shoals, so that floating objects should be driven ashore there by the current acting upon them when checked by the boom. A boom made like a floating chevaux-de-frise can also be used when heavy logs are not to be had.

Trestle bridges.—When the river to be bridged is not deep, and not subject to sudden floods, if squared timber or pine poles, masts or spars are to be had, a trestle bridge is most easily and most quickly constructed. An accurately measured section of the river is the first step towards its construction, the nature of the bottom being carefully examined, where each leg of the trestle is to rest: it is a good plan to trace this section on the bank so that the men working at each section should have before them the exact dimensions of the job before them. The construction will generally be facilitated by working from both banks. The distance they can be safely placed apart depends upon the nature and dimensions of the timber and upon the sort and size of the trestle to be used. From 12 to 16 ft. is the greatest distance they can be placed apart with safety even in sluggish streams; and their maximum height should not exceed from 20 to 25 ft.

Trestle bridges can be strengthened by piles driven in after the trestles are fixed, one on either or on both sides of the transom to which they should be lashed or spiked. Trestles may be constructed with either 2, 3, or 4 legs. The 2-legged trestle is the simplest, and is made as shown in Fig. 29. The 3-legged trestle is merely a tripod, the tips of the 3 poles being lashed together at tops, their butts being secured by a triangle of 3 spars lashed or treenailed to them, so that the junction of the tips should be as nearly as possible over the centre of gravity of that triangle; the sides of that triangle should not, as a rule, be less than $\frac{3}{4}$ths, or more than $\frac{4}{4}$ths of the height of junction of tips from the ground. The 4-legged trestle is practically nothing more than the union of two 2-legged trestles, the butts of the trestles being kept apart by cross-ledgers, so as to form a triangle, the base of which should be half its height. This 4-legged trestle is commonly used in Europe for scaffolding and temporary bridges: Fig. 30 is a cross-section through

the transom or cap to show how it is let into the standards or legs ; the dotted line is a small piece of wood spiked across the tips of the legs on which the transom or cap rests : it adds much to the solidity of the 4-legged trestle.



Figs. 29 & 30.

In America, where so many sorts of pines grow to great heights as straight poles, trestles were used during the Confederate war to a considerable extent in the bridging of the smaller-sized rivers, and in the repair or construction of railway viaducts, and bridges ; in many instances they were used in several tiers, one over the other. When several tiers had to be resorted to, the legs of the lower ones should conform to the depth of the river, so that when in position the caps or transoms should all be in the same horizontal plane. The trestles in each of the tiers above could then be made of exactly equal dimensions, which, in a great undertaking, greatly facilitated and hastened the completion of the work. In almost all instances the Americans used sills to their trestles, which is much the best form when the river-bed is of clay or mud, and the butts of the legs or standards cannot

then sink much. In the sketch the trestle is fastened together with lashing in the manner taught in all our military schools, but the Americans almost invariably used treenails of hard wood of from 1 to 2 in. in diameter, according to size of timbers used in the trestles: an axe to cut and drive them and an auger to bore the holes are alone necessary, whereas the rope required for the lashings of even a medium-sized bridge would weigh tons. *The lashings* are of $2\frac{1}{2}$ in. rope; those required for a 2-legged trestle are 6 of 30 ft., and 3 of 15 ft. long: for the 4-legged trestle, 8 of 30 ft. and 14 of 15 ft. long: for the 3-legged trestle, 12 of 30 ft. and 6 of 15 ft. long. The Americans often used trestles of 25 ft. in height, the common form being that of an inverted W, with a horizontal brace across the four legs of that letter. When, however, the bottom is rocky or very uneven, sills must be dispensed with, and two strong ledgers used instead, being fastened on each side of the legs as near their butts as the unevenness of the bottom of the river will permit, and so that these ledgers may rest on the bottom.

Trestles can only be used in deep water—particularly if there is much current—by loading them below with stones or other weights. The simplest method of applying these weights is by means of basket or light crib work being constructed round the bottom of each leg, or, when four-legged trestles are used, by surrounding the lower part of the space included within the four legs with crib work, and filling it with stones.

The mode of lowering these trestles into position is shown in Fig. 31. A is a boat or raft about 6 ft. wide and 25 ft. long, kept temporarily in position by two poles, *s s*, stretching from it to the bank where they rest upon a pole, *x x*, about 5 in. in diameter, to which they are pinned or lashed at a sufficient distance apart to allow of the trestle being shoved out and eventually lowered between them; this distance will of course depend upon the extreme breadth of the trestle to be placed in position.

The trestle nearest the bank being usually a small one in shallow water, we will suppose it placed, and the roadway finished out to it. The trestle to be fixed next, having been put together on the bank, is pushed out on rollers, legs foremost, to the end of the made portion of bridge; a pole, *g g*, about 5 in. by 5 in., and 25 ft. long, is temporarily lashed over the outer legs at a distance from the cap of about a third of the trestle's height; a guy rope, *y y*, is fastened at its middle by a clove hitch to the cap, one end to be held on shore, the other on the boat. The trestle is shoved out so that the ends of *g g* shall rest on the poles *e f*, *e f*, at each side until it begins to topple over, when, by means of the guy rope, it is brought into a perpendicular position, as shown in sketch. It can thus be hauled out close to the boat by a rope passed round *g g*, and lowered until the legs rest on the bottom, by gradually loosening off the lashing fastening it to the pole, *g g*, which will then be removed for use with the next trestle.

If it is found that the bottom is so uneven that the trestle is not vertical,

the trestle should be swayed backwards and forwards by means of the guy ropes while it rests upon the leg which is too long; this will make a hole for it, and cause it to sink as far as required, if the bottom be of sand or gravel.

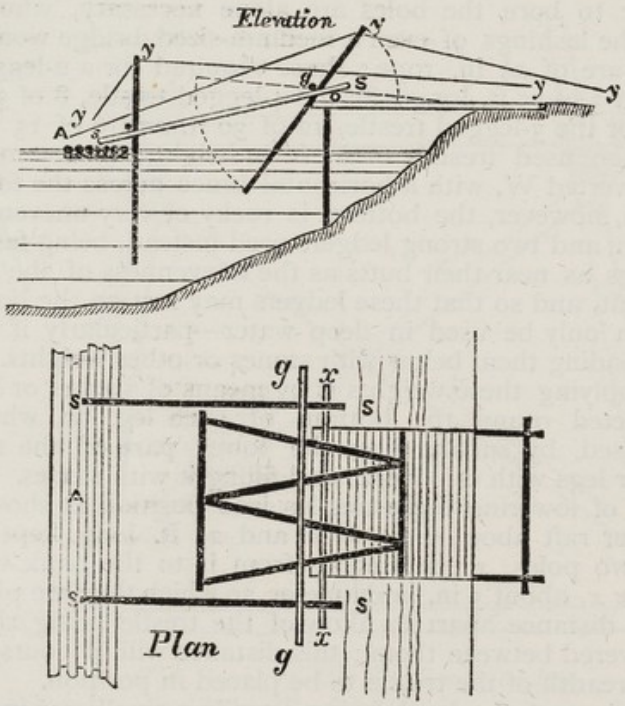


Fig. 31.

Crib piers.—For rivers where the stream is rapid, or where freshets are to be expected, the bridges should be constructed on piers of cribwork, if wood is plentiful.

A crib pier is made as follows: Say the pier is to be 18 ft. long and 4 ft. wide at top, and 15 ft. high, the sides having a slope of $\frac{1}{6}$th their height. The frame to form the base of such a pier would be 23 ft. long and 9 ft. wide [outside measurements]. To make this frame, lay down on the bank two logs or beams, A A, 24 ft. long, and about 15 in. in diameter; place under them three round poles, B·B·B, of about 6 or 8 in. in diameter, to act as rollers for facilitating launching. These logs form the sides, and should be 7 ft. apart. Across their heads and centre place three others, C C C, 10 ft. long, and of the same thickness, having an interval between each of about

9½ ft. These five logs are each notched 3 in. to receive one another, and pinned together with 2 in. treenails: Fig. 32 is a plan of the frame forming the base of the piece; Fig. 33 is a longitudinal section through pier when finished.

Cross-pieces of about 6 in. stuff are then pinned on at about 1½ ft. apart, and covered with about 2 in. thickness of brushwood, which is kept in its place by a few heavy stones placed on it. If no stone is to be had, gravel or clay, inclosed in canvas bags—to be tarred if possible—may be used instead. A few courses of timber [if possible not less than 9 in. in diameter] to be then added on to the sides, ends, and centre brace, one over the other, all being scored on both sides to a depth of 2 in. and pinned to one another, care being taken that a batter of $\frac{1}{6}$th their height is given to the sides and ends.

Fig. 33.

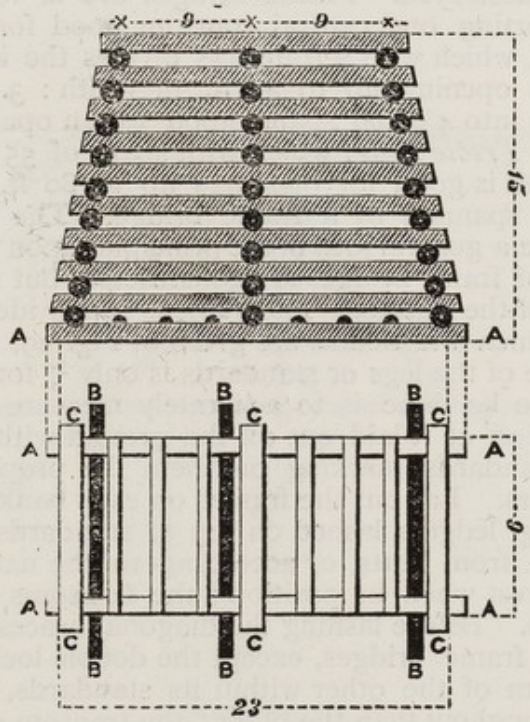


Fig. 32.

The pier is then launched, and when in sufficiently deep water laden with stones so as to sink it nearly to a level with the upper course; a few other courses being then added, it will be towed to the position it is to occupy, and sunk by adding more stone, completing the courses of timber

until they reached the required height. The inclosed space should be filled with stone up to the highest water mark.

A pier of this description will bear any truss, or, if necessary, trestles like those in Fig. 29 may be erected upon them. If stone is not to be had, clay or sand can be used by lining the inside with closely-made hurdles, having a layer of moss or leaves next to them.

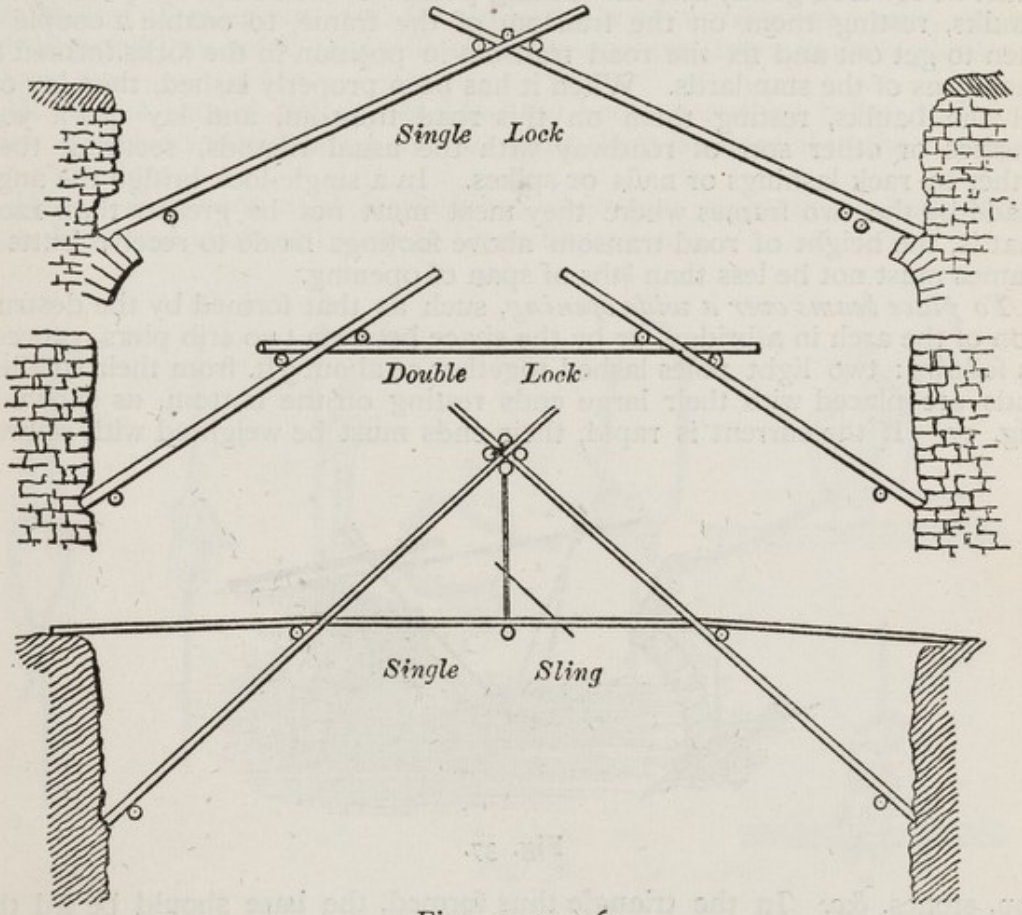
Wharves or piers can be made by a similar process in places where the action of waves would probably carry away trestles or piles, inclosing the space required for the pier with cribwork and filling it in with stone.

All these plans are calculated for large bridges. Smaller ones with a clear width of 8 ft. of roadway can be made in a similar manner.

Frame bridges are useful in bridging canals or the ditches of large works, or to restore communication over a masonry bridge, one or more of whose arches have been destroyed. Frame bridges are of four sorts:—1. The *Single lock*, supporting one central transom good for a span of 30 ft.: 2. The *Double lock*, which with 2 transoms divides the bridge into 3 spans, good to bridge an opening up to 45 ft. in width: 3. The *Single sling* dividing the bridge into 4 equal spans, good for an opening up to 60 ft. in width: and 4. The *Treble sling*, which with spans of 55 ft. in length makes a 6-span bridge, and is good for openings up to 80 ft. wide, the extreme limit which can be spanned by a frame bridge. The following sketches, Figs. 34, 35, 36, give a general idea of the principles upon which the three first of these four sorts of frame bridges are constructed, but no attempt is made to give the details of the frames. The frame is nearly identical with the two-legged trestle, of which the details are given in Fig. 29, the chief difference being that the slope of the legs or standards is only $\frac{20}{8}$ for frames.

The first thing to be done is to accurately measure the opening to be bridged, and a section of it laid out on the ground with lines and pickets: lay out on it the standards, marking on them the proper positions for the transoms and ledgers. Lay out the frames on each bank, butts of standards towards the opening, ledgers lashed on top of standards as they lie thus on the bank about 2 ft. from butts, or according to the nature of the footings where butts are to rest when in position; the transoms to be lashed underneath the standards. Before lashing the diagonal braces, square the frames carefully; as in all frame bridges, except the double lock, one frame has to rest on the transom of the other within its standards, one frame must be 18 in. narrower throughout than the other; the transom of the narrow frame should be 18 in. wider than the width of roadway in the clear between ribands. Drive bollards or pickets for guys and foot ropes. Attach fore and back guys and foot ropes to each frame, the latter fastened with a timber hitch round the standards below the ledgers. Cross the fore guys, passing those of the narrow frame between the horns of the broad frame. Whilst the frames are being constructed, the places where the butts of the

standards are to rest must be carefully prepared; these footings must be correctly square and on the same level throughout on both sides of the opening, or the frames will not lock properly. Great attention must be paid to the various lashings (the strongest lashings being used for the road transoms) and also to the positions of the transoms, and distances apart of the standards, as on these points depend the strength and stiffness of the



Figs. 34, 35, 36.

bridge. Wedges with well-rounded points are useful for tightening the lashings; they should be driven so that the points may be downwards to prevent their dropping out. The butts of the frames, one at a time, must then be pushed out over the opening nearly as far as the footings prepared for them are below the level of the roadway; then raise the frames, the foot ropes holding them suspended, until the butts of the standards reach

these footings, when the foot ropes must be slackened off until the butts are in position; until the frame arrives at a vertical position it must be steadied by its back guys, the ends of which should be given a turn round a bollard or stout picket post; when vertical it may be necessary to haul gently on its four guys to get the butts of the standards into the footings prepared for them. Both frames being thus raised to a vertical position on these footings must be lowered gently into the locking position. Send out temporarily two baulks, resting them on the transom of the frame, to enable a couple of men to get out and fix the road transom in position in the forks formed by the horns of the standards. When it has been properly lashed, then lay out all the baulks, resting them on this road transom, and lay down your chesses or other sort of roadway with the usual ribands, securing them either by rack lashings or nails or spikes. In a single-lock bridge the angle made by the two frames where they meet must not be greater than 120°, that is, the height of road transom above footings made to receive butts of frames must not be less than $\frac{2}{7}$ths of span of opening.

To place beams over a wide opening, such as that formed by the destruction of the arch in a bridge, or by the space between two crib piers, proceed as follows: two light poles lashed together at about 3 ft. from their smallest ends are placed with their large ends resting on the bottom, as shown in Fig. 37. If the current is rapid, their ends must be weighted with railway

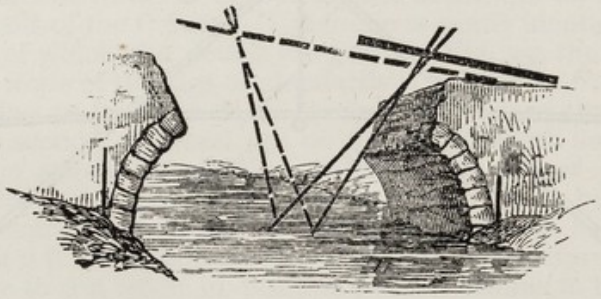


Fig. 37.

iron, stones, &c. In the triangle thus formed, the base should be $\frac{1}{3}$rd the height. The beam is then shoved out a few feet through the fork thus formed, which is then hauled out over the opening by ropes; should it be impossible to get any one to the other side for this purpose, the beam being temporarily lashed to the fork can be pushed out, until its far end reaches the other side. The dotted lines in the sketch show the beam when nearly over. In this operation it is necessary that the breadth of the opening and the height of the roadway over the bottom where the poles must rest

should be accurately computed, so that the beam may be lashed to the fork at the exact place which will insure the end reaching precisely the required spot.

A Table giving the specific gravity of various trees will be found in the article on "RAFTS."

In collecting materials for bridges, the following articles are the most important: tow, tar, pitch, bees-wax, canvas, paint, putty, white-lead, varnish and all other materials for rendering boats waterproof; nails, spikes, crowbars, all iron work that will serve for anchors, rope, barrels, planking, beams, &c.

All officers should practice making the knots described below: a knowledge of their uses and being able to make them is essential in the construction of bridges.

No. 1.—*Reef knot*, used for lashings when two ropes, or the ends of one rope, have to be fastened so as to be easily undone.

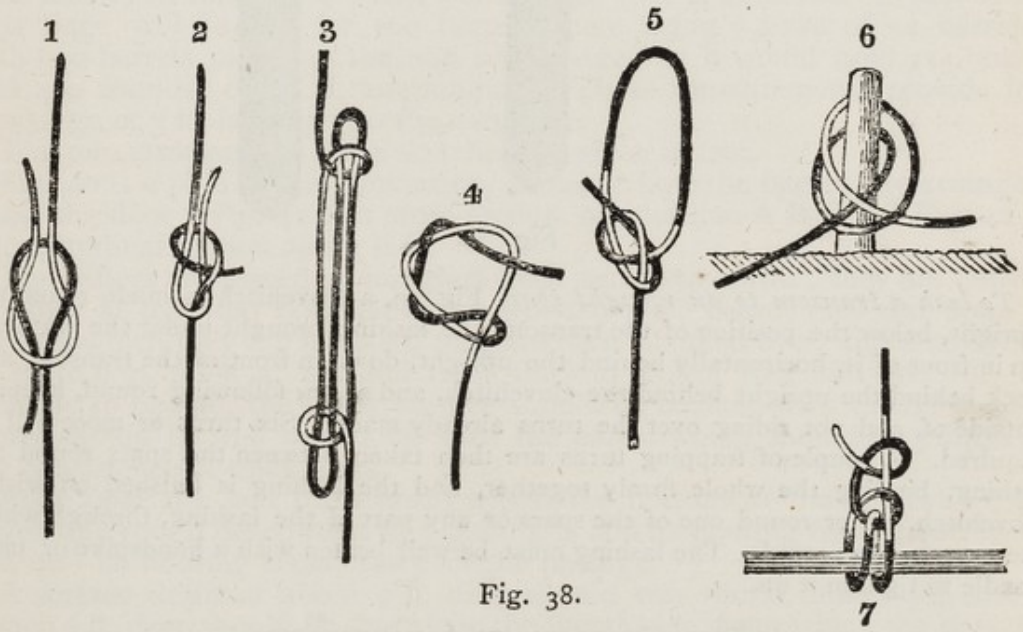


Fig. 38.

No. 2.—*Single sheet bend*, for joining two ropes, or fastening a rope to a loop; it can be made much more secure by passing the lower rope twice round the loop.

No. 3.—*Sheepshank*, for shortening a rope when both ends are fastened.

No. 4.—*Timber hitch;* as long as strain is maintained it cannot give way, but immediately it is taken off it comes undone easily; it is useful in dragging material from place to place.

No. 5.—*Bowline*, invaluable in making a loop at the end of a line ; it is difficult to undo ; it is useful for making the drawloop of slip-nooses.

No. 6.—*Clovehitch*, for making fast breastlines and painters ; it binds with great force.

No. 7.—*Fisherman's-bend*, for making fast cables to anchors or spars.

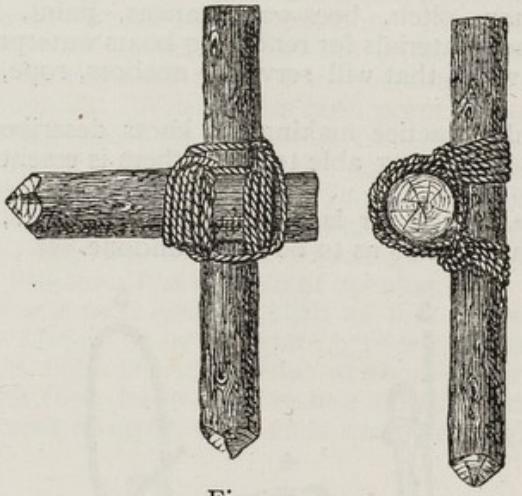


Fig. 39.

To lash a transom to an upright spar, Fig. 39, a clovehitch is made round the upright, below the position of the transom, the lashing brought under the transom, up in front of it, horizontally behind the upright, down in front of the transom, and back behind the upright behind the clovehitch, and so on, following round, keeping outside of, and not riding over the turns already made. Six turns or more will be required. A couple of frapping turns are then taken between the spars round the lashing, binding the whole firmly together, and the lashing is finished off with a clovehitch, either round one of the spars or any part of the lashing, through which the rope can be passed. The lashing must be well beaten with a handspike or pick-handle to tighten it up.

THE CUSTODY OF AMMUNITION.

All ammunition not contained in the waggons accompanying the army must be placed in magazines built for its reception, or in houses of the country selected for the purpose ; storage for a large quantity will be required at the base and intermediate depots. At the base the houses selected for it and the combustible stores should be at least 1000 yards away from any town or other storehouses.

If buildings are to be had, those of one story, and of the most substantial nature should be selected ; all lofty ones, unless provided with conductors, to be avoided ; a church without a steeple, or, better still, a jail should be chosen if possible. To prepare them for the reception of powder, all windows, except those actually required for light and ventilation, should be built up. Buildings roofed with wooden shingle or thatch, to be avoided ; if nothing but a wooden-roofed house is to be had, it should be strengthened so that it will bear a covering of 6 in. of sodding. If the sides as well as the roof are of wood, an embankment of mud, if possible, faced next the house with stone set in mud should be built up all around it, so that no woodwork should be visible from the outside. All inflammable substances to be removed as much as possible.

Field Magazines.

When there is good natural drainage, an excavation of $3\frac{1}{2}$ ft. deep, 7 ft. wide and 17 ft. long, with a roof constructed over it as shown in sketch on next page, will do well for 100 barrels, there being 7 rows of 14 barrels, with two barrels placed at the end of passage ; or it would hold 714 boxes [428,400 rounds] of M.H. ammunition. These measurements provide for a passage of 3 ft. leading into the magazine.

The measurements in these sketches are given in feet.

Fig. 40 is a plan of the excavation, showing how the barrels are arranged along the floor : Fig. 41 is a cross-section on the line A B C D ; Fig. 42 is a longitudinal section along E F.

The rafters are placed 18 in. apart from centre to centre ; they are halved together at top, and fastened with a wooden pin ; below, they rest upon a sill into which they are notched, they are then planked over, and a covering of earth 6 in. thick at top and 12 in. thick at foot of roof laid over all. If sods are to be had, the outer surface should be covered with them ; if not, straw should be well mixed up with the earth, which should be put on in the consistence of thick mud.

Four poles are laid transversely across the bottom of the excavation, on which any rough description of planking is laid as flooring for the barrels to rest on—no flooring is necessary for the passage.

A surface drain of about 2 ft. deep should run round three sides, and a trench 6 ft. deep should be dug along the fourth side, from which the passage opening into the magazine will be cut at one end ; care to be taken that there should be good drainage from this trench into some neighbouring watercourse.

The materials required for this magazine would be 24 rafters 7 ft. long, not less than 4 in. in diameter at smallest end, if made of poles, or 5 in. × 2 in. if made of scantling ; 11 poles of same dimensions and 2 poles 10 ft. long, to support planking of inside walls ; 4 poles of 7 ft. long to lay flooring on ; 580 square feet of planking not less than one inch thick ; a

door 5 ft. × 2½ ft., and two door-frames; one for the door and one to support the planking forming the porch outside. The barrels can be laid on loose stones if scantling and planks are scarce.

Magazines that may be exposed to the enemy's fire require a substantial covering of earth.

The sketch on page 433 is of a magazine for a field-work [to contain 72 barrels of powder] where there is plenty of interior space. The measurements are given in feet.

Fig. 42.

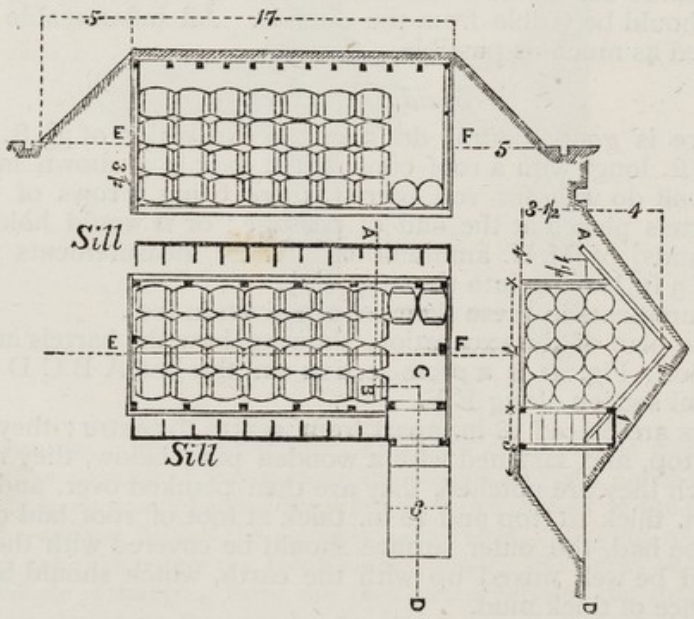
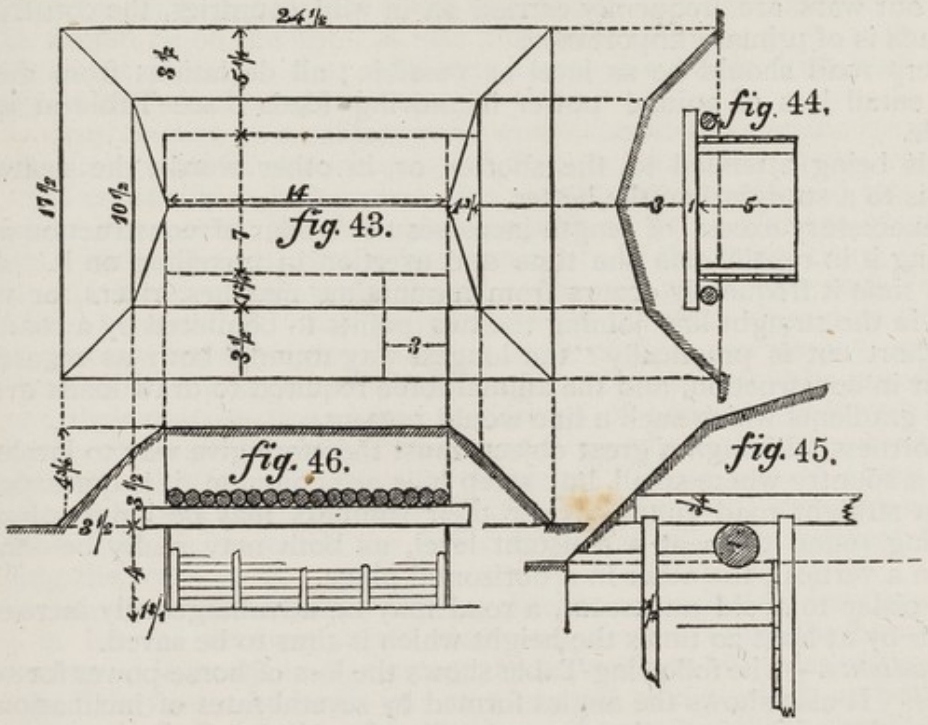


Fig. 40. Fig. 41.

Fig. 43 is the plan, Fig. 44 the cross section, Fig. 45 is an enlarged section showing part of the passage and the uprights retaining the side planking; Fig. 46 is a longitudinal section. The splinter proofs to be of trees, 9 in. in diameter; they are laid along the long sides of the excavation; the earth is retained on the inside by planking or hurdles, kept in position by small poles or scantling of about 3 in. stuff sunk a foot in the ground, and let in above 3 in. into the splinter proofs, as shown in Fig. 45.

The excavation is 14 ft. long, 7 ft. wide, and 4 ft. deep; including passage, it amounts to 455 cubic ft. The earth required for the covering is 925 cubic ft., the excess would be supplied from the drain of 2 ft. deep

round 3 sides, and from the trench of 6 ft. deep along the side where the passage leads into the interior.



The materials required would be 5 splinter proofs 9 in. × 9 in., and 11 ft. 6 in. long for roof of passage and of magazine opposite passage ; 16 splinter proofs 9 in. × 9 in. and 10 ft. long ; 2 wall-plates 12 in. × 12 in. and 16 ft. long ; 17 uprights to retain planking 4 in. × 4 in. and 6 ft. long ; and 330 square ft. of any planking above an inch in thickness. For every additional dozen barrels the length of the magazine must be increased 22 in., which will increase the amount of excavation by 61½ cubic ft., and the earth required for covering by 78½ cubic ft.

When the interior space is limited in a field-work, the magazine should be placed under the parapet as shown in this section.

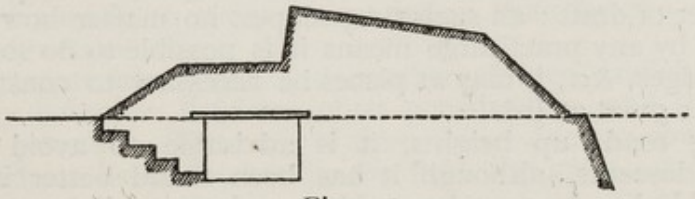


Fig. 47.

ROAD-MAKING.

As our wars are frequently carried on in wild countries, the construction of roads is of primary importance.

Every road should be as level as possible; all deviations from the true level entail loss of animal power in moving loads; see Table at end of Article.

This being attended to, the shorter, or, in other words, the nearer the road is to a straight line the better.

Unnecessary excess of length increases the labour of construction and of keeping it in repair, also the time and exertion in travelling on it. At the same time it frequently occurs from mountains, marshes, rivers, or valleys lying in the straight line joining the two points to be united by a road, that the short cut is practically "the longest way round," both as regards the labour in construction, and the animal force required to draw loads over the steep gradients which such a line would present.

Shortness, although a great object, must therefore give way to levelness.

In a country where small but steep hills are common, it is quite possible that a straight road running over their summits may be longer than one winding round them at a constant level, as both may really be straight, one in a vertical, the other in a horizontal plane.

In order to avoid an ascent, a road may be advantageously increased in length by at least 20 times the height which is thus to be saved.

Gradients.—The following Table shows the loss of horse-power for several slopes. It also shows the angles formed by several rates of inclination, and the number of feet ascended in every mile of road of such slopes.

There is a vast difference between the duty of an officer laying out a road during a campaign for immediate use, and of an engineer doing the same for a permanent highway in peace. The latter will, within certain bounds as regards expense, sacrifice everything to keep his gradients as low as possible, say to the about 1 in 30, which is generally regarded as the maximum on first-class roads. The officer, on the other hand, dare not commit himself to large cuttings, embankments, or bridges, and must therefore submit to frequent undulations and steep gradients, so long as they do not exceed 1 in 15. It may be necessary, however, at some points to go so far as 1 in 10, as horses for short spurts can quadruple their ordinary power of draft; all such steep slopes, no matter how short, are to be avoided, if by any practicable means it is possible to do so. For ramps leading to bridges, &c., it may at places be necessary to construct them at a slope even as great as $\frac{1}{3}$rd.

In carrying roads up heights, it is advisable to avoid having any considerable descents, although it has been found better in the mountain roads of India, in very long rides, to have a slight counterslope of

about 30 yds. every 500 or 600 yds. to ease the traction and prevent any great flow of water down the road. The gradients should be even, being, if necessary, somewhat steeper below than above. In zigzagging up hills, the curves should be on the level, as also a distance of about 50 ft. at the top of each straight piece, so that with long teams the whole draft may not be thrown on the wheelers at the turns.

The Cross Section on a military road where considerable traffic is expected, should show a minimum width of 16 ft.; at particular spots where the labour of construction is excessive, this may be even be reduced to 14 ft. for very short distances. Whenever it is possible to do so without great extra labour, a width of 24 ft. should be given, 17 ft. in the centre being macadamised. If, however, the traffic is not to be very great, only 10 ft., or even 8 ft., need be metalled. In zigzagging up hill the width should be $\frac{1}{4}$th more at the curves when the zigzags form an angle of from 120° to 90°, and one-half more when the angle is from 90° to 60°. Roads should be raised in the centre; their cross-section should be formed of two straight lines having a rise in the centre of the road of from 4 to 6 in., where the lines meet being rounded off; this fall will suffice for drainage. Those formed along a hill-side should be in a single slope of $\frac{1}{8}$ from the outer to the inner edge, where the drain will be, to catch the water from the hills and prevent it from reaching the road.

Drainage is provided for by digging ditches on each side, leaving a space of 24 ft. for the roadway; their size must depend upon the humidity of the country. If meant to "intercept the water from hill sides rising above the road" they must be large, but as a general rule a width at bottom of one foot will suffice; their side slopes to be 1 to 1. They should lead to the gullies, &c., forming the natural drainage of the country.

To lay out a road.—It being necessary to connect two points, A and B, by a road, it must be remembered that one which will last for a year or two at the utmost is all that is generally required. The highways constructed between Balaclava and Sebastopol plateau remain now as a monument of our ignorance of military requirements in such matters. Although the road may only be wanted for one or two campaigns, yet it will, in most instances, have to sustain an immense and constant traffic, sometimes by night as well as by day. This continual wear must be provided for more by arranging for its frequent repair by gangs of men told off permanently to every 3 or 4 miles, than by the character of its original construction.

The time, materials, tools, and number of men available for the work must greatly influence the form of its construction, and therefore the line that is to be selected. The more of these things one can count on, the more level the road can be made, but in the field the great art is to make the most of resources at hand.

A map, showing the country between the two points to be united by a road, is of great importance. If one cannot be obtained, a rough, traversed survey must be made of the footpaths following the required line. Rough horizontal sections to be made along them.

If there is not time to do so, the heights must be estimated by the eye, or by means of an aneroid barometer. (See Article on "BAROMETER.")

The difference of level between the termini and the highest point to be crossed having been thus ascertained, and divided into the distance between those points, will give the general gradient. If it is too steep, the ratio must be increased by adding to the length of the road by carrying it round instead of directly across hills. Thus if the difference of level is 500 ft., and the gradient has been fixed at 1 in 20, the road must be at least 10,000 ft. long.

Take the road over gravel as much as possible, for with such a subsoil the drainage is always good, and no metalling is required.

When the country is hilly or much intersected by rivers, there will generally be certain points in the line to be followed, by which the road must pass, such as low gaps in hills, fords, or parts of rivers, favourable for the construction of bridges. Such points are to be noted at once on the map, and all attention turned towards deciding the line the road is to follow in connecting them. There will also be some obstacles, such as precipices, ponds, marshes, of such a self-asserting nature, that if by any possibility they can be avoided the road must pass round them.

In laying out roads, follow as much as possible the course of streams running in the required direction.

In crossing a range of hills or mountains, a line of road should be sought for wherever it is found that the sources of streams flowing down the opposite slopes approach nearest one another.

When time and labour is of great consequence, it is sometimes easier to carry a road by zigzags over a hill than by following the course of the stream, where cuttings and considerable blasting may be necessary. In doing so the fewer the zigzags the better.

In deciding upon a line of rail through forests, the highest trees should be climbed to obtain a good view; the course selected to be marked by notching the trees with an axe as you go along.

In the open, the line should be marked out by small piles of stones or stakes at every 50 yds., curves or zigzags being lock-spitted where necessary.

Construction of the road.—The centre of the road having been marked out by pegs or small piles of stones, a practicable path, 5 ft. wide, should be made along its entire length to facilitate subsequent work. Lines scored with a pickaxe, or marked by stones, put 2 or 3 ft. apart, should be laid down on each side to mark the outer edges and the position of the ditches.

In some places the earth from the ditches will be required to raise the road, but in general it is advisable to throw the excavated earth on the outside. The width the road is to be must then be cleared, all large stones broken small, and trees rooted up from it.

When it is possible to pull trees down by ropes fastened to the uppermost part of their stems it is better to do so, the roots being cut through for that purpose.

In levelling the surface for the reception of the broken stone, a common plough can be used with great advantage in skimming off irregularities of surface.

In running roads through woods, the trees should be cut down for 20 ft. on each side of the road, the stumps being left in the ground; the timber can be used in construction or burnt.

Metalling.—As soon as the line has been approximately determined upon, the largest available number of men to be set to work along it, breaking stones or collecting gravel or timber, according to the material intended to be used. The stone hammers should weigh 1 or 1½ lb., with heads 5 in. to 6 in. long, and 18 in. handles for use when sitting, or 3 ft. long when standing. For every 10 of such hammers there should be one weighing 2 or 3 lbs., 6¾ in. long in head, with a 3 ft. handle.

The stones to be broken up so that each piece should be about the size of a hen's egg.

The best stone is that which is hardest to break up, such as whinstones, basalts, sienitic granites, and beach pebbles; soft granites, sandstones, and the ordinary limestones are bad, but for military roads whatever may be the stone at hand it must be used; if there are several kinds available, but in limited quantities, the hardest description should be reserved for the surface. The slag from furnaces is a good material. A medium labourer can break in a day from 1½ to 2 cub. yds. of soft, or from ½ to ¾ cub. yd. of hard stone. Broken stone occupies twice as much space as when solid.

When the road has been levelled, and prepared for metalling, if there are plenty of loose stones about, of 4 or 6 in. in diameter, have them placed on it so as to form a well-packed covering of about 6 in. in thickness. Over this layer lay another of about 4 or 6 in. of stones broken up to egg size, as already described. Sand-bags are useful for collecting stones, a bag of some sort or other being given to each man of the party told off for that work. Sometimes it is not possible to do more than collect the stones lying about, and throw them on the track prepared for their reception: in such cases, gangs of men provided with long-handled hammers should be employed to break up the largest-sized stones on the surface. When nothing but gravel is to be had, it should, if possible, be mixed with a proportion of loam, to bind the pebbles together.

When the road has to be taken along the side of a hill, it is made half in

excavation and half in embankment. The diagram explains itself. The steps, *a a a*, are cut to prevent the earth slipping, and the ditch, *b*, is intended to prevent the surface drainage from reaching the road.

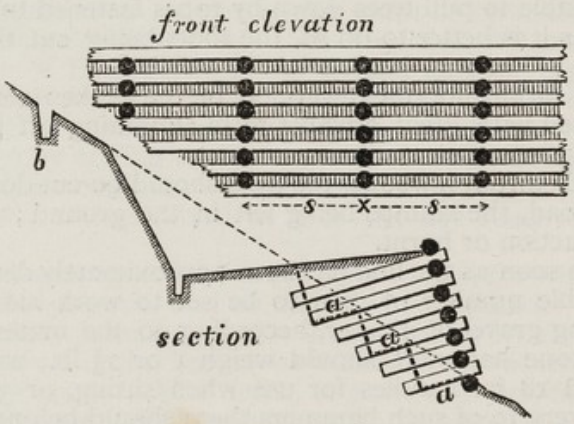


Fig. 48.

Retaining Walls.—The angle at which the soil will stand decides whether retaining walls are necessary or not.

Owing to the steepness of a hill round which a road is to be carried, it may be necessary to support the outer slope of the made portion by a revetment wall of dry masonry built with a slope of 3 in. in every foot, and having a thickness at top of $2\frac{1}{2}$ ft.

The largest possible stones should be used; those with rounded surfaces must be broken with the hammer before they will bind. There should be a parapet wall of about 2 ft. above the road. When wood is plentiful it should be used in preference [the larger it is the better], being built up with a slope of 2 in. to every foot; the timbers are kept in position as shown in the diagram. The braces should be 8 ft. apart, and sunk at least 3 ft. into the firm unmade ground; they should be notched into the timbers forming the retaining wall, as shown in Fig. 48.

Corduroy Roads.—In well-wooded countries, particularly if the drainage is bad, or the country swampy, they are excellent substitutes for macadamised roads. They are made by laying young trees of from 6 in. to 12 in. diameter side by side, and close together, to form the surface. A pole of about 6 in. by 6 in. should be pinned with spikes or treenails along their outer edges to keep them in position, and when possible, it is better to lay the trees forming the roadway with their ends resting on similar poles sunk until their upper surface is level with the ground.

Embankments may be formed easily with timber when it is in abundance, as in Canada: the logs being laid at right angles with one another, the upper surface, if it is for a road, being corduroyed over.

Fig. 49 shows such a road in section, Fig. 50 in elevation.

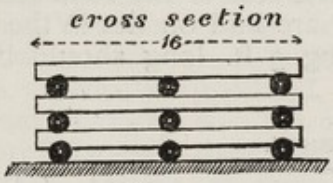


Fig. 49.

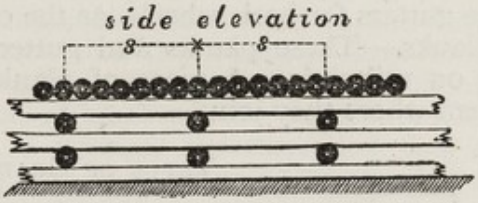


Fig. 50.

In all corduroy work it is most desirable to adze away the logs along the wheel track so that the wheels may pass over an even surface. The interstices between logs may be advantageously filled up with some small boughs, chips, sand, &c. We used this species of road to a great extent during the Red River expedition.

Plank Roads.—When 3 in. planks are to be had, they form the very best of roads for military purposes. For a 16 ft. road the planks should be laid on 4 sleepers, if they are to be had, the outer ones 5 in. by 5 in., the inner ones of 6 in. by 2 in. laid on flat side; if not to be had, planks can be used in their stead, or they can be dispensed with altogether, the planking being laid on the ground. The sleepers should be sunk to a level with the surface; the junction of one row of sleepers should not be opposite that of other rows, and a piece of plank about 2 ft. long should be placed under each junction. The spikes used should be 5 in. long [22 lbs. to the 100 spikes], with chisel-shaped edges, which are to be driven across the fibre; wooden spikes can be used if iron is not to be had. Before laying the planks, the road should be brought to a plain surface. If there is plenty of material at hand, it is a good plan to spike down a piece of scantling about 5 in. by 5 in. along the centre, to keep the wheels in their proper places. The planks should be laid as shown in Fig. 51 [the measurements are all shown in inches], for if laid with even sides it is difficult when a wheel gets off the planking to get it on again. An inch-coating of small stone or gravel can be laid over the planking with great advantage. A horse can draw on a plank road from twice to three times as much as on an ordinary macadamised one.

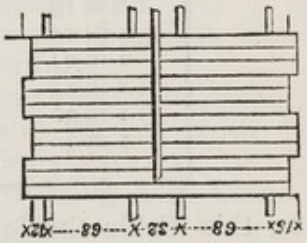


Fig. 51.

Swamps.—In carrying roads over swampy places, strong hurdles, laid on

the ground, or fascines, or even loose brushwood [not exceeding 2 in. in diameter] laid close together will form a good foundation ; they should be covered by 6 in. of broken stone or gravel.

Wooden Tramways.—If timber abounds, wooden gutters may be laid with great advantage for the wheels to run in. It is not necessary that there should be gutters for both wheels, as the outer side of the road may run on simple planks. These planks and gutters are laid on ties in the way that rails are on railroads. A piece of planking 3 ft. long should be placed under them where they join.

TABLE OF GRADIENTS.

Inclination.	Angle.	Rise in Feet per mile.	A Horse can Draw.
	° ′		
1 in 10	5 43	528	·25
1 in 11	5 11	480	·265
1 in 12	4 46	440	·28
1 in 13	4 24	406	·295
1 in 14	4 5	337	·31
1 in 15	3 49	352	·325
1 in 16	3 35	330	·34
1 in 17	3 22	310	·355
1 in 18	3 11	293	·37
1 in 19	3 0	277	·385
1 in 20	2 52	264	·4
1 in 24	2 23	220	·5
1 in 25	2 18	211	·52
1 in 26	2 15	203	·54
1 in 30	1 55	176	·64

In this Table the load which a horse can draw on the level is taken as represented by 1.

In ascent, a perfectly smooth road tells more against draught than one of ordinary roughness.

Ascents tell more on a horse than on a man : that is, every additional degree added to the gradient causes greater loss of power to a horse than to a man, in proportion to their respective strength.

Repair of Roads.—Roads used as the communications of an army require constant repair, which is best provided for by dividing each road into sections, the length of which must depend upon circumstances, each being placed under the charge of a N.-C. O., with a few men under him, by whom materials for repair must be prepared, collected, &c. An officer should be told off to so many sections.

RAILWAYS.

In all future wars, the main lines of supply will, in civilised countries, be along railroads. Indeed, when the contest is likely to be a protracted one, and the topography of the country is favourable, it will often be advisable to lay down a railway temporarily, as we did in the Crimea and Abyssinia. We were the first nation that demonstrated how feasible and useful it was to do so. As for such an operation there will always be engineers especially appointed, no attempt will be made here to explain the manner of doing so ; but it is strongly recommended that all S.Os. should carefully study the construction of railways as practised in America. The English system is more applicable to permanent constructions, everything being well finished, and immense works undertaken to obtain the lowest possible gradients ; whereas in America, where lines are run through wildernesses, economy of construction is the first great object aimed at. The influence of railroads is strategical rather than tactical.

WORKING OF RAILROADS.—Previous to an army embarking for the theatre of war, every arrangement must be made for working the railroads which are to form the chief lines of communication : much will, of course, depend upon whether the existing staff on such lines can be relied on, or to what extent it will be necessary to supplement it, or whether it will have to be replaced altogether.

It may be necessary to send out engines and rolling stock ; for, if the enemy can obtain any power over the railroads before your arrival, he will destroy the rolling stock, or run it off into his own territory.

For the general working of the line, a Superintendent should be obtained from some of the large English railroads ; he should be well paid, and attached to the Staff of the General of Communications, with local or high honorary rank. We understand the construction, working and administration of railways better than any nation in Europe ; and, from the numbers employed upon our network of iron highways, we can always obtain the very best railway staff in the world ; but it is absolutely necessary that that staff should exist on paper in time of peace, and be capable of mobilisation upon the shortest notice. The Superintendent selected should be assisted by an efficient staff selected by himself. Under his orders there should be an especially enlisted "Construction Corps" of workmen, for the repair and maintenance of the road, to be organised under military officers. Taking, as a model, the corps established by the Federal Government during their war, the organisation might be into battalions, as follows, their number being according to the necessities of the service ; one man a mile, or two to every 3 miles, will generally be ample.

Battalion of Construction Corps.

Staff of Battalion.

- Commandant Major, R.E., specially selected for his knowledge of railway work.
- 2nd in command, a Captain R.E., ditto, ditto.
- A Quartermaster.
- A Sergeant-major to act as clerk.
- A Rodman [to be a staff-sergeant].
- 2 Messengers.

1st Subdivision.

No. of men.	
1	Engineer of bridges. To be an officer of R.E., selected for his knowledge of bridge-making.
1	A Quartermaster.
1	An Assistant-surgeon.
1	Sergeant-major to act as clerk and time-keeper.
1	A Hospital Steward [staff-sergeant].
1	A Quartermaster-sergeant [staff-sergeant].
6	One Sergeant to every 50 men, to act as foreman.
30	One Corporal to every 10 men, to act as sub-foreman.
300	Mechanics and labourers.
2	Blacksmith and helper.
12	Cooks.

Making a total of 3 offrs., 3 s.ss., 6 sergts., 30 corps, and 314 privates.

The 2nd subdivision to be the same, except that the O.C. and the men under him should be skilled in laying rails.

The 3rd subdivision to consist of a clerk of the works to supervise the water stations, having under him a sergeant as foreman, 12 mechanics and labourers, together with one cook.

The 4th subdivision to consist of a clerk of the works experienced in masonry, with a sergeant [to be a mason] as foreman, 10 masons and helpers, and one cook.

The 5th subdivision to consist of three experienced guards, to be 1st class s.ss., and 3 others, to be sergts., at a lower rate of pay, 2 locomotive engineers, to be s.ss., 2 firemen, to be corporals, and one cook.

The strength of the battalion would therefore be—4 officers, 3 quartermasters, 2 assistant-surgeons, 17 sergeants, 62 corporals, and 655 privates.

They should be armed with the short rifle and sword-bayonet, and drilled to their use, so as to be able to defend themselves, but should never be made use of as combatant soldiers.

PROTECTION OF RAILWAYS.—A railroad will always be, more or less, open to injury from cavalry raids: it is therefore essential that its protection should be especially provided for by the General of Communications, a sufficient force being placed at his disposal for that duty. The nature of the country, the character of the enemy, the composition of his army, and the disposition of the inhabitants, can alone determine what force will be required, and what is to be the proportion of cavalry to infantry, &c. &c. The more mounted infantry that can be spared for this work the better.

It is folly attempting to guard a line by distributing along it 10 or 12 men to the mile. Central points must be selected as positions for flying columns, ready at all moments to move out, either by train along the line, or on horses, and in waggons along the country roads, to pounce down by forced marches upon the enemy's columns. The position of these flying columns to be changed constantly.

Small cavalry parties should scour the country to the right and left of the line to the greatest possible distances compatible with their safety, telegraph stations being pushed out, and signal stations posted on commanding ground still farther out, so that it should be impossible for any movement to be made by the enemy within the zone thus watched, without its being immediately known to the several flying columns.

A good system should be thus established for watching the enemy, the country people being well rewarded for giving correct information.

The inhabitants to be informed by proclamation that any of them discovered injuring the railroad or telegraph, or attempting to obstruct the former, will be hanged without mercy. In some countries it may be possible to make the inhabitants living along it responsible for its preservation, and it may sometimes be necessary to make severe examples by burning the houses near the spot where any injury has been done to it.

The most vulnerable points of railroads, as explained in the article upon their destruction, are large tunnels, viaducts, and bridges. In many instances it may therefore be necessary to protect them by block houses containing small garrisons of from 20 to 100 men, each being commanded by an officer. Some should be made proof against field guns, and all should be made as strong as possible by means of all available obstacles. A Machine Gun, with a good supply of ammunition in each, would add greatly to their power of defence. Fire balls are useful on dark nights to show what an enemy investing the block house may be about. It is sometimes very necessary that there should be a block house at each end of a viaduct or long bridge, when it is advisable to inclose with palisading some little space all round the bridge, strong gates being arranged for, allowing trains to pass. The object of all such works is merely to protect the bridges until the nearest flying column has had time to arrive, for it

must be remembered that it is by closely watching the enemy, and not in holding the line itself, that you can alone hope to protect it efficiently.

DESTRUCTION OF RAILWAYS.—It must be remembered by all Os.C. patrols or small reconnoitring parties that they are not upon any account to destroy railroads without orders emanating from the G.O.C., for it is possible they might paralyse the future movements of an army by doing so.

A railroad may be rendered useless to an enemy by destroying the track itself, by destroying or removing the rolling stock, or by destroying the means of supplying fuel and water to the engines.

The subject must be considered under two heads.

1st. When from there being no likelihood of a railroad in an enemy's country ever being of use to you, it is advisable to destroy it in the most effectual manner possible.

2nd. When, from its being in your own territory, you do not wish to destroy great works, such as large bridges, tunnels, &c. &c., or when, from it being likely that you may again, in a short time, require it for your own army, you desire only to render it temporarily useless to the enemy.

1st. In destroying a line when time is of little consequence, the rails, chairs, &c., should be removed to the rear to be made use of as required on the lines in use by your army. In most instances, however, time is a great object, as such duty generally devolves upon bodies of cavalry, who have succeeded in cutting in upon the enemy's line of communication, and who have consequently to make all possible haste to escape being cut off. The most vulnerable points are large viaducts and bridges, particularly if they are made of wood: if of brick or stone, powder must be used to destroy them; when time permits, the piers of the viaducts should be destroyed as near the ground as possible. (See Article on the "DESTRUCTION OF BRIDGES.") In destroying woodwork by fire, whatever oil can be obtained from the neighbouring houses should be poured over it to make it burn quickly; coal oil is the best. If there are tunnels, to blow one in at several points well within the tunnel where the ground above is of a sandy nature, is the most efficacious means of blocking up a line. It is better to blow down one long tunnel in several places than several tunnels in only one place.

In all deep cuttings where there are retaining walls, a few charges of powder, exploded judiciously behind them, soon fill up the cutting. If telegraph wire and fallen trees are intermingled with the debris, the work of clearing it out is rendered much more difficult.

Some countries are so level that railroads running through them present no bridges or embankments for great distances. To destroy the

rails and ties, or sleepers, is therefore the only means of rendering them useless.

Curves should always be selected, as it is more difficult to repair them than straight pieces of the line. To tear up rails is not so easy as all may think. On railroads, the workmen draw the spikes with clevis bars and claws, and unscrew the nuts and bolts with wrenches, all of which are too heavy to be carried by cavalry soldiers.

A good substitute for a wrench can be made with a screw-bolt and two nuts, as shown in Fig. 52, the first nut being screwed on to the bolt as far as it will go, and the other screwed on just far enough to fit the heads of the screws or nuts to be removed. In all fish joints where there are bolts and nuts made use of, these wrenches can be easily made, the first two nuts being removed by tapping their corners with a stone or hammer until twisted off: when one has been made, more nuts can be removed by it, and any number of others made by them. When time presses, most rails can be destroyed by a charge of 8 oz. of guncotton, placed against them halfway between 2 sleepers, and tied round the rail.



Fig. 52.

When there is plenty of time, the wooden ties or sleepers should be made into long piles and set fire to, the rails being placed across them, and when sufficiently hot in the middle, bent up into the shape of a U, or round a tree or telegraph pole. It is of the greatest consequence that rails should not only be bent, but twisted as well, for if only bent they can easily be straightened, as explained in Article on "RECONSTRUCTION;" but if well-twisted, they must be re-rolled before they can be of any use. When well-heated in the centre as described, they can be easily twisted by inserting the point of a pick into one of the fish-plate holes at either end, and then bearing in opposite directions.

As, however, time will in most instances be of the utmost consequence, it is desirable that some means be devised for tearing-up rails rapidly, and bending and twisting them when cold. The following is a description of a plan invented for that purpose during the late American war.

Two pieces of U-shaped iron or steel about 6½ lbs. each [see *a* in Fig. 53], are placed under the two ends of the rail shown in sketch; levers [*b*], 11 or 12 ft. long, and 4½ or 5 in. in diameter at the large end, are inserted in the irons, when by pulling on the levers the whole rail is ripped from its fastenings in less than half a minute, and the chairs broken.

A detachment intended for the destruction of a railroad should be told off into squads of 10 men; to each should be given before starting 2 of these U-shaped irons, 2 axes, and 2 pieces of stout rope, each 6 yds. long. A supply of the torpedoes described in Article upon "DESTRUCTION OF BRIDGES," should also be taken upon all such expeditions.

Having reached the part of the line selected, each squad should be given 12 rails to remove ; suppose the rails to be 20 ft. long, there would be 45 squads to a mile of road. Say the detachment consisted of 1000 men, there would be 450 to destroy the mile of rails, leaving 550 men to cover the operation.

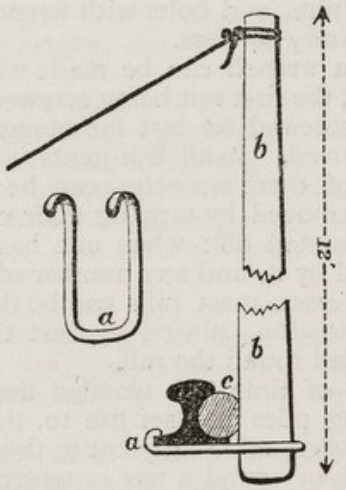


Fig. 53.

Each squad should at once provide itself on the spot with 2 wooden levers of the dimensions already given, and 2 wooden wedges or blocks [*c* in sketch] to place between the rail and the levers ; the ropes, *d*, to be fastened to the small end of the levers. The 2 U-shaped irons having been forced under one end of a rail near together, and the wedges and levers placed as shown in sketch, one lever is pulled on and bent down to the ground, with the second a further twist is then given as far as it can be moved ; a fresh hold is then taken with the first, and the operation continued until the twist is sufficient. The rail can then be bent by pulling on a rope attached to the loose end, and afterwards removed altogether by applying one of the levers to the end which had remained fastened. Five minutes is sufficient time to twist, bend, and remove a rail, so in one hour the 12 rails told off to each squad ought to be removed : in fact, 450 men should in that time destroy a mile of road. The ties should then be stacked by each squad, a couple being split up to make them burn the quicker. If coal oil is to be had in any of the neighbouring houses, it should be poured over them with that object.

Rails vary in weight from 50 lbs. to 70 lbs. the yard.

To destroy Locomotives.—It is most desirable that all officers should make

themselves acquainted with the several parts of the machinery named in the following paragraphs.

Draw off the water from the boiler, light a large fire in the fire-box ; this will destroy the flues. The most efficacious method is to fire a round shot through the boiler. The latter plan should always be adopted when it is possible to do so.

To Disable Locomotives without permanently injuring them.—Remove to a place of security, or hide any of the following pieces of the machinery. The pump rams, clacks, or delivery pipes : one or both safety-valves ; the mud plugs of boiler ; the link connecting the slide valve to the valve gearing ; eccentric straps ; one or both cylinder tops or covers. To fill the suction pipes of the pumps with melted resin or lead, or even with cotton waste or tow, should be temporarily effective, and many hours might elapse before the cause of stoppage was discovered.

To Disable Tenders in a similar manner, remove the hose pipes, coupling bar and chains between engine and tender, or the brasses from the axle-boxes.

To Disable Passenger Carriages, Trucks, &c., without permanently injuring them.—Remove one or both wheels [or in American cars, one or both trucks]. Take off the axle guard or the bolts from one or two of the guard plates ; the brasses from the axle-boxes, or the draw bars. The two last are most easily effected.

To destroy Passenger Carriages, Trucks, &c., burn them.

In fine, all piles of coal or other fuel should be burnt, the water tanks and the pumps used for filling them destroyed, and all shops for the repair of engines, &c., and everything that will burn, set on fire.

2nd. *To render a line temporarily useless*, so that whilst it would take much time for an enemy to repair it, you could do so quickly yourself, will depend much upon your respective resources. If you know that he cannot provide rails, remove a hundred yards of them at various intervals ; if he has no supplies of telegraph wire on hand, remove it. Remove the pistons from all the pumps supplying water to the tanks ; provided that you can easily replace them, you can even go so far as to destroy a bridge ; take care that all rolling stock and fuel is removed within your part of the theatre of war.

Railway communication was upon many occasions temporarily intercepted by the cavalry during the late Southern struggle for independence in the following manner : a high embankment having been selected, a couple of thousand men were dismounted and formed in single rank along a rail, but outside of it, and facing inwards. The rails at both flanks were disconnected, so that the portion of the line to be torn up occupied by the single rank of men, was not fastened to the rest of the line. Upon a given signal the men stooped down and grasped the rail, and upon another signal, all lifted it up to a vertical position, with the ties fastened to it, and then let it

fall over on the other side down the embankment. The rails could not then be replaced without unfastening them from the ties, and relaying the whole superstructure. When the ties or sleepers are very firmly fixed in the ground, the operation of overturning a section as described can be facilitated by using poles or rails as levers under the rails.

Repair of Railroads.—Repair of railroads will be effected by the Reconstruction Corps, its Hd. Qrs. being at some central point, where workshops can be established in safety. All bridges and culverts within possible reach of the enemy should be numbered and classified under a few heads, such as 1st, 2nd, and 3rd class, according to their dimensions; materials for the complete renewal of each class should be kept ready in the central depot, so that if information is received at any moment that such or such a bridge or culvert has been destroyed, the Reconstruction Corps, in starting to repair it, can take exactly what is necessary for doing so; this should be carried out so far, that even trusses of the various sorts to suit the spans of the larger bridges should be kept on hand ready for conveyance to any part of the line.

In all secure places there should be an ample supply of rails, spikes, sleepers, and tools necessary for reconstructing the permanent way should it be destroyed. All rails that are only slightly bent into a curve without being twisted, are easily straightened by means of a common jack-screw or jim-crow, or by sledges.

General Haupt, of the Northern army, used the following contrivance for straightening rails that had been simply heated in the centre and bent. 5 blocks of wood, *a*, *b*, *c*, *d*, *e*, about 10 in. square, and 5 ft. long, were placed as shown in fig. 54, where *x x* is the rail. The top one was notched to the

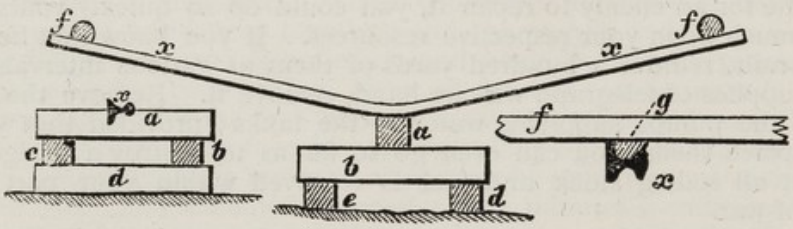


Fig. 54.

shape of the rail so as to receive it, and prevent it from turning; pressure was applied by from 12 to 16 men at each end by means of two poles, *f f*, about 3 or 4 in. in diameter, a small piece of some hard wood, *g*, being placed along each end of the rail to form an even surface for the poles to rest upon. The men on each side would press down or relieve the pressure at the words "down" or "up," the rail being moved backwards or forwards or turned as required.

After a short drill the negroes employed were able in from 2 to 3 minutes to straighten a rail so that it did not vary from $\frac{1}{4}$ to $\frac{1}{2}$ in. from a straight line, permitting it to be laid in the track and spiked; these short bends could, if necessary, be removed afterwards by the jack-screw apparatus.

As a general rule it was found that those bent with a curve of 1 ft. or more radius, could be thus straightened in from 2 to 4 minutes, while those which had been heated to a high degree and bent at a sharp angle, could not be restored without heating and hammering.

No time should be lost in attempting to straighten the latter; when cold, they should be put on one side to be sent, when the new track has been laid, to the place prepared for heating them, &c.

A furnace for doing so can be made with two parallel walls of brick, stone, or even clay, with bars laid across to hold the wood or coal. When heated, the rails are laid upon a straightening table and hammered until the bends are removed. Such a table is made with a piece of timber 12 in. square and as long as a rail, on which two rails are placed, base downwards, with a third between them base upwards, the whole being firmly spiked; the base of the top rails forms the plane surface on which the rails are straightened.

MOVEMENT OF TROOPS BY RAILWAY.

The experience gained in the late Franco-German war proves that, upon double track lines worked upon the continental system, time is not gained in moving large bodies of troops, including their proportion of guns and *materiel*, by rail, when the proportion of sabres and bayonets is greater than 435 to the English mile of the distance to be got over. In England, where rolling stock is practically unlimited, and our railways so well worked, I think that an English army corps (war strength) can be moved with a saving of time by rail, for any distance over 45 miles, being for large bodies of troops a proportion of 600 sabres and bayonets to the English mile.

On nearly all English railways there are 2 lines of rails, but in America and on most of the continental lines there is seldom more than one. The rapidity with which troops can be conveyed is greatly affected thereby, and the fewer the places where trains can pass one another on such single lines, the fewer will necessarily be the number of trains that can be at work at the same time upon every 100 miles of road.

On single lines, trains can only be despatched from the termini at intervals of twice the time it takes a train to run from one crossing place to the next one: thus, if a train takes 35 minutes running between the longest distance between any 2 crossing-places on the line, trains should not be despatched from either terminus at shorter intervals than 70 minutes. On a double line, in a military point of view,—i.e. remembering the time required to load and unload trains,—the number of trains actually running on the line

at the same time is almost without limit, but on a single line, the total number of trains that can run on it at any one time is only half the number of the sections between all the several crossing-places and the termini, half of which trains will be running in one direction and the remainder in the other, if the line is being worked up to its greatest working capacity.

It is most essential that a low rate of mean speed should be fixed for military trains, so that if time be lost by any train from any cause, it may be easily recovered by increasing the pace for a time. The speed to be fixed upon will be influenced by the power of the locomotives, the levelness or steepness of the line and its general working condition, the number of carriages in each train, and the average distances to be run without stopping. For their military trains of 50 or 60 carriages the Germans fix the mean speed at from $12\frac{1}{2}$ to $15\frac{1}{2}$ British miles the hour; this rate includes all delays occasioned by short halts for watering the engine, slackening speed in passing small stations, &c. &c. These long trains of the Germans are worked by 2 engines, one in front, the other behind the train over lines with gentle gradients. When the gradient is steep, the trains are reduced to half this size. After due consultation with the best railway men, it was found that for military purposes in England the train should not as a rule exceed 31 passenger carriages, as our sidings and platforms do not admit of a greater number; 40 carriages to a train to be regarded as the maximum. Such trains could be run with ease and with great precision at a speed of 25 miles an hour, including all ordinary stoppages, an extra allowance of half an hour stoppage being allowed every 3 or 4 hours.

The experience gained during the American war shows that to supply an army of 100,000 in the field by means of a single line of rails, the proportion of rolling stock should be, engines 0·25 and freight carriages 6·0 to every mile of road: this does not provide for the conveyance of troops. The following Table may be useful as giving a fair idea of the rolling stock possessed by several nations:—

Rolling Stock per Mile of Road.	English.	Irish.	Scotch.	Canadian.	United States generally.	The State of New York.	German.	Indian.
No. of Locomotives . .	·709	·2448	·51	·21	·236	·243	·43	·2027
Ditto Passenger Carriages	2·244	·86	1·327	·3	·16	·34	·807	·46
Ditto Freight and Goods do.	19·694	4·0	16·8	2·95	4·068	3·364	6·7	4·34

As these calculations include all branch lines, it may safely be assumed that on all main lines there will be about one-half more on foreign and one-quarter more on home lines.

In calculating the amount of rolling stock available for use, a deduction of 50 per cent. for locomotives, and of 30 per cent. for all carriages must be made for those usually undergoing repairs.

The gradients on a line will greatly influence the weight which engines can draw, as the following Table will show. It is drawn up assuming that the weight which any engine could draw on the level is represented by 1·00.

Gradient.	Engine will draw.	Gradient.	Engine will draw.
1 in 700	·75	1 in 60	·18
,, 500	·67	,, 50	·16
,, 250	·5	,, 40	·09
,, 100	·26	,, 30	·06
,, 80	·22	,, 20	·016

The average weight of an English locomotive is 28 tons when running, or with its tender 46 tons. In India the engine and tender when running weigh together about 35 tons only.

The number of loaded carriages that go to make up a train in England may be assumed at 34 passenger, or 40 to 50 freight carriages, when the gradients do not exceed 1 in 330. An ordinary engine will draw such a train easily at 20 miles an hour, stoppages included, and such may be assumed as the pace at which troops can be moved with efficiency. The length of the sidings forms a limit to the length of trains that in single track lines is absolute. In America, where the gradients are generally steeper than in England, 10 to 15 passenger, or from 16 to 22 freight carriages go to a train, and the former would be drawn at the rate of from 16 to 22 miles, the latter at from 12 to 15 miles an hour.

In computing the number of soldiers (armed and equipped) that can be conveyed in any carriage, the usual allowance is 8 soldiers to 10, and 6 soldiers to 8 ordinary passengers. A soldier should have 20 inches of seat as a minimum. Our saloon carriages will hold 32 to 40 soldiers, according to their size.

A covered goods waggon carries 6 tons, and has a capacity of about 500 cub. ft. An ordinary goods truck carries 1 ton of straw, 1 ton of hay, 5 to 7 tons of coal, 6 to 9 head of cattle, 30 to 45 sheep, or 1 of any description of gun or waggon (with limber) used in the field. A sheep van with 2

floors will carry 80 sheep or 2000 lbs. of bread (bread for conveyance by rail should not be packed in more than 4 tiers). A van (with break in it) for luggage varies in capacity from 300 to 500 cub. ft. and carries about 5 tons. A cattle truck to carry 7 to 8 horses saddled should be 17′ 6″ long, and 7′ 4″ wide, the entrance being at least 6′ 2 ″ high: it should be covered at top and have the ends boarded up: the lower part of the door should be made to fall down on a hinge to form a gangway. For the conveyance of horses, the bottoms should be sound, and at least 2″ in thickness. No covered carriage with a less interior height than 6′ 3″ should be used for conveyance of horses. Open goods waggons may if necessary be used for horses, provided their sides are over 4′ high. If it is necessary to use goods waggons for the conveyance of men, seats with backs should be roughly fitted up; in estimating the number they will carry, the space required may be calculated at 4 sqr. ft. per man.

This Table gives the average weight and carrying capacity of ordinary carriages on British lines.

Carriage.	Weight of Carriage (4 ft. 8½ in. Gauge).	Carrying capacity.	
		Narrow Gauge, 4 ft. 8½ in.	Broad Gauge.
	tons. cwt.		
1st Class.	5 18	24 soldiers.	
2nd ,, ...	6 4	*32 to 40 soldiers.	50 to 60 soldiers.
3rd ,, ...	6 12	,, ,,	,, ,,
Truck	4 0 to 7 0	5 to 7 ,, ,,	

* 4 Men on a seat.

On American railroads a first-class car carries 60 passengers, the other passenger cars generally 40: a box car carries 9 tons of freight, or 10 horses with harness on, or 9 cavalry horses, saddled with coats rolled, valises, &c., on saddle: a cattle car will take the same number of horses. A platform car or flat (29′ long and 9′ wide) will carry a 12-pounder gun, its limber and waggon with its limber, or 3 ordinary farmer's waggons, or 5 one-horsed carts.

Every movement of troops by railroad naturally divides itself into five distinct operations.

1st.—The march to the station where the embarkation is to be effected.

2nd.—The embarkation.

3rd.—The journey.

4th.—The disembarkation at the end of the journey; and
5th.—The march from the station when disembarked to the bivouac or camping-ground.

1st. *The march to the railway station* is a purely military operation, and when the numbers to be conveyed are large, is one requiring the greatest nicety of detail, so that the numerous columns should not cross on the way, and so that all should arrive at the proper station and in proper time. Upon the staff rests the responsibility for making these arrangements.

After due consultation with his railroad advisers, it is for the responsible staff officer to fix upon the place where the several arms of the service should embark, and where the Commissariat was to load its stores; in general it is a good arrangement for the infantry to get into the trains at the passenger stations, reserving the freight stations for the cavalry and R.A. The time-table for the despatch of the force having been drawn up, and the routes to the various railway stations having been selected, the troops would be ordered to move so as to reach these points exactly at the hour required: the distances should be nicely calculated to insure this.

The approaches to the stations must be kept clear, and silence strictly enforced when the troops arrive near them. The arrangements to be made by the responsible S.O. require great care, but no matter how ably they may be devised, unless regimental officers enforce discipline most strictly whilst marching through a town to the railway, upon their arrival there, and whilst embarking in the carriages allotted for the reception of their men, all will be of no avail, and disorders, such as those that we find took place in 1870 at Paris, Metz, Amiens, and other great termini, will certainly result. It is during such operations that the discipline of a regiment is tested, and that one discovers how much better it is in some corps than in others. Partial delays and mistakes are inevitable, entailing more or less discomfort upon all ranks—but these petty inconveniences are necessarily attendant upon our lot as soldiers, and they should be accepted cheerfully. Grumbling about the delay, and finding fault with the arrangements made, is not the way to further the interest of the service or the ends aimed at by the special operation then in progress, but it is a certain method for causing disorder.

It is very necessary that only the troops for whom the carriages are ready should be allowed to enter the station, and the presence of all sight-seers, or friends with them, should be positively forbidden.

At some termini, such as Euston Square and Victoria Stations, there are inclosures outside where troops could be massed to some small extent previous to entering the station; the public should be strictly prevented from entering such spaces.

In a great movement of troops by rail, the very common fault of reaching the station too soon may overturn the best conceived arrangements. The dread of being too late is a bugbear that drives us constantly into the opposite extreme, and both extremes are nearly equally injurious in most military operations, and they certainly are equally so in moving masses of all arms by rail.

The smallest possible number of men should be permitted to fall out whilst in the station. In order to prevent the necessity for their doing so, it is very advisable to have a 10 minutes' halt somewhere near the point of embarkation when marching to it.

2nd. *The embarkation of the men in the carriages.*—The Queen's regulations give very good rules for this, but they only deal with it from what I may call a regimental point of view. Regarding it as a staff question, it is one that embraces so many topics that a volume could easily be filled with instructive information on the subject, as the general working of railways in war is embraced in it. In all movements of troops, whether by land or sea, one great rule is to keep the various military units as complete at all times during the operation as possible. Thus, it is not only essential that with cavalry the horses and the men to ride them should go by the same train, but that whatever may be the number of sabres, bayonets, or guns conveyed by any one train, or ship, they may be fit for war, complete in every necessary field equipment, having their transport with them so as to march off without any delay upon leaving the train, or disembarking from the ship.

This is a point that civilian traffic managers are prone to forget or to ignore, so much so, that in all the railway problems worked out by order of the Q.M.G. from time to time by the railroad committee, consisting of railroad engineers and officials, I find that in moving troops they are sent forward without any transport. They calculate upon despatching trains at intervals of 8 minutes. Under such an arrangement the terminus where they would have to disembark would be in a curious state of confusion after the 1st hour when the troops began to arrive, being crowded with men unable to carry their ammunition, camp equipment or baggage.

Allowing 20 ft. as the average space occupied by a carriage, a siding should have a clear length of 240 yards to accommodate a train of 34 carriages. As our sidings exist at present, we may assume 40 carriages to be about the maximum number for all military trains in England. It is well to remember, however, that by sending a battalion of infantry in 2 trains, instead of in 1 very large, we reduce the rapidity with which we can convey masses of infantry by one-half.

An English army corps requires 114 trains, without allowing any for control purposes; but adding on, say 21 trains for provisions and their attendant transport, the total for an army corps would be 135 trains consisting of 4590 carriages of all sorts, or in other words, one railroad carriage would be required for every 6 sabres and bayonets, armed, equipped, and provided with their due proportion of guns, tools, pontoons, telegraph apparatus, hospitals, transports, &c. &c.

Assuming that in England by the most extraordinary efforts you could despatch 67 trains in the 24 hours (*i.e.* a train on an average of about every 24 minutes), it would take 2 days and 2 nights to despatch one of our army corps by any one line of double railroad under the most favourable circumstances. Consider what it would be to work a line for even 2 days under such pressure. It could only be possible by borrowing additional hands from other companies, or by denuding of servants the branch lines or the portions of the main line not comprised in the operation, so as

practically to render them, for the time, almost useless to the public. I dwell upon this because men who are more scientific than practical sometimes forget in calculating the maximum carrying capacity of a railroad, that the physical power of the railroad official is an important factor in the sum. Although, saving accidents, and within certain wide limits, a locomotive is capable of sustained exertion as long as you tend it properly with fuel, water, and oil, still the man who drives or stokes it is not so capable. His powers are very limited, and without his proper amount of daily rest and sleep, he soon breaks down altogether.

The derangement of everything on a line of railroad over which masses of troops are being sent is so great, that in Germany the rule is to give a railroad terminus a rest of 2 days after the movement of any great force, or after a fortnight's continuous work. This is for the purpose of repairs, and for correcting the irregularities that are inseparable from such great operations.

In making these great railway calculations, it must also be remembered that, even under the pressure of war, it will seldom be possible to completely stop all ordinary traffic. The postal services must be attended to, and large cities, since the introduction of railroads, depend so completely on the provinces for food, that to stop the ordinary traffic would be virtually to starve their inhabitants.

A certain number of trains per diem must therefore be allotted for these purposes. I think, therefore, for ordinary calculations, upon English lines, that we should not reckon upon being able to despatch more than about 45 trains in the 24 hours by any one double line of railroad. During the great concentration of the two hostile armies in 1870, the Germans seldom ran more than 14 or 16 military trains during the 24 hours, the French from 20 to 25 in the same time; but then their trains were about twice as large as ours would be.

It has been laid down by us that on a double English line, the steady despatch of military trains at intervals of half an hour was the maximum that could be effected.

In estimating the number of trains you can run in a day, other important facts have to be considered. Supposing it has been accepted, as with us, that trains may be run one after the other with intervals only of 7 or 8 minutes, have you enough rolling stock to furnish the required number of trains? In England the rolling stock is so very great, that this consideration may be passed over, as, practically, all being of the same gauge, any amount that could possibly be required could be collected on any one line from the other great companies; but if operating abroad, or in an enemy's country, a very limited amount only might be at your disposal. The Germans calculate that carriages despatched loaded during the first day's movement, for distances not exceeding 200 English miles, can be back again at the starting-point and again despatched loaded on the 3rd day; for distances between 200 and 400 English miles, on the 4th day; and for distances between 400 and 500 miles, on the 5th day. In England, where the pace is greater and the trains smaller, we might, I think, calculate upon having this rolling stock again available in less time.

In movements over a single track line, the intervals between the departure of trains

cannot be less than the time a train will take in running between the two crossing-places that are farthest apart on the line.

Another point to be considered is, can you have a train ready loaded to start every 8 minutes? Admitting that it takes 30 minutes to place half a battalion of infantry, with all its equipments, regimental transport, &c., in a train, and double that time to load each train carrying cavalry, R.A., or stores, it would require at least 5 platforms, or 5 separate places where infantry could be embarked, so that a train carrying infantry could be despatched every 8 minutes, and at least 9 such places if the trains were loaded with cavalry or R.A., allowing 10 minutes after the despatch of every loaded train for an empty one to be shunted back to take its place alongside the platform. Platforms unprovided with appliances for placing loaded waggons on the trucks, or for getting horses into the cattle trucks, are unsuited for the embarkation of troops. In some countries the cattle and other trucks are made so that their ends let down. A continuous platform can thus be formed by the portion of the train composed of trucks, those for the reception of horses being placed in rear of the passenger carriages, and the trucks to carry the waggons or guns being placed at the rear of all. The horses are walked from the end of the train (where there is always the means of getting horses and carts on to the end of the hindmost truck) to the most forward cattle truck, the end of each truck being raised, and replaced in its proper position as soon as each has received its proper complement. The same method is pursued with the carts and waggons. This is a much more expeditious mode of embarking them than that of putting them in from the side.

At the London termini of some of our main lines there are great facilities for loading trains, as the platforms are numerous, and their goods stations are well provided with all the appliances necessary for loading cattle and stores. But although you may be able to despatch 6 or 8 trains an hour from London, unless you can unload a similar number in the same time at the point of disembarkation, your labour will come to naught. Whatever may be the smaller number that we can either load at one end or unload at the other end of the line in an hour, that must be the number of trains despatched along the line in that time. It is therefore a great object to increase the facilities for the embarkation and disembarkation of troops to the utmost. In a country like England, several lines could always be made available in any great movement of troops, and the numerous branch lines could be utilised as affording places for loading and unloading without interfering with the principal stations on the main lines. In an operation that must, from its magnitude, extend over several days, especially if the movement is for a distance of over 50 miles, brigades or divisions might at the outset make one or more day's march, according to the magnitude of the operation, so as to reach a station, perhaps on a branch line, but at any rate some place where they could entrain without blocking up the main line.

In the same manner, a great operation can be very much facilitated by sending some brigades or divisions to points within one or two marches of the point of concentration. They should be despatched if not the first, at least early in the operation, so that supposing the whole movement was calculated to last 3 or more days,

they might have time to march from the points where they left the railway, to their destinations.

As much care is required that the troops at the end of their journey do not get jammed into the town where the terminus is situated, and so block up the exits from it, as is necessary in keeping the approaches to the starting-point clear.

The construction of platforms for entraining and disembarkation is a subject well worthy of study and of practice, for in England so little attention has been paid to military considerations in the construction of even our most important lines, that in case of war, or of invasion, we should have to erect many temporary platforms; for our short military trains, they should be at least 250 yds. in length, and about 20 ft. wide.

An officer accompanied by a N.-C.O. from each squadron, battery, or company, will precede the troops, and, in concert with the station-master, will label or mark off, with a piece of chalk, on the footboard of passenger carriages, and in a conspicuous place on the side of the cattle trucks and horse boxes, the troop, battery, or company allotted to them, and the number of men or horses each will hold. The bottoms of cattle trucks should be carefully inspected before being used for conveyance of horses, as accidents might arise from the planks being unsound.

The arrangement of the carriages in trains and all details connected with the movement of troops by rail should be made in consultation with the railway officials, who understand the work far better than any purely military officer does.

The 2nd and 3rd class carriages usually hold 5 on each seat; the simplest plan therefore is to move the men in "fours" along the platform, holding a section opposite each compartment: the sergeants must fall into the ranks before "fours" are formed, and if possible there should be a N.-C.O. or at least an old soldier in each section. Cloaks and greatcoats (except when worn), and valises, &c., will be stowed under the seat where each man sits, but as a rule he should retain possession of his rifle or carbine; these arms are never to be placed on the floor of the carriage.

In cases of accidents the officers will proceed at once to their companies' carriages, and see that the men retain their seats until ordered to descend. It is in such cases above all necessary to maintain order: no efficient aid can be secured without it, and all must work under some supreme direction.

The men once in the carriages, to be kept there, only those required for fatigue being allowed on the platform; the fatigue parties should leave their arms and accoutrements in their carriages whilst at work on the platform.

The strictest silence must be maintained in the ranks, from the moment of entering the station, until the train with its living freight has fairly left, and is clear of it. When the train is ready to proceed, "attention" will be sounded.

Horses should remain harnessed or saddled during railway journeys made as parts of any large movement of troops.

In the movement of supplies, it is a great matter if they can be despatched already

loaded in carts or waggons, so as to be merely wheeled off the trucks at the end of the journey where horses should be in attendance to take them to the front.

This might be feasible when feeding an army from a base a few hundred of miles distant by rail, the empty waggons being sent back daily.

Entraining of Infantry—One sergeant for each company, one for the detail attached to Hd.-Qrs., and one for the guard and prisoners, the whole under an officer, should be sent on to mark the carriages so as to arrive at the railway station 40 minutes before the time named for the departure of the train. The sergeants will previously ascertain with exactness what strength the companies and parties they represent will muster at the station; the guard and prisoners not to be included in the strength of their companies, as separate compartments will be told off for them. The officer in charge of the above-mentioned parties will then give over to the N.-C.O. the compartments of the carriages for the accommodation of their men, &c.; each N.-C.O., as soon as the compartments for the party he represents are handed over to him, will mark on the foot-board of each compartment, with a piece of chalk, the name or letter of his party, and will then place himself opposite that one which is nearest the side from which the troops will approach the carriages. The battalion will arrive at the railway station 20 minutes before the time named for the departure of the train, and will be halted by the C.O. on ground which will be pointed out by the S.O. superintending the departure; each company will then be told off into sections, according to the size of the compartments into which the carriages are divided, and when this has been done, the battalion will move on to the platform in fours; when the rear of each company arrives at its marker, it will be ordered to halt and turn towards the train, remaining in fours. Each captain will now move along the front of his company, and point out to each section the compartment it is to occupy, and having done so, will give the order "*Quick march*," when the men will move at once into their respective compartments, and then take off their valises. When a battalion moves with regimental transport, the latter should be, if possible, at the railway station 30 minutes before the time named for the departure of the train, and it should be entrained in the same manner as R.A.

Entraining of Cavalry.—On arrival of a cavalry regiment at the station, the men will dismount, each man taking nothing but his carbine, except when the cloak is required for wear, and they will then be told off, so many to each carriage.

Having deposited their accoutrements on the spot selected, and in the same order in which they stood in the ranks, they will be told off into sections of 7 or 8 horses, according to the capacity of the horse trucks.

The sections will be numbered off from the right of the squadron, and they will afterwards file from the most convenient flank, each halting opposite the truck marked with the number of the section. A quiet horse should be selected to go in first, followed by No. 1 of the front rank of each section, and then his rear rank man. Should a horse be very restive, backing him in will generally succeed.

As a rule, the first horse is to be led in and secured to the opposite side of the carriage, by the bridoon reins and the head-collar rope, either to a ring placed for the purpose, or to the bars of the truck. The other horses will follow in order, each dragoon taking off the bridle bit, hanging it round the horse's neck, and leaving the truck the moment he has secured his horse.

The horses' heads, when it is possible, should be placed facing away from the second line of rails, as the horses are easily frightened by trains and engines passing. The moment the last horse is in, the door must be at once shut, and the fastenings of the trucks afterwards carefully examined by a railway official.

1 N.-C.O. and a couple of intelligent men from each troop, previously told off for the purpose, will go round and examine the fastenings of all the troop horses, and make such alterations as may be necessary under the personal superintendence of the troop officers.

When all the horses of a section have been embarked, the men should at once proceed to the spot where they have left their arms, cloaks, &c., which they will resume and fall in; they will also be desired to remember the number and position of the truck containing their horses, and to fall in, in front of it, when they are ordered to disembark.

In a lancer regiment, certain men previously told off will collect the lances, and deposit those of the leading troop in the front luggage van, and those of the other troop in the rear van.

The loading and unloading of the officers' chargers from the officers' horse boxes should go on simultaneously with that of the troop horses, but if possible at a different part of the station.

When it is advisable for the cavalry to unsaddle, one large covered goods waggon for each troop will be required to pack the saddles in; the waggon for the first troop being placed in front, that for the second troop in rear of the cattle trucks. After the men have deposited their arms, &c., as already detailed, they will be ordered to unsaddle, and hold their horses; they will then remove their saddles, bridles, and appointments, and pack them in the corn sacks, laying them on the ground in a regular manner opposite to the waggon which has been told off to their respective troops. 1 N.-C.O. and 2 men, selected for each waggon, will then arrange the corn sacks with their contents in the luggage vans in a convenient manner, so as to take up the least possible space. The same men will be employed to take out and distribute the corn sacks with their contents on arrival at the destination.

When the arrangements before detailed are properly carried out, the train can be ready to start in half an hour from the time of beginning to load. Even less time will be sufficient for unloading.

No hay or straw should under any circumstances be left amongst the horses; all forage required that cannot be obtained on the road should be taken in closed-up waggons.

The closer horses are packed together in the carriages the better.

Entraining of Artillery.—On the arrival of the battery at the station, it should be drawn up in the nearest convenient spot. The men will dismount, and after being permitted to fall out for necessary purposes, will then be formed up two deep, take off their packs (if H.A., their swords), and, some convenient place being selected, will lay them on the ground in the order they stood in the ranks.

The horses will then be unhooked, the traces hooked over their backs in the usual manner, and told off in sections according to the capacity of the cattle trucks; each section will then file off to the truck allotted to it, under the direction of the O.C. the division, and be embarked in the same manner as laid down for cavalry. The gunners will assist the drivers in the loading of the horses, and on the conclusion of this duty the whole will proceed to embark the *matériel*.

In loading the guns, waggons, and carriages, trucks loading from a dock are, if possible, to be used; when, as is the case on some railways, the ends of these trucks let down and meet, the carriages of the battery may be run on from one to the other in a few minutes. These trucks, however, are not so convenient when there are no docks or other facilities for unloading, and should in such cases be avoided.

Trucks having sides letting down are next in point of convenience; and lastly, low-sided trucks. Most of these take conveniently a gun or waggon with its limber.

Carriages must, when loaded from a dock, be run on to the truck unlimbered. The wheels must be well secured with lashing rope and scotches, the latter being generally procurable at railway stations. Should there be hay on the waggons, it is not to be suffered to remain during the journey, but must be placed in a luggage van.

Low-sided trucks are found on most railways; the loading of these requires more manual labour than other trucks, as it is necessary to lift the carriage over the sides by main force. The gun (or waggon) and its limbers are to be placed on the truck with the trail (or perch), and the shafts pointing inward and resting on the floor.

There are some trucks on which more than a gun and limber may be placed, reference being always had to the weight which they are calculated to bear. In loading, the gun should first be placed on the truck close to one end, the trail on the floor; then its limber is to be backed upon it as close as possible, the shafts resting on the floor; the waggon limber is then to be placed on the truck the reverse way to the first limber and its shafts elevated. Finally, the waggon-body is to be embarked, perch pointing inwards and resting on the floor.

This mode of conveyance requires much lashing, and these large trucks are not recommended when others can be obtained. When used, they should, if possible, be loaded at the end, as the operation when performed from the platform is most laborious.

No projections, whether guns, shafts, or spare wheels, are on any occasion to extend beyond the buffers.

The horses and carriages being loaded and secured, the men of the battery will proceed to the place where they have left their swords, which they will resume and fall in two deep, and be told off in squads corresponding to the capacity of the compartments of the railway carriages, care being taken that one N.-C.O. or an old soldier should be in each compartment.

Entrainment of R.E. and A.S.C.—The instructions given for R.A. apply to troops and fd. Comps of the R.E. and to the loading of vehicles generally. One truck is required for the conveyance of each waggon. The load on a pontoon waggon will project several ft. beyond one end of the truck it rests on, and it is therefore necessary to run an intermediate truck between each pair of trucks carrying such waggons. Pontoon waggons should be loaded back to back, so that their loads may project over the intermediate truck. As a general rule, waggons can be run on to trucks, the sides of which let down, and be locked round into position. Pontoon and trestle waggons being of exceptional length must, in the first place, be partly unloaded, then lifted sideways by hand on to their trucks, and subsequently reloaded, the operation occupying considerable time, and being very laborious. When the sides of trucks do not let down, all descriptions of waggons must be lifted into position by hand, except in the cases where the ends of the trucks let down and meet, and the waggons must be run on from a dock, when the whole operation of loading is much facilitated. No spare wheels or stores should be allowed to project above the tops of the waggons or beyond either side of the trucks. All shafts should be taken off and stowed beneath the waggons.

No. of carriages required for conveyance of Troops.—An infantry battalion on war establishment will be carried in 2 trains as follows:—

Left wing, one train.	For forage, baggage, &c.	1 Luggage-van with break.
	,, 15 Officers	1 First-class carriage.
	,, 533 Men	17 Second or third ditto ditto.
	,, 3 Officers' chargers	1 Horse-box.
	,, 24 Draught-horses	3 Cattle-trucks.
	,, 3 G.S. waggons	3 Carriage-trucks.
	,, 1 S.A.A. cart	1 ,, ,,
	Total	27 Railway carriages.

Right wing, one train.	For forage, baggage, &c.	1 Luggage-van with break.
	,, 16 Officers	1 First class carriage.
	,, 533 Men	17 Second or third ditto ditto.
	,, Officers' chargers and hospital mule	3 Horse-boxes.
	,, 24 Draught-horses	3 Cattle-trucks.
	,, 2 G.S. waggons	2 Carriage-trucks.
	,, 2 S.A.A. carts	1 ,, ,,
	Total	28 Railway carriages.

A regiment of cavalry on war establishment will be carried in 4 trains each as follows:—

One squadron with proportion of regimental head-quarters, one train.	For forage, baggage, &c.	1 Luggage-van with break.
	,, 7 Officers*	1 Composite carriage.
	,, 155 Men	5 Second or third-class ditto.
	,, 20 Chargers†	7 Horse-boxes.
	,, 120 Troop-horses	17 Cattle-trucks.
	,, 12 Draught-horses‡	
	,, 3 G.S. waggons§	3 Carriage-trucks.
	Total	34 Railway carriages.

A battery of R.H.A. on war establishment will be carried in two trains each as follows:—

For forage, baggage, &c.	1 Luggage-van with break.
,, 4 Officers‖	1 Composite carriage.
,, 86 Men	3 Second or third-class carriages.
,, 8 Carriages¶	8 Carriage-trucks.
,, 82 Battery horses	11 Cattle-trucks.
,, 8 Officers' chargers**	3 Horse-boxes.
Total	27 Railway carriages.

A 16-pr. battery of field artillery on war establishment will be carried in two trains each as follows:—

For forage, baggage, &c.	1 Luggage-van with break.
,, 4 Officers††	1 Composite carriage.
,, 96 Men	3 Second or third-class carriages.
,, 8 Carriages‡‡	8 Carriage-trucks.
,, 4 Officers' charges§§	2 Horse-boxes.
,, 73 Battery-horses‖‖	9 Cattle-trucks.
Total	24 Railway carriages.

* With one squadron there will be only 6 officers.

† With one squadron there will be 19 chargers and the hospital mule.

‡ With one squadron there will only be 8 draught-horses.

§ With one squadron there will be 2 G.S. waggons and 1 forge waggon, and with another squadron there will only be 2 G.S. waggons.

‖ Only 3 officers with one train.

¶ Only 7 carriages with one train.

** 7 Chargers and the hospital mule with one train.

†† Only 3 officers with one train.

‡‡ Only 7 carriages with one train.

§§ The hospital mule to go with these chargers.

‖‖ One of these battery horses to go in horse-box with chargers.

A 9-pr. battery of field artillery on war establishment will be also carried in two trains, the number and description of railway carriages being the same as for a 16-pr. battery, except that only 8 cattle trucks for battery horses will be required with each train.

3rd. *The journey.*—The rate of travelling abroad is very slow for their heavy military trains; in Germany it is only from 15 to 18 of our miles an hour, in France between 17 to 20. With us the pace has been laid down at from 20 to 25 miles an hour. The short halts made to take in water and coal are included in these rates.

It is very essential to establish a low average speed, so that lost time may be made up for by increasing it for short distances occasionally, for a quarter of an hour lost by any one train through some trifling accident would otherwise make itself felt throughout the whole columns of trains, so as to disturb completely the time-table drawn up for the entire movement.

Every two or three hours, according to the total length of the journey, there should be a short halt of 15 minutes, and every eight or nine hours, a long halt of at least an hour, for feeding both men and horses. In drawing up the time-tables, these halts have to be calculated for, and the points selected where they are to take place. Plenty of sidings and good platform accommodation, and good supply of water, are the first necessities for these halting-places, especially for those where it is intended to feed. Protection for the men from inclement weather is also most desirable.

The arrangement required for feeding the men at the selected places during a great movement of troops are considerable. On the manner in which they are designed and carried out much must ever depend. A report of the train should in all cases be made by telegraph to the place where the men are to halt for refreshment, giving the numbers in each train.

At every such halting-place, a military commandant is necessary, and the higher his rank the better, but under all circumstances he must be an able man, and carefully selected. He would be responsible that the necessary meals were properly provided for all ranks halting there. A large force of cooks, butchers, and bakers, organised under a commissariat officer, would be required, to be told off into reliefs, so that there should be no check in the issue of food to the stream of men and horses passing through the place. Large cooking-ranges would be required for this purpose if the journey were a long one, but under any circumstances, even in moving troops in Great Britain, it would be necessary to provide the men with hot tea or coffee.

At some stations during the late war, by introducing a jet of steam from a locomotive into the vessels containing the water and the coffee, it was prepared in the shortest possible time. Hot tea or a hot soup during a long journey is not only very palatable, but is almost a necessity for health, and keeps every one in good-humour.

On arrival at the place agreed upon for the train to halt, the officers will get out and go to their companies' carriages. Sentries from the quarter-guard will be posted to prevent the men from straggling, or getting out at the wrong side of the train.

When these arrangements are completed, the "*Halt*" will be sounded, and those who require to do so will get out of the train, leaving their arms in the carriages.

When it is intended to water and feed the horses of mounted corps during a halt, the "*Feed*" will be sounded, when the men will get out of their carriages and proceed at once to the trucks containing their horses, water in buckets having been provided by previous arrangement; one man will then get into the truck, and water each horse in succession, the buckets being passed to him from the outside. The horses may then be fed with corn from the nose-bag in the usual manner.

Horses take a long time to water in railway carriages, as each has to be watered from a bucket separately. Along each platform where troops are to arrive for a long halt, there should be at least 160 buckets kept always full for this purpose; upon reaching a feeding-station, each officer having so many carriages under his charge during the journey, will see that this duty is properly carried out. Indeed, during all railway journeys, no matter what may be the arm of the service, the carriages should be divided equally amongst the subaltern officers, the captains going round to ascertain that everything is correct.

During great journeys it is desirable that at each long halting-place there should be a small hospital close to the station with a medical officer always in attendance.

The Station Commandant at these halting-places should be supreme on the spot, no officer, no matter what may be his rank, passing through having any power to issue him orders, or interfere in any way with his arrangements. He must never leave the station whilst the operation is in progress, and he or his assistant must be present upon the arrival of every train, the O.C. in each train reporting himself to him, and taking orders as to the time when the journey was to be resumed. If through any carelessness on the part of regimental officers, every one is not in the train at the exact minute indicated by the Station Commandant, the train must start all the same; if delays are permitted on account of absentees, the whole movement might be compromised. He will receive his orders direct from the G. of C., by whom the arrangements for the operation have been made. He must be in all instances the channel of communication with the railroad officials, to whom no orders are to be given on any subject by the officers travelling. Extra latrine accommodation at all important halting-places should be provided.

The feeding of the locomotive is nearly as important as the feeding of the troops, and halting places must be selected with this object in view. An engine drawing a heavy load consumes about 100 cub. ft., or 660 galls. of water and about 8 cwt. of pit coal per hour.

The police duties at the halting-places should be carried out under the Station Commandant's orders: no intoxicating liquor to be allowed for sale in or near the place. The station to be kept clear of spectators, and the strictest order and regularity to be maintained in it.

When it is time to proceed, the "*Close*" will sound, on which the men will all return to their carriages: the officers will see that their men are all present, and, having so reported to the C.O., the sergeant of the guard will be ordered to withdraw

the sentries and return to his carriage. Lastly, the officers will get in, and the C.O. will give directions that the train may proceed.

During the Fenian raids in Canada, troops had to be moved into districts infested by raiders: to prevent accidents to the loaded trains from the possible destruction of the line, a pilot engine carrying a S.O. was kept running ahead of the train so as just to be always within signalling distance: when nearing the enemy's vicinity, all proceeded at a walking pace. With the leading train was a telegraph operator, who carried a portable instrument and sufficient copper wire to connect it with the telegraph wires of the railway; each train was provided with skids to enable guns and horses to be disembarked at any spot. A detachment of railway workmen with 20 or 30 rails should be with leading train, in which there should be an officer of rank and a railway official of authority of that particular line.

These precautions should never be omitted when there is just cause for apprehension.

4th. *The disembarkation* is very similar, as far as the arrangements required, to the embarkation. With infantry, enough men being left as a fatigue party to assist the drivers to unload their waggons and horses, the main body should be marched clear of the station, and halted on the nearest available open space on the route to be taken, where arms should be piled to await the arrival of the baggage, no straggling upon any pretence whatever to be permitted. As soon as the baggage comes up, the column to march at once for its destination, no halt being again permitted until well clear of the terminus, and adjoining town or village. The Station Comdt. at point of arrival should give all C.Os. their orders, as to the mode of disembarkation and the arrangements to be made until each column gets clear of the place. Any block at the place of arrival is more serious even than at the point of departure, for it must jam up all trains in rear, thereby rendering accidents more liable, and throwing out all arrangements made for the operation. The Station Comdt. must see that this is prevented, and that no troops are allowed to hang about the station or its approaches.

There is always during war a tendency on the part of administrative officers to make railroad stations depôts for their stores. Commissaries find railroad carriages very convenient places for their supplies. There is a great temptation to keep stores brought by rail, and not immediately required at the moment of their arrival, in the carriages they come in. The zealous Commissariat officer, thinking naturally of his own department only, all his thoughts and energies being centred in his important duty of supplying the army with food and powder, begs of the S.O. to permit him to keep his stores in their railroad carriages, until he has to issue or despatch them to the front.

Such requests must never be complied with; for to lock-up rolling stock as storehouses at a time when every available carriage is of consequence would be most imprudent, and to allow a station to be blocked up by an accumulation of carriages during military operations, would be the worst of folly. Storehouses for the reception of supplies should be obtained at some little distance from the station, and if possible, in a direction different from that to be taken by troops in their march to the front.

When moving troops with what I may call tactical objects in view, that is, moving them to the assistance of others already engaged (as, for instance, those pushed on to Frossard's assistance on the 6th of August, 1870), where it is possible it may be necessary to disembark them at any moment, you must carry in each train skids, or some sort of brough for getting the horses, guns, and waggons off the carriages. Although the operation entails labour and requires time, it is a great advantage to be able to disembark at any point you choose, irrespective of railway stations. During the Fenian raids upon Canada, we had every train provided with broughs, and I saw a battery of R.A. disembarked by their assistance in a very short time far from any station.

When the train reaches its destination, the officers will get out first, and the halt being sounded, the men will get out and fall in opposite their carriages. Cavalry or R.A. will be marched to some convenient spot selected by the O.C. at the station to deposit their arms, cloaks, or knapsacks.

The door of each truck is then let down, and a mat or loose straw, if it can be procured, spread upon it; the horse opposite the entrance is to be immediately bridled, and led or backed out by the man to whom it belongs; the horses to the right and left following it in turn. The troops will then be formed up in the most convenient place, and the horses again held until the arms, &c., are resumed and placed upon the saddle.

As it may become necessary to unload without the aid of a platform of any sort, some strong skids, not less than 15 ft. long, and some planks to form a ramp should always be carried. In case of urgent necessity, two lengths of rail may be used for the same purpose; but it is believed that a small temporary platform may be made by the employés of the railway in a sufficiently short time in ordinary cases.

5th. *The march from the point of leaving the train to the camp or bivouac.*—In any great movement it is necessary to run trains by night as well as day. Troops of all arms will thus reach their destination at all hours of the night. As night marches are to be avoided if possible, much will depend upon the nature and objects of the operation in progress, and upon the locality at the point of disembarkation in arranging for the disposal of the troops arriving at night. It is absolutely necessary that they should move away from the station, to prevent a block in the movement in rear, yet to move them any distance, especially if there is no moon, is a difficult operation. During the long days and fine weather of summer, it is easy to provide for the bivouac of the corps arriving; but during the long nights and inclement weather of winter, it is a difficult matter to arrange. Cavalry and R.A. should, as a rule, be despatched so as to reach the point of disembarkation at least 2 hours before dark in the evening, or not earlier in the morning than about an hour before daybreak; the troops arriving in the night between those 2 hours to be infantry. If the weather is at all fine, infantry arriving at night can be marched into any field, ordered to pile arms and lie down, a few drivers standing by the transport horses that are left hooked-to if the night is too dark to unhook and picket them to their own waggons. But with cavalry or R.A. it is hopeless to think of any arrangement except that of

every man standing by his horse all night when it is very dark, a duty that is very wearing to strength, trying to the temper, and depressing to the spirits, as all who have seen it tried know full well.

The general rule would naturally be in all great strategical movements, to collect each division, or at least each brigade, together within a few miles of the place of disembarkation, so that it should march complete to the general rendezvous or point of concentration.

Electric Telegraph.—We were the first nation that used it in the theatre of war, a wire having been run down to our trenches before Sebastopol. During the Indian mutiny, the wire uniting us with Calcutta followed close upon our heels, so close that I have seen the workmen when laying it actually under a fire of canister. A careful study of the late wars in America, Bohemia, and in France, will give the student an idea of its immense value in military operations. In future, a regular signal corps, under charge of an officer, will take the field with an English army, to act under the orders of the C. of the S., the care of the instruments and the working of the line being under the superintendence of the C.R.E. No attempt will therefore be made here to describe the various processes for laying or fixing a line of wires. On level ground 16 poles per mile are sufficient for two wires, but when many wires are used, 30 and even 40 are used. The wire most commonly used in Europe for aerial lines is No. 8 B.W.G.,* with a diameter of ·17 in., weighing 389lbs. per mile: No. 4 is sometimes used, its diameter being ·24 in., weighing 775 lbs. per mile: in India the standard size is No. 5½, with a diameter of ·217 in., and weighing about 660 lbs. per mile: in America, No. 9 is most commonly used, diameter ·158 in., weighing about 300 lbs. per mile; the diameter of No. 14 is ·08, and it weighs 90 lbs. to the mile. The wire used in Abyssinia by us was No. 16 B.W.G. copper wire, 64 lbs. to the mile: that used in Ashantee was No. 11 B.W.G. galvanized-iron wire, weighing 2 cwt. per mile. In South Africa several sorts of wire were used, but none was more satisfactory than a three-strand galvanized-iron wire of 18 B.W.G., weighing 120 lbs. to the mile. In some instances, the wire has been used without insulators, and has answered well. The cable used by our telegraph troops has a diameter of ·32 in., and weighs 280 lbs. per mile; but it is now intended to replace it by a cable weighing only 168 lbs. per mile. At present the troop carries only sixty miles of wire, but when the proposed changes have been effected in its organization and equipment, 160 miles of wire will be carried by its eight sections (20 miles per section). The overhead wires carried by troops at present is 15 B.W.G. (copper, weighing 80 lbs. per mile). In future it is intended to use bamboo poles 15 ft. long, and about 8 lbs. each.

All cavalry raids made upon the enemy's communications or into his

* Birmingham Wire Gauge.

territory should be accompanied by a skilled operator, who should be provided with a pocket instrument and a small supply of copper wire, and when the enemy's language is different from yours, by a supply of ribbon paper and the instrument for recording the messages on it.

Thus provided, an O.C. a cavalry detachment that has got into the enemy's rear, can, by tapping the wires at any place, learn the messages that are going over them, and perhaps in that way the plans that are being made to capture his party. In many instances the Southern commanders having seized some telegraph station in their enemy's rear, sent orders in the name of Northern generals to various posts, directing them to move so as to fall into a net prepared for them ; trains of supplies of which they were in great need were thus secured. To prevent such tricks being played upon you, a secret signal, to be frequently changed, should be determined upon, without which no orders are to be obeyed. It is necessary that the operators should not even know that such existed. For instance, for the month of June, it may be arranged that each message should begin or end, or both, with a word of 5 letters, for the next month with a word of 6 letters, or that the 3rd word in the message should be of so many letters, &c. &c. The secret to be communicated only to Os.C. posts.

To Destroy Telegraph Line.—Pull down a pole so as to get at the wire, and then cut it in several pieces : the more poles destroyed the better. This is, however, easily repaired. An admirable plan for destroying communications is by means of non-conducting wire having the outward appearance of the ordinary wire in use. Being furnished before starting with some of this wire, and the tools used in repairing telegraphs, send a man experienced in such work up a pole, and let him there cut the wire close to it, uniting it again by the non-conducting wire spliced on in the usual manner. This should be done at several places along a line, and always at a pole. The result will be that, although all galvanic communication will have ceased, a man merely marching along the line shall not be able to discover where the break exists ; one must go from post to post with an instrument to test each intervening portion of wire before the exact spot can be ascertained. It is advisable that a pole here and there should also be destroyed, and the wire cut, so that it should be supposed at first that the interruption simply resulted therefrom.

SIGNALLING.—The system is so simple that it might be advantageously included amongst the subjects upon which regimental officers are examined previous to promotion. It is of great importance that outposts should be able to communicate by signals with the main body, and that officers in charge of patrols, reconnoitring or flanking parties, advanced or rear guards, should have the power of rapidly communicating to the general what they observe, or the intelligence they may obtain. Sending messages by mounted

men is always liable to accidents, and at best is but a tedious process. At times, circumstances may preclude the possibility of doing so.

During an action or the execution of movements in presence of an enemy, orders can be sent with rapidity and silence, by night or by day, to the several detached corps by means of the new system of signalling. By its means communications can also be maintained between the troops ashore and the fleet.

Communication by means of the system of flag signals described farther on, was kept up between the main body and the flanking parties whilst advancing upon Fort Garry in 1870: it worked well, and was of great use.

The electric telegraph is, during war, constantly liable to interruptions, so it is essential to have the power of supplementing it by a system of signalling that is independent of all elaborate apparatus.

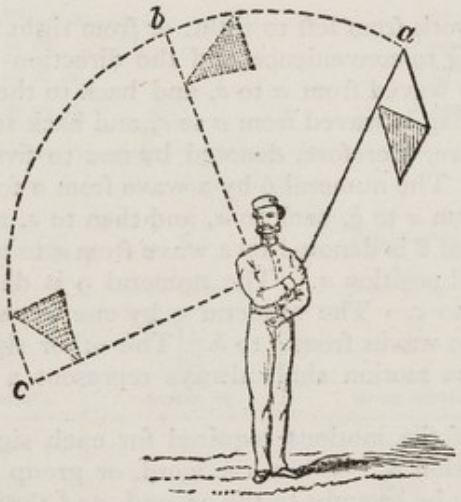


Fig. 55.

Signal rockets can be used at night with advantage, and are visible in clear weather at long distances—see page 41.

The mode of signalling adopted is by a combination of short and long flashes, or appearance of any given object with proper intervals or obscurations between them, which are made by visual apparatus, such as revolving shutters or disc, collapsing cones, flags, banderols, jets of steam, &c., by day; by lamps or lights at night; and by a combination of short and long sounds made with a fog horn, bugle, or steam whistle, in fogs, or when visible symbols are not available.

The appearance of the object are termed 'flashes,' and are of two lengths, termed respectively 'short' and 'long' flashes,—sometimes also called 'dots' and 'dashes,'

—which, separated by obscurations, are used in combination to express the signs required, and are usually written thus:

▬ to express the short flash or dot,
▬▬ ,, long flash or dash,

the interval of obscuration, or of the disappearance of the object, being left blank.

At night these signals are in all cases made by the obscuration and exposure of a single light; in the daytime by the different apparatuses which may be employed.

At short distances no special apparatus is necessary, the simple waving of the arm with a hat, flag, handkerchief, &c., being sufficient.

This signalling without apparatus is that which should be practised by officers and N.-C.O.'s. When it possible so to do, the handkerchief should be placed on the end of a stick about 6 feet long.

The flashes are made with the arm, or with a flag as described above, in the following manner.

The signalman may work from left to right, or from right to left, as shown in the figure (p. 469), according to convenience and the direction of the wind. To make a short flash, the flag is waved from *a* to *b*, and back to the normal position *a*. To make a long flash, the flag is waved from *a* to *c*, and back to the normal position *a*.

The numerals 1 to 5 are, therefore, denoted by one to five waves of the flag from *a* to *b*, recovering to *a*. The numeral 6 by a wave from *a* to *c*, recovering to *a*. The numeral 7 by a wave from *a* to *b*, back to *a*, and then to *c*, recovering to the normal position *a*. The numeral 8 is denoted by a wave from *a* to *c*, back to *a* and then to *b*, recovering to the normal position *a*. The numeral 9 is denoted by two waves from *a* to *b*, and one from *a* to *c*. The numeral 0 by one wave from *a* to *c*, recovering again to *a*, and then two waves from *a* to *b*. The other signs are made in the same manner, so that a short motion shall always represent a short flash, and a long motion a long flash.

On the completion of the motions required for each sign, the flag must always be brought to the position *a*. When the word, or group of figures, is completed, the butt of the staff may be brought to the ground, and the flag at the same moment gathered in.

In receiving a message, the flag should always be kept in the position *a*, except when answering.

Messages can be sent either by means of the signals laid down in the 'Army and Navy Signal Book,' lately compiled by authority, or by spelling the words according to the alphabet given below, or by using the Morse Alphabet when communicating with telegraph stations unprovided with the code. It is, I think, very much to be regretted that the Morse Alphabet has not been adopted for the code, as it is now in general use for telegraph purposes. At present, a good signalman must know the two systems, a necessity that makes the art difficult to acquire.

It being advisable to keep the signal book as secret as possible, it will only be in possession of a few, so that for common work the alphabet will be used. 'The symbols and numbers expressing the alphabet are identical with those forming the alphabet in the signal book.'

Preparative . . . . , &c.

(A continued succession of short flashes.)

Spelling prefix . . . . . .

Stop . . . . . .

(A continued succession of long flashes.)

General answer . . . , &c.

(A continued succession of long and short flashes alternately.)



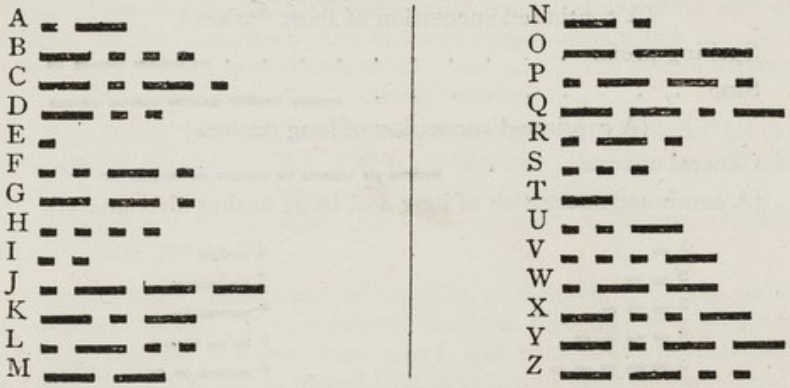
1 Understood.	2 Not Understood.	A 5	3 Numeral.	4 Wait.
B 6	C 7	D 8	E 9	F 10
G 11	H 12	I 13	J 14	K 15
L 16	M 17	N 18	O 19	P 20
Q 21	R 22	S 23	T 24	U 25
V 26	W 27	X 28	Y 29	Z 30

Stop or end of word ▬ ▬ ▬ ▬, &c.

NOTE.—This signal is repeated twice at end of message.

In communicating with the Navy not more than two letters are to be sent in one group, and the numbers 1, 2, 3, and 4 are not to be used, the Naval Answer being ▬ ▬▬ ▬▬ ▬ ▬▬ ▬ ▬▬ ▬ ▬▬ ▬ ▬▬.

THE MORSE ALPHABET.



Preparative, stop, and general answer are the same as in the code.

Repeat and Interrogative, ▬ ▬ ▬▬ ▬▬ ▬ ▬.

The operator should make the signals in a precisely similar manner to that in which he makes the numbers in signalling, pausing between each letter as he does between each figure, and treating each word as a number. He should never commence any word after the first until he has received the "Answer" from the receiving station, to indicate to him that the word is understood.

With this code great expedition may be obtained in the transmission of messages to stations where the operators are very expert; but very constant practice is necessary on the part of the operators to enable them to transmit and receive messages accurately and quickly.

CYPHER.—It is most important to be able to transmit messages in writing, or by electric telegraph, or by signals, by means of a cypher unintelligible to those unprovided with the key. An admirable plan for doing so is described in the 'Army and Navy Signal Book,' but as it is rather too complicated to be generally remembered, the following simple plan will answer all outpost purposes. Divide a square into 25 spaces, and number them as below.

This method of numbering them, and the key-word, is all that one has to remember, so that when a message in cypher is received, one has only to draw roughly in pencil a square as above, and number the divisions in the same way. The key-word can be changed daily, or whenever it is considered necessary. It should be a word of at least six or seven letters, and must not

have any letter repeated in it. In the diagram given, the word 'MAJESTY' is the key. The letters composing it are accordingly spelt along the spaces from left to right, beginning at the left-hand top corner. The succeeding spaces are filled with letters thus: the space following that on which is written the last letter of the key, is marked with the letter A: or if that letter is contained in the key-word, then the letter nearest it in the alphabet in order of sequence, which may not be in the key-word, and so on through all the spaces. For example, after the Y of 'majesty,' the next letter is B, because A is in that word and B is not; then C, D, then F (E being in the key), and so on to Z.

1 M	2 A	3 J (I)	4 E	5 S
8 T	9 Y	10 B	11 C	6 D
7 F	12 G	H	12 K	7 L
6 N	11 O	10 P	9 Q	8 R
5 U	4 V	3 W	2 X	1 Z

In this and all other cyphers, whether letters or figures be used, they should always be written in groups of 4 or 5 letters or figures, so that whilst avoiding giving any clue to the length of the words used, the accidental omission of letters or figures may be more easily detected. This is especially necessary when the messages are transmitted by signal or electric telegraph.

Messages are written in this cypher as follows; for every required letter of the alphabet, having found in it the diagram, see the number of its space, and substitute for it in the message, the letter in the space having the corresponding number. Thus I want to send the following message:—

WE ATTACK AT NOON.

It runs thus in this cypher:—IVXR RXOG XRDC CDDD.

It may be seen there are two more letters in the cypher message than in the actual words of the message: these two letters are to complete the last group to four, which would otherwise have only had two letters in it. In adding letters for this purpose, care must be taken to select those which are least liable to lead to misinterpretation.

One letter will always be on the centre square, which has no number. Whenever, therefore, it may be necessary to use it, the true letter is used. With 'majesty' for a key-word, that letter is H.

To decypher a message, the process is merely the reverse of that described above. For example, the following message is received:—IVXR RXOG XRDC CDDD. I look out for I in the diagram, and find its number to be, 3, and that the letter on the space with the corresponding number is W, and so on.

The following cypher is also by a substitution of letters one for the other; it is somewhat more troublesome to use than that already described, but without a knowledge of the key it defies interpretation, as the same letter is represented by various letters at different parts of a sentence, word, or even syllable. It was used successfully during the Ashantee war. The key is any number that may from time to time be fixed upon, of seven or more figures, say 4,631,870. Let us suppose that the same message as above is to be sent in this cypher. Write under it (beginning at the first letter in the message) the key-number, one figure under each letter in rotation, and keep on repeating the key-number until there is a figure under every letter in the message. The substitution of letters is then determined as follows. The first letter W having 4 under it, you represent it by the letter that comes fourth after W in the alphabet, but as there are only three, you add on as many letters as may be required from the beginning of the alphabet in regular order: A is therefore the substitute for W. The next letter, E, has 6 under it, and is represented by K, which is the sixth letter after it in the alphabet. The next letter, A, has 3 under it, and is therefore represented by D, the third letter after it, and so on, the whole sentence being as follows—

WEAT TACK ATNO ON	message.
4631 8704 6318 70	key.
AKDU BHCO GWOW VN	message in cypher.

The decyphering is merely the process reversed: whenever the figure o occurs, there is no substitution. Like the other cypher, the letters in a message should be written in groups of 4 or 5 letters.

MILITARY SURVEYS.—It is taken for granted that officers understand the art of surveying; if not, let them ask a brother officer to teach them as soon as possible, and let them study Jackson's book on the subject.

It is very necessary that every officer on the Staff, especially the younger officers, should be able to delineate the features of a country on paper, at the same time it is ridiculous to imagine that every one can acquire the art of doing so well. All men can, however, learn to survey, and most men can, by application, even learn to give a rough idea of ground on paper. To represent the features of a country on paper really well, requires a considerable gift of artistic talent that is not to be acquired by every one, and it is only men who are so gifted who should be selected for topographical work during war. A really good military draughtsman would convey a better idea of ground after a few hours' work, than the unartistic sketcher could do in a similar number of days. The topographical work of a campaign should be done by a special branch of the Staff, as it was done during the China war of 1860, the officers employed upon it being available at all times for all other purposes, such as reconnaissance duties, &c., as required by the C. of the S.

As soon as the staff is organised, it is most necessary that special instructions should be issued by the C. of the S., as to the descriptive terms to be used in reports of localities, positions, &c., when describing their physical features, and as to the manner in which they should be represented on paper. This is necessary to prevent confusion, for so many men have different styles of doing so, that a few clearly defined rules on these points are essential.

The best scales for field surveys are 2, 4, and 8 inches to the mile; and for an index plan, 2 miles to the inch; it is taken for granted that maps of about this last-named scale are in possession of all S. Os., before the campaign opens. The object of the survey must always be held in mind; it is not to measure land for farming or building purposes, but to put on paper a delineation of the country, showing all its features which affect military operations, and showing the distances with sufficient accuracy for all military purposes.

The instruments to be in every S.O.'s possession are—the prismatic compass, marked off from 1° to 360°, and bronzed on the outside; a protractor (made for compass surveying, and divided by the 4-in. scale); a pair of folding compasses; a small colour box, with brushes, pencils, and a piece of india-rubber; pencils of coloured chalk are also very useful at times. The small range-finder issued for musketry use is of great use in surveying, and I strongly recommend that all officers employed on topographical work should have one. I saw it used to great advantage in Zululand. A block sketch-book 9 in. square, with blue lines ruled parallel to one another, but at irregular intervals, is the best to draw upon. With each division in charge of the senior S. O. there should also be a box sextant. Some one officer belonging to the topographical branch should have sole charge of all the triangulation work. He will commence by measuring a long base; and, working from it, will fix the positions of all villages and important

points in his vicinity, extending his work as far to the front as possible. He can do this either with a pocket sextant resting on a stand, or with a small theodolite. With the steeples of churches or other remarkable points fixed, and their positions pricked off on the sketch-book, an officer filling in the details has only to observe two that subtend an angle of about 90° from where he is, and lay off the bearings from each of them on his book ; where those bearings intersect is his position ; in this manner the details of 5 or 6 square miles can soon be filled in. In doing so he will make use of the style that he is best acquainted with, for some that use the vertical touch cannot do the horizontal one. It should be a rule with all employed surveying in the field that the day's work is inked in every evening. The author has had considerable experience, and he strongly recommends brush-work in preference to pen-work, as saving time and labour. All streams and water should be shown in blue ink, woods by a wash of green (Hooker's is the best).

Whilst surveying, the compass should be secured round the neck by a string, and carried in a breast-pocket. It should have no cover ; the glass should be strong, and the action of putting down the sight-vane flat on the glass should throw the needle out of gear. The pencil, a hard HHH, should be fastened by a string to the sketch-book, as should also the protractor and india-rubber.

In pacing distances, do not attempt to carry large numbers in your head ; when you have counted 100 close the little finger of either hand ; for the next 100, close the third finger, and so on until 500 is counted ; for 600 open the little finger, and so on until all the fingers are again open, when 1000 will have been counted. Each 1000 paces should be at once noted in your book or on your sketch. When written down, you begin again with another 1000.

Some prefer to measure distances in yards instead of the pace of 30 in. I have always paced in yds., and found from practice that I was much less liable to error than when I measured distances in paces of the regulated length, and in plotting one's work on paper, the advantage is all in favour of using the yard.

To judge distances accurately is of great importance ; every opportunity should be taken of practising the eye in doing so. Where there are telegraph poles in the direction you wish to know a distance, they are a great assistance, as they are usually from 50 to 100 yards apart, according to the number of wires, and having ascertained the number of poles used per mile on any line of telegraph, the distances between them may be roughly assumed as the same throughout. Good eyesight can distinguish bodies of troops at 2000 yards ; at that distance a man or horse appears like a dot ; at 1200 yards cavalry is distinguished from infantry, and movements can be seen ; at 900 yards they become clear ; the motion of arms and legs is visible at 800, and the head appears as a ball at 650 yards.

In sketching the features of the ground, the one great guide is to observe the course the water flows in ; stand on any little hill or mound, and in looking round you will see the marks left by the water of the last shower. In fact, a delineation of the natural drainage of any section of the country

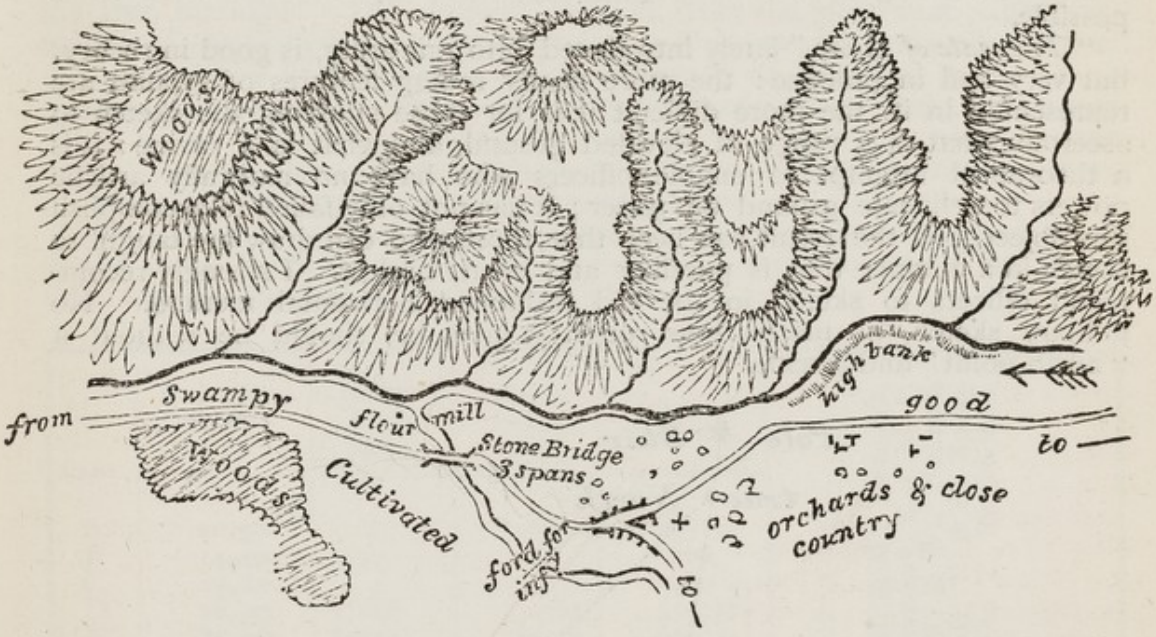


Fig. 56.

describes its features, and requires only little additions to make it into a good military map. Given to any one accustomed to sketching a ground, a plan showing the water-courses (which when drawn alone resembles a decayed leaf with its fibrous portions only remaining), the features can be sketched in with tolerable accuracy, although the draughtsman had never seen the country.

The groundwork of all surveying must be triangulation, and working from the large data down to small results and deductions therefrom. The more it enters into a survey, be it with or without instruments, the better will be the work. The more information you can convey on the face of a plan the better : it is far better to learn from the plan itself that such a bridge is of *wood*, or of *4 spans*, &c. &c., than that you should have to search through an accompanying report for that information. The same thing as regards roads ; it is easy to write along them *good, bad, macadamised, paved*, &c.

For rough sketches, when time is of importance, there is really only one style for military drawing : the touch is so simple that it requires no

artistic powers, and although done with the greatest rapidity, is yet capable of being subsequently worked up and improved into a highly-finished sketch, either by pen or brush, the latter being the best. Here is a rough specimen. The writer has many times made sketches in this way on horseback, taking care to fill in particulars and improve them as soon as possible.

"*The scale of shade*," lately introduced into our army, is good in theory, but very bad in practice: the more neatly rolling features of ground are represented in it, the more difficult it is for those studying the sketch to ascertain what is a range of elevated ground, and what is a ravine: it is a theoretical attempt to enable officers who have no naturally artistic powers to delineate ground on paper; it has not only failed to accomplish this object, but the result has been that those who can draw are taught to sketch in a manner that is puzzling and nearly useless. I strongly recommend officers to sketch in the old fashioned horizontal method. No military sketch, no matter how rough it may be, should be without a "north-point" and a scale.

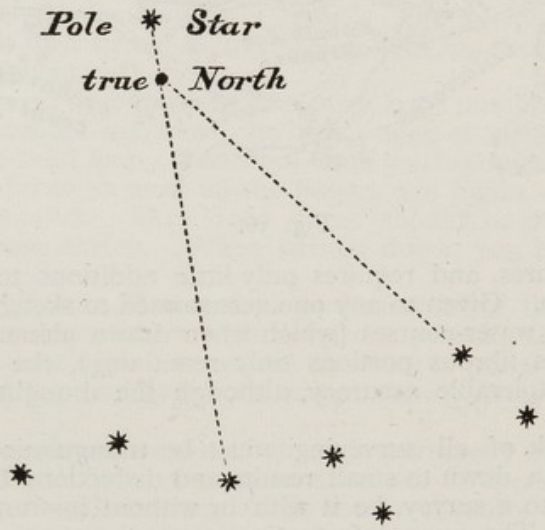


Fig. 57.

Attached to the topographical department there should be a light cart or waggon with two wheels, 15 ft. in circumference, fitted with a dial arrangement to measure distances as the cart went along. It should carry the papers, instruments and materials for the department, and could thus be made to fulfil two purposes. A corporal or sergeant as draughtsman

and clerk should accompany the cart on the march, and make a regular traversed sketch of the road, taking the distance from the dial. In this manner a series of bases will be obtained according as the army advances.

The variation of the compass should be constantly checked by finding the true meridian. The simplest method is by the polar star; the intersection of the dotted lines may be taken as the true north for all practical purposes. The illustration shows the position of the stars in the Great Bear. Erect a pole anywhere, and at the distance of a couple of hundred yards have another put up, so that the two are in a line with the true north; the variations of your compass can be ascertained the next morning by taking the bearing of one pole from the other.

The fractional scales commonly used for military maps in Europe are shown in the following table, which gives their equivalents in inches to the mile, miles to the inch, and in yards to the inch.

	Fractional Scale 1 in	Inches in the Mile.	Miles to the Inch.	Yards to the Inch.	
A	10,560	6	·167	293·34	
B	14,400	4·4	·227	400	
C	15,840	4	·25	440	
D	20,000	3·168	·31565	555·55	
E	25,000	2·5344	·39457	694·44	
F	28,800	2·2	·454	800	
G	31,680	2	·5	880	
H	40,000	1·584	·6313	1,111·11	
I	50,000	1·2672	·7891	1,388·88	
J	60,000	1·056	·94696	1,666·66	
K	63,360	1	1	1760	
L	75,000	·8448	1·18371	2,083·32	
M	80,000	0·792	1·2626	2,222·22	
N	84,000	·75428	1·3257	2,333·33	
O	85,439	·733	1·364	2,401·09	
P	100,000	·6336	1·5782	2,777·77	
Q	126,000	·5085	1·9886	3,500·049	
R	126,720	·5	2	3,520	
S	160,000	·396	2·5252	4,444·44	
T	200,000	·3168	3·1564	5,555·55	
U	320,000	·198	5·0504	8,888·88	
V	500,000	·12672	7·891	13,888·88	
W	633,600	·1	10	17,600	
X	1,000,000	·06336	15·782	27,777·76	

Austria uses, B, F, & O., Belgium, D, H, & M., Denmark, D, M, & S., France, H, M, & U., Germany, E, I, M, P, & T., Great Britain, A, C, G, K., R, & W., Holland, E, & I., Italy, E, I, L, & O., Russia, N, & Q., Spain, J, & P., Sweden and Norway, D, P, and T., Switzerland, E, & I.

When time admits, avail yourself of every possible opportunity of taking accurate bearings and angles from all church steeples and high ground, as well towards the rear as the front.

Scales.—Continental nations indicate the scale upon which a map is drawn by the fraction that any linear distance measured thereon is of the actual distance on the ground. This is a little puzzling to us who are accustomed to scales of so many miles to the inch, or of so many inches to the mile. When obliged to use a map with a fractional scale, you should at once construct a scale for it of British miles. To do so, you have merely to divide 63360 (the number of inches in a mile) by the denominator of the fraction of the scale to ascertain the number of inches it is to the English mile. Thus a scale of $\frac{1}{80000}$ is 0·792 in. to the mile, because $\frac{63360}{80000} = 0{\cdot}792$. With a scale divided to hundredth parts of an inch, mark off 79 parts and you have one mile on the map. It is easy to divide that distance into four parts to give you quarters of a mile. To ascertain the number of English miles to the inch on a map with a fractional scale, reverse the process: thus, with a scale of $\frac{1}{80000}$: $\frac{80000}{63360} = 1{\cdot}262$ miles, or 2222 yds. and 8 in. = 1 in. on the map.

Form of Report for an Itinerary.—I have found, from a considerable experience of military reports, accompanied by sketches, that the simplest forms are the best; most of the elaborate forms given in books were designed by men who never conducted a reconnaissance in war. As you open your metallic paper pocket-book (size 7 in. × 4 in.), let the left-hand page be ruled into squares, a quarter of an inch in the side, so that if your scale is an inch to the mile, each square is 440 yds. × 440 yds. Mark along right-hand edge of page, 1, 2, 3, 4, and so on, at every inch, so that the distances in miles may be distinguished at once. If there is plenty of time to prepare this book, it is a good plan to mark the mile lines in red ink, so that a glance at the paper shows you the distance upon it. Begin your sketch at lower end of page, working upwards, noting name of place and hour of starting. Let your road wind about as it seems to do in reality, marking by compass the bearing of all villages one from another in degrees, read off a prismatic compass divided from 1° to 360°; do the same with all remarkable objects to right and left of the road, taking care to distinguish angles from distances by having the degree mark over them. Place your ordinary remarks, such as the time you reached particular localities, close to the edges of the paper; be very particular to note the number of minutes you halted at each place. Under the name of each village, note the number of inhabitants, and of houses, whether of stone, brick, or wood. Convey as much information on the sketch itself as you can do without interfering with the delineation of the features of the country. Keep the opposite page (ruled) for noting the information which

you cannot put on your sketch, such as the name of postmasters, magistrates, leading residents, the best guides to be obtained, the supplies to be had, &c. Never trust your memory. Note in your book all you wish to remember, and ink it in every night after your march. In all reports, be careful to distinguish the information that is derived from your own observation from that obtained from the inhabitants; in the latter case name your authority, and state the amount of reliance that can in your opinion be placed upon it. The state of the weather during the march to be recorded. For the accommodation that houses and villages will afford, see page 251.

Field Fortification.—It is taken for granted that officers are conversant with the names of works, and the technical terms in permanent fortifications, and that they have a clear conception of the object of the art; also that they have been well instructed in the construction of shelter trenches, as now laid down in our drill books. The official "Manual of Elementary Field Engineering" should be in every officer's possession.

The works thrown up in the field, perhaps the work of a night, perhaps the labour of months, are rough imitations of the great fortifications constructed to defend cities: the principles are the same in both instances, but the materials required for their construction, and the time, are wanting in the field. Those principles must be borne in mind by the officer who has merely to throw up cover for his advanced post—they must never be lost sight of; they are as applicable to the defence of a farmhouse as to that of a capital. For anything like an extended system of defence, there will always be R.E. officers to lay down the general plan, and give the outlines of the works to be made, but it is a disgrace to any S.O. who knows less of the science than an engineer: he should be able to go carefully over all schemes for defence, to point out to his general the weak points, and to make propositions accordingly for modifying the projected works, &c. It may also be of moment occasionally for S.Os. to design and carry out temporary works of defence. A few general memoranda will be given here for reference on this subject. The tracing must depend, 1st, on the configuration of the ground to be defended; 2nd, the object in view; 3rd, the time available for the construction, and the number of men to form the garrison.

Every preconceived notion must give way to the first consideration, which will indicate generally the outline to be followed. The following considerations must never be overlooked: No salient angle to be less than 60°; the re-entering ones to be from 90° to 110°, but never less than the former: the extent of isolated and enclosed works to be proportioned to the numbers intended for their defence, to be calculated roundly at a running yard of parapet to every two men, deductions being made for space occupied by artillery. The prolongation of all faces of works to be directed upon points where it is impossible to establish batteries, such as marshes, &c.

Apart from the local or immediate object in view, all works must provide, 1st, cover for the troops to occupy them ; and 2ndly, must have their front well swept by their own fire, and that from other works or troops in their neighbourhood, to which again they should afford similar protection. In fact, the true test of the soundness or otherwise of any proposed scheme of defence is the aid and support its several component parts can mutually afford.

The objects in view when it is determined to throw up field-works are so varied that I shall attempt no enumeration of them ; they are to be found in every ancient and modern writer upon military history as of constant recurrence in every phase of a campaign. The time available must influence not only the profile to be given to the works, but also their tracing ; for if there are only a few hours to spare, it is absurd to attempt enclosed redoubts, and so on ; but in most cases the possibility of having more time than can be positively calculated on should be taken into consideration, and the works should be of such a nature as to be capable of constant further development.

PROFILE.—The minimum height of parapets of all well-finished field works constructed in a plain should be 8 ft. If the work is on ground much higher than all around it, the height may be less ; if the reverse is the case, it must be much more : care to be taken that, not only are the men manning the front faces sheltered from fire, but that those standing on the banquette of the rear faces are so too. To *defilade* the interior of all field-works is essential ; the construction of large parados or traverses can be undertaken for that purpose when the work is otherwise completed.

For infantry who intend acting defensively, but who are to assume the offensive during an action whenever favourable opportunities show themselves, a bank of earth 3 ft. high, with a base 8 ft. or 9 ft., having a trench on each side of 5 ft. wide by 1 ft. 6 in. deep, is the best profile ; a berme of 1 ft. should be left on both sides ; 100 yds. of it can be easily thrown up by 100 men with two hours' fair work. In thus providing cover for men, all material that is procurable on the spot that will add to the strength of the parapet, or which will increase the steepness of the interior slope, should be used, such as barrels, house furniture, logs of trees, turf, sods, hurdles, gates, rails, fences, &c. Every hour that men are left in such a breastwork, its defensible qualities ought to be added to, but in positions where it may be necessary to move cavalry or artillery to the front, care must be taken not to erect such a barrier in the form of a parapet that both those arms cannot easily cross. After fair cover from the enemy's view (which is the first consideration) has been obtained generally along the line of breastworks, and if time still admits of further work, it is better to devote all available labour to strengthening particular salient points, so that

they should be, as it were, strong bastions to the rest of the line, which should be their curtains. If time permits, they may be made secure against capture by a sudden rush. As *points d'appui* they will add immensely to the strength of a position ; however, it must be remembered that it is extremely dangerous to enclose any works in the rear. As a rule, they should be left open, so as to be seen into by other works or batteries, for the purpose of recapture from the enemy, should he succeed in getting into one.

If it is a question of constructing a square redoubt, the sides should not be less than 20 or more than 90 yds.: in calculating the garrison for them, an allowance of 500 square feet for each field gun, and the same for the entrance traverse, must be allowed ; the remaining superficial space, calculated in square feet within the foot of the slope of the banquette, divided by 20, will give the maximum garrison, but unless the parapets are most substantial, to put more than 300 men into any one enclosed work, would be to convert it into a charnel-house when the enemy has the power of bringing a heavy fire from field guns to bear upon it. The minimum garrison for a square redoubt of the minimum size is 80 men, to be disposed in single rank along the banquette and without artillery ; the maximum garrisons for the largest square redoubt should not exceed 400, with 4 field pieces. If the number of men and guns to be enclosed in a field-work exceed these limits, a redoubt with good flanking defence should be constructed.

The thickness of the parapet must depend upon the nature of guns that are likely to be brought against it ; from 10 ft. to 12 ft. along the superior slope is a fair thickness to resist field guns. If intended to resist a sustained fire from field guns, the thickness should be at least 15 ft. The depth of the ditch having been fixed upon, its mean width can, of course, be determined by dividing the superficial area of a section of the parapet by the depth, as the sections of the ditch should about equal that of the parapet. To calculate the time that a certain ditch can be excavated in, the ordinary task of an untrained workman is commonly estimated as 1 cub. yd. per hour for 4 hours at a stretch in fairly easy soil. The average of men will not, however, excavate 1 cub. yd. in less than $1\frac{1}{2}$ hour, if he has to use the pick. If the depth of the ditch requires the earth to be thrown on a stage and from thence to the parapet, an additional number of shovelmen, equal to half of those in the ditch, would be required on the stage to forward on the earth to the rammers and shovellers on the parapet. Profiles of the work should be erected at all the angles by driving poles into the ground of the required height to represent the intersection of the several slopes of the parapet and banquette : these poles should be joined by sticks or string, so as to form a complete section of the work. Good rammers are easily made by cutting off, with a saw, logs from trees about 9 in. in diameter. The drainage of all works should be provided for when constructing them.

Field-works should not be occupied by their garrisons until the enemy is actually in view. It is advisable to keep the men away from them as much as possible, and, unless surrounded by an enemy, the cooking at least should be carried on outside.

The following data may be useful. Banquette to be 3 ft. for single, and 4 ft. 6 in. for double rank: slope to it, $\frac{1}{2}$: interior slope to be riveted, if possible, the base being 1 ft. or 1 ft. 6 in.; the superior slope should never be less than $\frac{1}{4}$, but it ought to be $\frac{1}{6}$; exterior slope, $\frac{1}{1}$; berme, from 1 ft. to 3 ft. Escarp and counterscarp as steep as the soil will permit, and between 6 ft. and 12 ft. deep. The ditch never should be less than 10 ft. wide at top. *Platforms* for guns should have a slope of $\frac{1}{15}$ to facilitate the guns being run out.

Sandbags are very useful in the construction of field-works, and in all works of defence. Those used by us are issued in bundles containing 125, and each bundle weighs 75 lbs. Sandbags when tarred are made up in bundles of 50, which weigh 70 lbs. The sandbag, when empty, measures 32 in. × 16 in., and when filled and partially flattened down in a revetment, &c., it measures 18 in × 10, or 11 in. × 6 in.: it holds about a bushel, or, when in use, 1 cub. ft. of earth.

Gabions.—Their most convenient size is 2 ft. in diameter and 3 ft. high: when that size, they should weigh from 35 to 50 lbs., according to the nature of the brushwood employed. When they are made on the spot where they are to be used, they can be made 5 or 6 ft. high with great advantage for the interior revetment of batteries or field-works.

Fascines are also very useful for revetments, the cheeks of embrasures, &c. The usual dimensions are 18 ft. long and 9 in. in diameter: they should not weigh more than about 140 lbs. It should be bound securely at intervals of about 18 in.: wire makes the best binding material.

Embrasures splay outwards, and should be 2 ft. wide at neck, and 3 ft. wide at a distance of 5 ft. from neck: the sill should be $3\frac{1}{2}$ ft. above the platform for ordinary field guns.

Loopholes splay inwards: if made with sandbags they should be 3 in. wide in front, and 10 in. wide in rear; in making them in walls, they should not as a rule be less than 3 or 4 ft. apart, so as not to weaken the wall unduly.

Obstacles.—In all closed works, or in the portions of a long line that represent the bastions, as it were, every effort should be made to render approach to them difficult by the construction of obstacles placed in their immediate front, so as to be always under your observation and under your fire. They are especially useful in all savage warfare to guard against night attacks. When your enemy are barefooted, broken bottles or small sharp stakes driven into the ground are very effective. The most easily made, and the best obstacle, is that afforded by felled timber with the leaves and small branches lopped off, the others being pointed and turned towards the

enemy ; if the trees are on the spot, they should not be cut more than two-thirds through, so that they cannot be dragged away. If wire is to be had, it should be fastened from branch to branch as much as possible, as it vastly increases the value of the *abattis*. Wire fences are common now in many countries ; they are invaluable as an obstacle in front of a work ; all obstacles should be well under musketry fire ; if they can be screened from the enemy's view or fire so much the better ; this can be accomplished, when time admits, by placing them as shown in sketch.



Fig. 58.

Wire entanglements are excellent obstacles, and are easily made if plenty of wire is to be had. No. 14 (B. W. Gauge) is a good size, but any telegraph wire will do. It is formed by driving stout stakes firmly into the ground checquerwise, about 6 ft. apart, leaving about 3 ft. above ground. The wire should be given two or three turns at least round every stake, and interlaced between the tops and bottoms of the stakes. The entanglement should be 8 or 12 yds. in width.

Chevaux-de-frise can be made of sword-blades or pointed poles let into a beam of wood so as to form an X in cross-section. The store pattern used by us consists of an iron tube 6 ft. long, containing 12 spears (6 ft. long) inside, which, when required, are easily fixed in 12 holes which are in the tubes : the tubes are fastened one to the other when placed in line, by a few links of iron chain. Each tube complete weighs 80 lbs.

Fougasses are small mines loaded with stones, bricks, or small live shells : a hole is dug at an angle of 40° inclined towards the enemy, at the bottom of which the powder charge is placed, the stones being placed immediately over the charge ; no earth to be placed over the stones, &c. : the mine is, in fact, merely an improvised mortar, and if discharged at the right moment when the assaulting party is close in front of it, its demoralising effect is considerable even upon the best troops ; the best position for them is on a road or path over which the enemy must come.

Working parties.—In siege works, especially when breaking ground the first night, it is most important to avoid all confusion by having all concerned well instructed in the nature of their duty. The parties should reach their ground exactly at the hour appointed, provided with their tools and ready to begin work at once. There will always be officers of R.E. to direct

the operation, but all S.O.'s should thoroughly understand the prescribed method for extending the men along the line selected for 1st parallel, &c. It is most desirable that each working man should be given a four hours' task, and when he has completed it, he should not have to work any more that day. In a previous paragraph the working powers of an untrained man are given. The men should be placed at intervals of 5 ft. along the line of work: if, as is sometimes done, one man of each file digs and the other shovels, the files should be the same distance apart as the men who both pick and shovel. It is found to be a good plan in the construction of field-works to tell the working party off in squads of three files each, of which three men pick and dig, two shovel, and one rams the earth.

DEMOLITIONS.—*Gun-cotton or dynamite* is better than gunpowder for hasty demolition: their explosive force may be estimated at 2 or $2\frac{1}{2}$ times that caused by powder where tamping is used, or at least 4 times the effect when the charges are not tamped. Gun-cotton and dynamite must be exploded by detonation. The former is made up by us in *discs* and in *slabs;* discs are carried dry in the field, packed in hermetically sealed tins; slabs are carried wet in wooden watertight boxes, which when full weigh about 12 lbs. 14 oz. The explosive force of wet is the same as of dry gun-cotton. The discs are of 3 sizes, $1\frac{3}{4}$, $1\frac{1}{4}$ and $\frac{7}{8}$ in. in diameter: the first weighs 2 oz. the other two sizes 1 oz. each. There is one perforation in each disc for the detonator. In boring holes for the reception of the discs, the hole should be $\frac{1}{4}$ in. wider than the diam. of disc. The slabs in use measure $6\frac{1}{8}$ in. sqr. and $1\frac{3}{8}$ and 1 in. respectively in thickness, one weighing 2, the other $1\frac{1}{2}$ lbs. each.

The detonators used in the field are used in connection with Bickford's fuze. They are packed in red tin cylinders, 25 in each. To use the detonator, insert a small piece of quick-match in the hole through the plug over the fulminating composition: cut the Bickford's fuze to the required length, and insert the end into the hollow end of the detonating tube, taking care that it rests on the before-mentioned piece of quick-match. The tube should then be slightly bent to prevent the fuze from coming out. We now supply the cavalry pioneers with these detonators, leaving the quick-match and the Bickford's fuze attached and ready for use. As the gun-cotton, if set fire to, will burn without explosion, care must be taken, by throwing a little earth over the charge, to prevent a spark from the Bickford's fuze setting it alight.

Bickford's fuze used for the ignition of mines, &c., is of 2 kinds, 1st, Ordinary; 2nd, Instantaneous: the first burns at a rate not exceeding 4 ft., its usual rate being only 3 ft. per minute. It is best lit by a vesuvian: it is kept in cylinders; each contains 24 ft. The second kind burns at the rate of about 30 yds. per second: it is quite water-proof. The "Instantaneous"

is distinguished from the "Ordinary" by being coated with an open-crossed snaking of orange-coloured worsted. When it is desired to explode several charges simultaneously, and no electrical apparatus is to be had, the instantaneous fuze cut into equal lengths should be used; the ends of these equal lengths are collected together, and ignited by a piece of Ordinary Bickford's fuze, cut long enough to allow the lighter to get away before the explosion takes place: care must be taken that all the lengths of the Instantaneous fuze are exactly the same, and that they all are effectively joined to the piece of "Ordinary" fuze used for ignition: it is a good plan to use a small bag of gunpowder for this joint, the ends of all the fuzes centering in it.

Powder hose is a substitute when Bickford's fuze is not to be had. It is simply a little tube of strong linen, ½ to 1 in. in diam.: it burns at the rate of from 10 to 20 ft. per second.

Gunpowder used in mines and demolitions should, if possible, be lodged in a wooden box well tarred or pitched over, or else placed in a leather or a waterproof bag, or in a well-tarred sandbag. When the charge has to be carried in a sandbag, two tarred sandbags, one inside the other, should be used for precaution against untimely ignition: a sandbag will hold 50 lbs. of powder, but it is most conveniently carried in bags holding 25 lbs. each.

Destruction of wooden bridges.—If time admits, they can be easily burnt, the inflammable materials obtained from the immediate vicinity being piled on or under the bridge for that purpose: if tar, pitch or coal-oil are to be had, their use hastens the destruction. In the American war of 1862-65, a small torpedo was advantageously used for the destruction of wooden viaducts and bridges. It is very easily made, and can be carried by a mounted man. It consists simply of a bolt of ⅞ in. iron, 8 in. long, with head and nut, the head to be 2 inches in diameter, and about 1 in. thick; a washer of same size as the head must be placed under the nut at the other end, with a fuse hole in it; between the washer and the head is a tin cylinder, 1¾ in. in diameter, open at both ends, which is filled with powder; the washer and nut, when put on, form a case which keeps it in its place. A coat of varnish should be applied to exclude moisture. To use it, a hole 2 in. in diameter is bored in the timber, into which the torpedo is driven, head downwards, and the fuse ignited. The fuse should be about 2 feet long. The explosion blows the timber to pieces, and, if it is a main support, brings down the whole structure. It is essential that the main braces or lower chords of truss bridges be chosen. Since then the use of gun-cotton has simplified the destruction of wooden bridges, as the stoutest timbers can be shivered to atoms by small charges used as described below in the destruction of large trees.

For masonry bridges, sink a shaft a few feet to one side of the middle of the roadway, down to the haunch of the arch, and drive a short gallery out from the bottom, so as to lodge the charge under the middle of the road-

way: from 50 to 100 lbs., according to the thickness of the arch, will destroy nearly any bridge. The mine should be well tamped.

To determine the amount of powder, the formula is $C = \frac{2}{3} T^2 \times B$; where C is the charge in lbs.; T the line of least resistance in feet, measured through the arch; and B the breadth of the bridge in feet. Except when the bridge is narrow, the charge had better be divided into two, to prevent the chance of blowing a hole through the centre, without bringing down the sides; there is a risk, however, in doing so, as it is difficult, when hurried, to arrange for the simultaneous discharge of the two charges together. If time presses, do not be sparing of your powder.

When time will not permit of your sinking a shaft to the haunch of the arch, a charge of 500 lbs. of powder placed in a trench 18 in. deep over the keystone of a semicircular arch of 26 feet span, $4\frac{1}{2}$ ft. thick, will break it in. The more earth and stones that can be piled up over the charge the better. Captain Schaw's rule for such demolitions is $C = \frac{2}{3} T^2 \times B$. (See preceding formula.)

When time is of consequence, preparations should be made in two places at the same time, one as already described, and the other over the crown of the arch, so that if, at last, from the near pursuit of the enemy, it is required to destroy the bridge before the haunch of the arch can be reached, the demolition may be effected at the crown. When the side walls are lightly built, it is much better to drive in a gallery from the side, so as to lodge the charge against the haunch, as this does not interfere with the traffic over the bridge, is less liable to accident, and enables the powder to be kept dry for some time, if the mine is not required for immediate explosion.

When gun-cotton is to be used without tamping along either the crown or haunches, the formula for charge in lbs. is, $C = \frac{3}{4} T^2 \times B$; when tamping is to be used, half that charge will be sufficient. Gun-cotton is so local and violent in its action that it is not as satisfactory as powder in the destruction of masonry bridges.

Iron girder-bridges can be destroyed by placing charges in the piers: the destruction of a pier is of course the destruction of the bridge: the charges should be placed in the piers immediately under where the girders rest upon them. The girders themselves may be destroyed by gun-cotton thus. An iron plate 1 ft. wide can be destroyed by the following charges which vary according to its thickness: $\frac{1}{4}$ in. plate, 2 oz. : $\frac{1}{2}$ in., 6 oz. : $\frac{3}{4}$ in., 14 oz. : 1 in., 21 oz. : $1\frac{1}{4}$ in., 38 oz. : $1\frac{1}{2}$ in., 56 oz.; 2 in., 6 lbs. 3 oz. : 3 in. $14\frac{1}{2}$ lbs.

To destroy trees with gun-cotton, a charge of 5 or 6 oz. placed in an auger-hole bored horizontally into the tree, is sufficient for one of 1 ft. in diameter, and for other trees, varying as the square of the diam. in ft.: thus, if the tree be 18 in. in diam., $1\frac{1}{2}^2 = 2\frac{1}{4}$ which multiplied by $6 = 13\frac{1}{2}$ oz. When the gun-cotton is placed round the tree as a necklace, about 8 times the quantity as thus calculated will be required.

To blow in a gate.—50 lbs. of gun-cotton, or 200 lbs. of gunpowder suspended to a sharpened pickaxe, or an auger driven into the centre of the door or gate, or even laid on the ground touching the gate, will destroy it: when powder is used, it should if possible be covered over with sandbags.

Stockades and walls can be destroyed in a similar manner: a single stockade of timber 12 in. × 12 in. may be blown down by 3 lbs. of gun-cotton per running foot. The slabs or discs (slabs are the best for this purpose) should be threaded together so as to be in contact, and hung against the stockade or laid on the ground at its foot. If powder be used, 80 lbs. without, or 60 lbs. with tamping will be required for the same stockade. For stockades of 10 in. timber and under, 4 lbs. of gun-cotton per running yd. will only be required. A 14 in. wall will require 1½ lbs. of gun-cotton per running ft., or charges of 60 lbs. of powder tamped with sandbags, &c., at intervals of 5 or 6 ft. apart.

Destruction of guns.—With cast-iron guns, half fill with powder, jam in a couple of round shot with nails, bits of iron, stones, &c., tamp up to the muzzle with stones and a little earth, fire by means of a long fuse laid to the vent. The trunnions are easily broken off by a sledge-hammer, which renders a gun comparatively useless. Brass guns are easily destroyed by firing a shot from another gun into them behind the trunnions.

The explosion of from 1 to 1½ lbs. of gun-cotton placed at bottom of bore well tamped will destroy most field or ordinary siege guns. The charge should be increased to 3 or 4 lbs. for the larger sized wrought-iron pieces. When time is immaterial, the operation will be generally performed by officers of R.A., who are instructed in the best means for doing so. For the hasty disablement of large guns, place 2 half slabs of gun-cotton lengthwise on the chase, their long sides touching, about 1 in. from the muzzle, tying them on with twine. Insert a No. 8 detonator with Bickford fuze attached, in the hole of one of the slabs. The tail of this fuze to point to leeward to prevent premature ignition. Ignite the fuze and retire about 50 yds. for safety: the 2 in. length of Bickford fuze burns about 40 or 50 secs. If the explosion has not dented the gun sufficiently to render it unserviceable, repeat the operation, tying the slabs on to the same spot. The effect of the detonation can be increased by placing a filled sandbag or a rod of turf over the slabs when they have been tied on to the chase. The gun-cotton should be perfectly dry, so if it rains some waterproof covering should be placed round it. A 1 lb. slab of gun-cotton used as above described will destroy most wt.-iron field guns.

MENSURATION AND USEFUL FORMULÆ.

Circles.—Their areas are to one another as the squares of their diameters. The diameter × by 3·1416 = circumference.

Circumference ÷ 3·1416 = diameter.
Diameter^2 × ·7854 = area of circle.
Circumference^2 × ·07958 = area of circle.
The length of an arc = No. of degrees × radius × ·07145.
The area of the sector of a circle = $\frac{\text{radius} \times \text{arc.}}{2}$

The area of a segment is ascertained by finding the area of the sector, and subtracting from it the area of the triangle formed by the chord, and the radii of the sector, if the segment is less than a semicircle; if the segment is greater than a semicircle, then, by ascertaining the area of the smallest segment and subtracting it from the area of the whole circle.

Triangles.—The area = $\frac{\text{base}}{2}$ × perpendicular height. When the three sides are known, and the area is required, subtract each side severally from half their sum; multiply those three remainders and the half sum together, and the square root of the product will be the required area.

In right-angled triangles, if the two sides forming the right angle are known, the hypothenuse = the square root of the sum of the squares of the two sides.

Given the hypothenuse and one side, the third side can be ascertained by subtracting the square of the known side from the square of the hypothenuse, and extracting the square root of the remainder.

The sums of the three angles of all triangles = 180°, so, if two angles of any triangle are given, the third is of course known by subtracting their sum from 180.

Let A, B, and C represent the three sides, and *a*, *b*, and *c* the three angles respectively opposite those three sides.

Given two angles (*a* and *b*) and one side B to find the other sides; $A = \frac{B \sin a}{\sin b}$ and $C = \frac{B \sin C.}{\sin b}$ This is the rule commonly in use in measuring distances to inaccessible points, where you can measure a base by a tape line, and the angles at it by a pocket sextant.

Given the two sides A and B and the included angle *c*, the side $C = \sqrt{A^2 + B^2 - 2AB \cos c}$.

The areas of all geometrical figures can be determined by the foregoing rules, by dividing them into triangles.

The cubic content of boxes, rooms, &c., is arrived at by dividing them into triangular and rectangular figures, and multiplying the area of such by the height.

The area of a parallelogram = the length × the height.

Spheres.—Surface = diameter^2 × 3·1416 = diameter × circumference: the cubic content = diameter^3 × 0·5236. The cubic content of the segment

of a sphere = ·5236 H ($H^2 \times {}^3R^2$), where H = height of segment, and R = radius of the base of segment.

Cones.—Surface = area of base + circumference of base × ½ slant height. The surface of frustrum = sum of girth at both ends × ½ slant height + area of both ends. The cubic content of cone or pyramid = area of base × ⅓ perpendicular height; of a frustrum = $\frac{1}{3}$ H (A + $a \sqrt{A \times a}$) when A and a = areas of the ends, and H = perpendicular height.

Cylinders.—Surface = area of both ends + length × circumference: cubic content = area of one end × length.

Wedges.—Cub. content is found as follows: to length of base × 2, add length of edge: multiply the sum by breadth of base, and by perpendicular height from base, and one-sixth of the product will be the cub. content.

PHYSICAL MEMORANDA.

Water.—1 cubit ft. distilled in vacuo. = 62·5 lbs. = 6·242 galls. = 25 quarts: 1 cubic in. = ·036 lbs.: 1 gallon (approximately) = 10 lbs. = 0·16 cub. ft. = 277·274 cub. in.: 1 cwt. = 1·8 cub. ft. = 11·25 galls.: 1 ton = 35·94 cub. ft. = 224 galls.: cub. ft. × 0·557 = cwt.: cub. ft. × 0·028 = tons: 1 cub. ft. of sea-water = 64·25 lbs.: weight of sea-water = weight of fresh × 1·028. All these figures are only approximately accurate. Fresh water boils at 212° Fahr. or 100° Centigrade: it freezes at 32° Fahr. or Zero cente.

Air is 840 times lighter than water: pressure of atmosphere at sea-level = 14·706 lbs. per sq. in. = pressure of column of mercury 29·92 in. high = pressure of column of water 33·7 ft. high: its temperature falls 1° for every 300 ft. of vertical height. A man requires about 220 to 240 cub. ft. per hour.

Velocity of falling bodies.—N = number of seconds in falling: S = space fallen through in feet: V, velocity in feet per second acquired in N seconds: V = N × 32·166 and S = N^2 × 16·033.

Animal power in lbs. raised 1 ft. per minute in 8 working hours daily:—The standard "horse power" is 33,000 lbs., but for average animals it may be taken as follows: the horse, 21,000; ox, 12,000; mule, 10,000; ass, 3500; man may be taken as a 5·5th of a horse, or on an average at 3800 lbs. At low speeds an ordinary horse can exert in regular work day by day for 8 hours per diem a steady pull of about 150 lbs., although some animals will not average more than 100 lbs. When a number of men pull together, each pulls, on the average, horizontally about half his weight.

Velocity of sound through the air at a summer temperature is about 1142 ft. (say 365 yds., a number easily remembered), and through water about 4950 ft. per second: distances can be measured with tolerable accuracy by counting the number of seconds between the flash and report of a gun.

This velocity increases with the loudness of the report.

The pulse, in health, beats from 72 to 75 times in a minute.

Measurement of distances to inaccessible places without instruments.—A B the breadth of a river is required: produce A B to any convenient distance

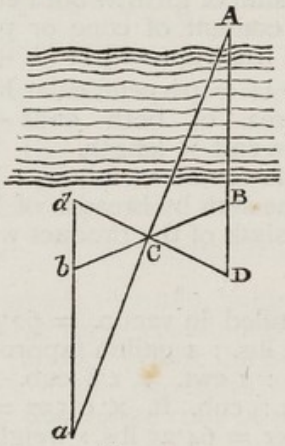


Fig. 59.

D: from D mark off in a convenient direction equal distances D C and C *d*; join B and C and produce the line until *b* C = C B: join *d* and *b* and produce the line until A C produced intersects it: measure *a b* and the result be the distance A B.

With a prismatic compass.—Measure a base C D and from its extremities plot on paper the lines A D and A C: their intersection will give A: the distance A B can then be measured by the scale upon which the base was laid down at. If time permits, it is better to lay off the base so that B bisects it, and the angles A B D and A C D should be about 60°; this is arriving at the distance by construction. To do so by calculation, the angles A D B and A C B should be measured by either the pocket sextant or the prismatic compass, and the required distance obtained by the formula given already regarding triangles.

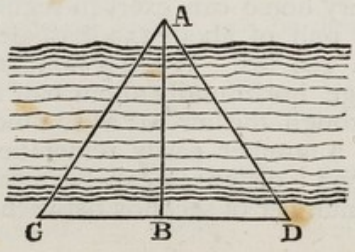


Fig. 60.

To measure the distance between two inaccessible points, measure a base, and find out, as described above, the distance between its extremities and both the points, which will give the two sides and included angle of the triangle that has the required distance for its base, and one of the extremities of the measured base for an apex.

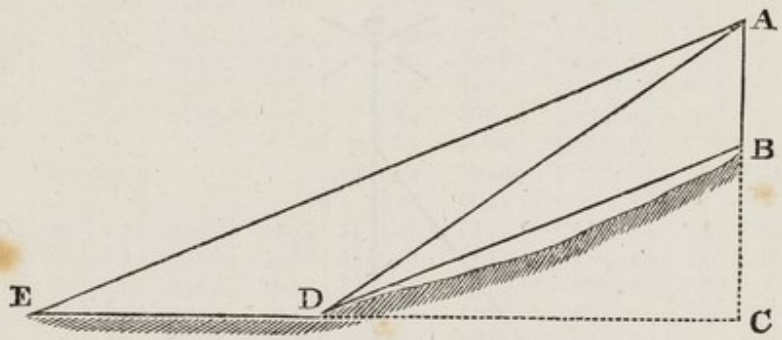


Fig. 61.

Required the height of A B and the difference of level between B and C, D being the nearest point to which you can get to B. Erect a stake the height of the eye at D, and measure the angles A E C and A D C as well as the base E D: $A C = \frac{E D}{\text{cotan A E D—cotan A D C.}}$ The height B C can be ascertained in the same way, which subtracted from A C gives A B. If A C is a height the foot of which is accessible, then A C = tan A E C × E C.

By the thermometer (Fahr.).—It can be used to ascertain the height of mountains thus: Let T = temperature of boiling water at any station deducted from 212°, and H = height in feet of station above the sea. Boil some water and ascertain T by means of a thermometer: $H = 520\ T + T^2$.

Barometer.—With a pocket aneroid, the number of feet corresponding with the elevation above the sea is generally marked opposite the readings on the dial, so that to find the height of a mountain, observe the readings at its foot and at its summit, and subtract the former from the latter; the difference is the height of the mountain approximately.

When the barometer is not marked with a scale of feet, the following is the formula: S : D : : 5500 : H, where S is the sum and D the difference between the readings, and H the height required in feet. When the barometer usually stands between 28 and 30 in., the simplest and best formula is $\frac{D}{\cdot 0011}$ = height in feet.

Thermometer.—To convert Centigrade or Reaumur into Fahrenheit let

C, R and F represent degrees in each respectively: F = C × 1·8 + 32; F = R × 2·25 + 32: C = (F − 32) ·5555; R = (F − 32) ·4444.

To lay out a right angle.—Take your 50 ft. measuring tape and unite in your hand the ring end and the point marked 48 ft. and pin or fasten down both ends at the point A: stretch it out from 1 to 12 ft. along the line A B, on which you wish to erect your perpendicular; pin it to the ground, or

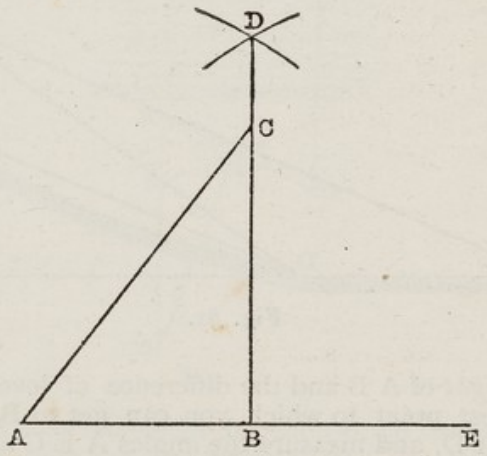


Fig. 62.

pass it round a wire or thin picket at B, the 12 ft. mark, and then taking the 28 ft. mark (C) between your finger and thumb, stretch the tape in the direction D until both sides of the triangle are taut; a line uniting the apex C and B is perpendicular to A E. This system is founded on the 47th Prob. 1st Book of Euclid. Another very simple method is by means of any string and a stick with A and E as centres, describe arcs of circles having a common radius, and if from where they intersect at D you draw a line to B, the central point between A and E, the line D B will be perpendicular to A E.

Useful weights and measures.—1 Sovereign = 2 drams: 1 Half-crown, $3\frac{1}{2}$ drs.: 1 Florin, 3 drs.: 1 Shilling, $1\frac{1}{2}$ drs.: 1 Threepenny Piece, $\frac{1}{3}$ dr.: 1 Tablespoon holds 1 oz.: 1 Dessert spoon, $\frac{1}{2}$ oz.: 1 Teaspoon, $\frac{1}{4}$ oz. These measures are used for veterinary medicine.

A cylinder 6 in. in diam. and $9\frac{8}{10}$ in. in height holds almost exactly a gallon. A box 24″ × 16″ × 22″ deep contains 1 barrel = 10,752·00 cub. in. A box 13″ × 13″ × $13\frac{1}{8}$″ deep contains 1 bushel = 2218·125 cub. in. A box $7\frac{1}{2}$″ × 7″ × $10\frac{9}{16}$″ deep contains 1 peck = 554·5 cub. in.

NATURAL SINES and TANGENTS.

Ang.	Sines.	Tang.	Ang.	Ang.	Sines.	Tang.	Ang.	Ang.	Sines.	Tang.	Ang.	Ang.	Sines.	Tang.	Ang.
5′	·0015	·0015		35′	·0102	·0102		37	·6018	·7536	53	64	·8988	2·0503	26
10′	·0029	·0029		40′	·0116	·0116		38	·6157	·7813	52	65	·9063	2·1445	25
15′	·0044	·0044		45′	·0131	·0131		39	·6293	·8098	51	66	·9135	2·2460	24
20′	·0058	·0058		50′	·0145	·0145		40	·6428	·8391	50	67	·9205	2·3559	23
25′	·0073	·0073		55′	·0160	·0160		41	·6561	·8693	49	68	·9272	2·4751	22
30′	·0087	·0087		60′	·0175	·0175		42	·6691	·9004	48	69	·9336	2·6051	21
								43	·6820	·9325	47	70	·9397	2·7475	20
Dg.			Dg.	Dg.			Dg.	44	·6947	·9657	46	71	·9455	2·9042	19
								45	·7071	1·0000	45	72	·9511	3·0777	18
1	·0175	·0175	89	19	·3256	·3443	44	46	·7193	1·0355	44	73	·9563	3·2709	17
2	·0349	·0349	88	20	·3420	·3640	43	47	·7313	1·0724	43	74	·9613	3·4874	16
3	·0523	·0523	87	21	·3584	·3839	42	48	·7431	1·1106	42	75	·9659	3·7321	15
4	·0698	·0699	86	22	·3746	·4040	41	49	·7547	1·1504	41	76	·9703	4·0108	14
5	·0872	·0875	85	23	·3907	·4245	40	50	·7660	1·1918	40	77	·9744	4·3315	13
6	·1045	·1051	84	24	·4067	·4452	39	51	·7771	1·2349	39	78	·9781	4·7046	12
7	·1219	·1228	83	25	·4226	·4663	65	52	·7880	1·2799	38	79	·9816	5·1445	11
8	·1392	·1405	82	26	·4384	·4877	64	53	·7986	1·3270	37	80	·9848	5·6713	10
9	·1564	·1584	81	27	·4540	·5095	63	54	·8090	1·3764	36	81	·9877	6·3138	9
10	·1736	·1763	80	28	·4695	·5317	62	55	·8192	1·4281	35	82	·9903	7·1154	8
11	·1908	·1944	79	29	·4848	·5543	61	56	·8290	1·4826	34	83	·9925	8·1443	7
12	·2079	·2126	78	30	·5000	·5774	60	57	·8387	1·5399	33	84	·9945	9·5144	6
13	·2250	·2309	77	31	·5150	·6009	59	58	·8480	1·6003	32	85	·9962	11·4301	5
14	·2419	·2493	76	32	·5299	·6249	58	59	·8572	1·6643	31	86	·9976	14·3007	4
15	·2588	·2679	75	33	·5446	·6494	57	60	·8660	1·7321	30	87	·9986	19·0811	3
16	·2756	·2867	74	34	·5592	·6745	56	61	·8746	1·8040	29	88	·9994	28·6363	2
17	·2924	·3057	73	35	·5736	·7002	55	62	·8829	1·8807	28	89	·9998	57·2900	1
18	·3090	·3249	72	36	·5878	·7265	54	63	·8910	1·9626	27	90	1·0000	infin.	0
Dg.	Co-sin.	Co-tan.	Dg.	Dg.	Co-sin.	Co-tan.	Dg.	Dg.	Co-sin.	Co-tan.	Dg.	Dg.	Co-sin.	Co-tan.	Dg.

ENGLISH and FRENCH WEIGHTS and MEASURES.

CAPACITY.

	Cub. Inches.	litres.	centi-litres.
4 Gills=1 pint	= 34·75 =	0	56·75
2 Pints—1 quart	= 69·33 =	1	13·5
4 Quarts—1 gallon 10 lbs. of water.	= 277·25=	4	54 =
2 gallons=1 peck	= 554·5 =	9	9
4 Pecks=1 bushel	=2218·19=	36	34
8 Bshls.=1 qr.=10·2 cub. ft.	=	290	78
5 Qrs.=1 load=51·33 cub. ft.=		1493	90

Gals. × ·1605=cub. ft.: Cub. ft. × ·779 =bushels.

Bushels × 1·284=cub. ft.: Cub. ft. × 6·232 =gals.

AVOIRDUPOIS WEIGHT.

437·5 grains } =1 ounce =28·34 grammes.
16 Drams }
16 Ounces =1 pound =·4535 kilgrms.
14 Lbs. =1 stone = 6·350302 ,,
2 Stone =1 quarter =12·700604 ,,

4 Quarters =1 cwt. =50·802416 kils.
20 Cwt. =1 ton =1016·04832,,
2000 Lbs. =1 ton in Canada and the U.S.
Lbs. × ·009 = cwt.: Lbs. × ·00045=tons.
1 ton of freight by measurement=40 cub. ft.
Cub. inches × ·003607=gals.
Cub. inches × ·00045=bushels.

LENGTH AND SQUARE MEASURES.

1 inch = ·0254 mètres.
12 Inches =1 foot = ·30479 ,,
3 Feet =1 yard = ·9144 ,,
5½ Yards =1 rod = 5·0292 ,,
22 ,, =1 chain = 20·1168 ,,
40 Rods =1 furlong =201·168 ,,
8 Furlongs, 80 Chains, 1760 Yards } 1 mile* = { 1609·344 / 1·60934 kilo-mètres.
2025·27 yds.=1 nautical mile or Knot, 1·15 miles.
69·0433 Miles or 60 nautl. miles=1 degree at the Equator: Miles × ·87=knots or nautical miles.
6 Feet=1 fathom: Knots × 1·15=miles. Yards × ·00057=miles.
120 Fathoms=1 cable length.
Feet × ·00019 = miles: Yards × ·0057 = miles.
640 Acres=1 sq. mile: 4840 sq. Yards= 1 acre.
For rough calculations, 70 yds. × 70 yds. = 1 acre.
Sq. Feet × ·111 = sq. yds.: sq. in. × ·007=sq. ft.: sq. yds.=·0002067 acres.
Cub. Feet × ·03704 (or for an approximate calculation ·04)=cub. yds.: Cub. Inches × ·00058=cub. feet.
40 Sq. Rods=1 rood: 4 Roods=1 acre.
4 Inches=1 hand (for height of horses).
500 Bricks= 1 load.
32 Bushels of lime=Do.
36 ,, sand=Do.
36 Trusses of straw or hay=Do.
1 Truss of straw 36 lbs.
1 ,, old hay 56 lbs.
1 ,, new ,, 60 lbs.
1 Chaldron of coal=53 cwt.
1 Sack of potatoes=224 lbs.
1 Cord of wood=128 cub. ft.

China.—16 Taels = 1 Catty = 1·333 lbs. : 100 Kin or catties = 1 Canton Picul = 133·333 lbs. : 111 catties = 1 seda picul = 148 lbs. : and 150 catties = 1 Chuppa Picul = 200 lbs. The common measures are, the Yin = 10 Chang = 100 Chih = 1000 tsun = 10,000 fun = 122 ft. (about): 1 Pu = 5 chih : 1 Li = 360 pu = 609 yds. (about) (like the Indian Koss, the Li varies greatly). In some localities it is ·22, and in others ·36 of a mile. The tael (it only exists in name) = 6*s.* 8·625*d.* (about). In 1869 the sterling value of the tael was only 6*s.* 2¼*d.*, and since then its value has been frequently quoted as only 6*s.*

Cyprus.—The oke is the common standard of weight, and is also used in the measurement of wine: it is 2·8 lbs. English, and contains 9·35 gills at 32 gills to the gallon: 3·42246 okes go therefore to the Imperial gallon. The measure of length is the Arslim, or Pik, which according to the Ottoman Code = 75 centimetres (= 2·46 ft.); but in Cyprus 2·575 ft. would seem to represent it more accurately. The Dunum is the measure for land; and whilst in Turkey it is 40 arslims² (103 ft.²), in Cyprus the farmers count the dunum as 60 arslims²; or, roughly speaking, the two dunums are 1108 and 2500 sqr. yds. respectively; or, very roughly, the ¼ and the ½ of an English acre. Distances are always estimated by the hour, and when

* In the province of Quebec the country people reckon distances by Arpents and Leagues; the former is about 63 yards (28 arpents=1 mile) 84 arpents=1 league.

a muleteer tells you the distance is a 5 hours' journey he means 20 miles, or 4 miles to every hour. The coinage is the copper piastre and the silver and gold coins of England.

Denmark.—1 Pund = 1·1028 lbs. : 1 Centner = 100 pund = 10,000 Kvinten = 100,000 Ort = ·50 kilogr. (French). The Mark = ·519 lbs. = ·235 kilogr. Measures, 1 Fod = 1·02973 ft. : 1 Rode = 12 fod : 1 Meile = 2000 roder = 4·68 miles = 7·53 kilomr. = 8237·834 yds. 1 Potte = 0·2339 galls. : 1 Anker = 5 viertel = 38·75 potte = 8·239 galls. The Rixdaler = 6 marks = 96 skillings = 2*s.* 2·35*d.* The gold Christiansdor = 7 dalers = 36 skillings = 16*s.* 3*d.*

Egypt.=1 Cantar = 100 to 110 Rottolos = 40 Okes = about 100·8 lbs. Measures, 1 Pik (or diraâ) = 22 to 27 in. : 1 Gasab = 4 diraâ = 16 Rub. : 1 Feddan = 1·1019 acre : 1 Ardeb = nearly 5 bushls. The piastre = 40 paras = 2½*d.* : the Kees, or purse = 500 piastres, average value about 5*l.* 2*s.* 6*d.* English and French gold and silver coins are in common use.

France.—The Metric system.

LENGTH.

	Yards.	Ft.	Inches.		Yards.
Centimètre =	0	0	·39371	or × ·010936 =	
METRE =	1	0	3·371	or × 1·0936 =	
Hectomètre =	109	1	1	or × 109·363 =	
Kilomètre =	1093	1	10·2	or × 1093·63 =	

Lieue de poste (2000 toises)=4263 yards or 2·4222 miles.
Lieue commune (4·44 kilomr.) = 2·75 miles = 4840 yards.
Kilomtr × ·621383=miles; Miles × 1·60934 =Kilomètres.

WEIGHT.

1 GRAMME=·0022 lbs.
1 Kilogramme=2·2048 lbs.=·01969 cwt.
Lbs. × ·4535 = killogramme ; Tonnes × 1.015965=tons.
Tons × 1·984=tonnes.

SOLIDS.

Millistere=61·028 cub. in.
STERE=35·317 cub. ft.=1 cub. mètre.
Hectostere=130·8 cub. yrds.
Cub. Ft. × ·0283153=cub. mètres.

CAPACITY.

Centilitre=·0022 gals. or ·6103 cub. inchs.
LITRE =·22 ,, or 61·028 ,,
Hectolitre=22·0 ,, or 2·75 Impl. bshls.
Kilolitre=220 ,, or 35·317 cub. ft.
Gallons × 4·543=litres ; Cub. In. × ·0163 =litres.

SQUARE MEASURE.

Milliare=115 sq. in.
Centiare=10·764 sq. ft.
Deciare=11·96 sq. yds.
ARE= 119·6 ,,
Decare=1196·046 ,,
Hectare=2·4712 acres=11,960·46 sq. yds.
Sq. Mètres × 10·7643=sq. ft.
Sq. ft. × ·0928997=sq. mètres.

N.B.—In the French system Deca means 10 times: Deci, $\frac{1}{10}$th of; Hecto, 100 times, and Centi $\frac{1}{100}$th of: Kilo, 1000 times, and Milli $\frac{1}{1000}$th of.

1 Franc = 100 Centimes = 9·38*d.* : 1 Napoleon = 20 francs = 15*s.* 10·32*d.*

Germany.—The French metric system is now common in Germany. The old measures were the Pfund, which was generally divided into 32 loth (each

loth = 4 quentchen), and which varied in the several States from 1·03 lbs. to 1·234 lbs.: 1 Fuss (Rhein) = 12·357 in. : 1 Elle = 26·258 in. The Fuss was divided into 12 Zolle and varied from 11·15 to 11·8 in. The Morgen varies generally from ·62 to ·8 acre. The figures shown after each State is the number of English miles in its Meile: Baden, 4·6028 : Brunswick, 4·613 : Hamburg, 4·68 : Hanover, 4·61 : Lubeck, 5·72 : Oldenburg, 6·133 : Prussia, 4·68 : Saxony, 4·222. The long German mile = 10,126 yds. = 5·753 miles ; the short mile = 6859 yds. = 3·897 miles. The common liquid measure was the Fuder = 6 Ohm, which varied from 187 to 212 galls., and the dry was the schäffel, which varied from 2 to 8 bushels. The Mark is practically = 1*s.*

Greece.—The French metric system is used, the Drachmé = gramme, and the Mnâ = kilogramme. The Libbra = 1·06 lbs. The Pecheus = mètre : the Stadion = kilomètre. The Stremma = the are. The ancient Keramion or Metrates = 8·488 galls. The coins are the Drachma = 100 Leptai = 8½*d.*

Holland, now uses the French metric system, the Pond weighing exactly the same as the Kilogramme (or 2·204 lbs.). The old pound = 1·088 lbs. The Elle is the same as the mètre and is divided into 10 palms. The mile (15 to a degree) = 4·6028 miles. The Bunder = hectare. The Kan = litre. The Guilder or Florin = 100 cents. = 1*s.* 8*d.*

India.—The standard pukka seer of Bengal = 16 chittacks, = 80 tolas, = 2·0571 lbs. English ; 40 of these seers = 1 Bengal maund = 82·2857 lbs. In Madras, according to the Tola system, 1 Madras Kuccha seer = ·6171 lbs., and 1 pukka seer = 2·0571 lbs : 5 kuccha or 1½ pukka seers = 1 viss = 3·0857 lbs. : 8 viss = 1 Madras maund = 24·6857 lbs. : and 20 maunds = 1 candy = 493·7142 lbs. The Madras commercial weight is, 1 pollum (1¼ oz.) = ·078 lbs. : 40 pollums = 1 viss = 3·125 lbs. : 8 viss = 1 maund = 25 lbs. : and 20 maunds = 1 Candy = 500 lbs. In Bombay 30 pice = 1 seer = ·7 lbs. : 40 seers = 1 maund = 28 lbs. and 20 maunds = 1 candy = 560 lbs. In Burmah 100 kyats = 1 pictha or viss = 3·6 lbs.

In Bengal the yard or Guz = 3 ft. : in Bombay ·75 ft. : and in Madras 3·0833 ft. The Ilahy Guz = 33 in., is now the standard measure in all Revenue Surveys, and the Beegah = 3025 sqr. yds. = 3600 sqr. Ilahy guz = ·625 acre, is now the standard measure for land in the Bengal Presidency, but locally the beegah varies considerably. The Kos is the common road measure.

The Rupee is common coin, in which all sums of money are calculated ; it is worth about 1*s.* 10*d.* and = 16 annas = 192 pi (the copper coin *pice* = 3 pi).

Italy.—The same as France now : the old standard weight was the Libbra, which varied locally from ·7 to ·8 lbs. The Braccio = about 22 or 23 in. The Naples Miglis = 1·15 miles : The Turin Miglis = 1·532 miles. The lira of 100 centesimi = 1 French franc = 9·6*d.* In Rome the Scudo = 10 Paoli = 4*s.* 2*d.*

Japan.—The Pacul = 100 catties = 133·33 lbs. The Inc = 6·25 ft. Road measures same as China. The Itsiboo = 1*s.* $5\frac{1}{1}$*d.*

WEIGHTS, MEASURES, AND MONEY OF FOREIGN COUNTRIES.

Austria.—The metric system is now commonly used (see France): but the old weights, &c., were as follows:—1 Pfund = 1·235 lbs. = 2 marks = 4 vierdinge = 16 unze = 32 loth: 100 pfund = 1 centner. The measures were 1 fuss = 1·037 ft.: 1 Elle = 2·55 ft.: 6 fuss = 1 Klafter: 4000 Klafter = 1 Meile = 4·714 miles = 8289·6 yds. = 7·586 kilomr.: 1 Yoch or Johart = 1600 sq. Klafter = 1·422 acres. The Eimer = 11·33 galls. = 56·564 litres: 1 Metze = 1·5387 bushels = 61·5 litres. The coinage is the silver Florin = 100 kreutzers = 2*s.* (about 9·83 florins = 1*l.*): the old coinage was, 480 Pfennige = 120 kreutzer = 2 gulden = 1 thaler = 4*s.* ·08*d.* (about).

Arabia.—1 maund = 3 lbs.: 1 bahar = 450 lbs.: 1 guz = 0·6944 ft.: 1 noosfia = 0·25 galls.: 1 gudda = 8 noosfia = 2 galls.: 1 piastre = 80 coveers = 3*s.* 8·5*d.*

Bavaria.—The metric system is now commonly used: the old weights, &c., were:—1 Pfund = 32 loth = 1·2346 lbs.: the measures were, 1 Fuss = 12 zoll = 11·49 in.: 1 Morgen = ·842 acres: 1 Meile = 2 post stunde = 4·6 miles = 7·442 kilomr: 1 Eimer = 13·7 galls.: 1 mutle = 4 schäffel = 24 metzen = 22·26 bushls. Coinage, 1 Gulden = 60 kreutzen = 1*s.* 7·9*d.* = 2·10 francs.

Belgium.—The metric system and coinage as in France.

Brazil.—The same as Portugal.

Canada.—Same as in England, except that 1 cwt. = 100 lbs. and 1 ton = 2000 lbs. The dollar = 4*s.* 1·25*d.*

Cape of Good Hope.—Generally the same as in England, but the old Dutch weights are still much used by the Boers. The proportion generally made use of in comparing Dutch and English weights is 92 lbs. Dutch to 100 lbs. English; the true rate, however, is considered to be 91·89 Dutch to 100 lbs. English avoir. In comparing the old Dutch measures of capacity with the English, the following ratios will be found useful:—

	Imperial.
1 schepel is equal to ·7663 old Winchester bushel, or	·743
1 muid is 4 schepels, or 3·0652 ,, ,,	2·972
1 load is 10 muids, or 10·652 ,, ,,	29·72

The 107 Dutch schepels = 82 Winchester bushels, or 4 schepels are about 3 imperial bushels, and 11 schepels are about 1 quarter.

A schepel is $4\frac{1}{2}$ inches square by $8\frac{1}{2}$ deep.

The weight of a muid of oats or barley is 104 lbs.; Boer meal, wheat, beans, peas, and mealies 180 lbs. Dutch.

1000 Cape ft. = 1033 British ft.: 12 Cape ft. = 1 Cape rood. 1 English mile = 425,944 Cape roods (nearly): 1 Cape morgen = 2·11654 English acres. 1 Rix dollar = 1*s.* 6*d.*

Table of Foreign Weights, Measures and Coinage most

COUNTRY.	WEIGHTS. Name of Weight.	WEIGHTS. English Weight avoirdupois, lbs.	MEASURES. Name of Measures.	MEASURES. English Feet.	LAND MEASURES. Measures.	LAND MEASURES. English Acres.
Austria ..	Pfund = 32 loths ..	1·2347..	Fuss	1·0371..	Joch	1·4233..
Arabia ..	Maund	3	Guz.	0·6944	.. ..	.. ..
Belgium ..	Bahar	450 ..	Foot	0·937 ..	Same as France.	
	.. .. See France					
Bavaria ..	Pfund = 32 loths ..	1·2347..	Fuss	0·953 ..	.. ..	.. ..
Bengal ..	Maund (40 seers)	82·133	Guz.	3·0 ..	.. ..	.. ..
	Seer	2·0533				
Bombay ..	Maund (40 seers)	28	Guz.	·75 ..	.. ..	.. ..
	Seer	0·7 ..				
	Candy	560				
Bohemia ..	.. .. See Austria		.. ..	.. ..	.. ..	.. ..
Canada ..	Cwt.	100 ..	.. ..	Same as in England		.. ..
Cape of Good Hope ..	.. .. See England ..		.. ..	,,	,,	.. ..
China ..	Pecul = 100 catties ..	133·3333	Chang = 10 chin ..	11·75 ..	.. ..	.. ..
Denmark ..	Pund	1·1028..	Fod	1·02973	Morgen ..	0·630945
Egypt	1 Cantar = 40 okes ..	100·8 ..	Gasab	0·944 ..	Fedden al risach	0·6628..
France ..	Kilogramme ..	2·2048..	Metre	3·2808..	Hectare ..	2·4712..
Greece ..	Libbra	1·06 ..	Foot	·98416..	.. ..	.. ..
Germany ..	Metric lb. ..	1·1024..	Rhenish foot	1·02973	.. ..	.. ..
Hamburg ..	Pfund	1·0682..	Ell = 2 fuss.	1·8794	Morgen ..	0·630945
Hanover ..	Centenar = 100 pfunds	103·1236	Foot	0·954	Do..	0·6438..
			Ell	1·91667	Acker	0·5897..
Hesse	Pfund	1·07 ..	Fuss	0 9 ..		
Holland ..	Pond	2·2047	Foot	0·928	Bunder ..	2·471169
			Ell	3·280916		
Italy	Kilogramme ..	2·2048..	Metra.. ..	3·280916	Giornata ..	0·9393..
Japan	Pecul = 100 catties ..	133·3333	Inc	6·25 ..	.. ..	.. ..
Malta	Rottolo	1·7503..	Foot	0·93 ..	Salma	4·44 ..
Madras ..	Seer	0·625 ..	Yard	3·0833..	.. ..	.. ..
Milan	Libbra	2·2047..	Metra	3·280916	Tornatura ..	40·4682
	Mettrica ..					
Naples ..	Rotolo	1·9642..	Canana	6·93167	Moggio ..	0·8261..
Netherlands	.. ..	.. ..	.. .. ..	Vide	Holland ..	.. ..
Persia	Cherray.. ..	0·7885..	Arish	12·7566	.. ..	.. ..
			Guerze	2·083		
Portugal ..	Arratel	1·0118..	Vara	3·5958..	Geira	1·4818..
Poland ..	.. .. See Russia		.. ..	.. ..	.. ..	.. ..
Prussia ..	Centenar = 110 Pfunds	113·436	Fuss	1·02973	Morgen ..	0·630945
Rome	Libbra	0·7477..	Canna	6·5307..	Pezza	0·6524..
Russia ..	Pood = 40 pounds	36·11408	Foot	1·146	Desatine ..	2·45 ..
			Sachine ..	7·0		
Saxony ..	Pfund = 32 loths.	1·0309..	Ell	1·8582..	.. ..	.. ..
Sicily	Libbra	0·7 ..	Canna	6·3725..	.. ..	.. ..
Spain	Libbra	1·0144..	Foot	0·927	Fanegada ..	1·1364..
	Castiliana ..		Warra = 3 pies	2·782		
Sweden ..	Skalpund ..	0·93653	Foot	0·974107	Tunland ..	1·21988
Switzerland	Kilogramme	22048 ..	Metre	3·28 8..	Hectare ..	2 471169
United States of America	Cwt.	100	Foot	1	Acre	1 .. ..
	Ton	2000 ..				
Turkey ..	Rottolo	1·27 ..	Pike	2·218 ..	.. ..	.. ..

commonly in use, with their equivalents in English Measures, &c.

ROAD MEASURES.			LIQUID MEASURES.			COMMON COINAGE.		
Mile, &c.	Engh. Miles.	English Yards.	Measures.	Imperial Gallons.	Number to 100 Imperial Gallons.	Name of Coin.	Metal	Value in
								s. *d.*
Mile	4·71	8239·034	Eimer	0·2201..	454·3889	Gulden or Florin ..	Silver	2 0
Mile	..	2148 ..	Noosfia .. .. / Gudda (noosfia)	0·25 .. / 2	400 / 50 ..	Piastre .. / 80 coveers	Silver	3 8·5
.. Same as France ..			.. ..	.. ..	.. ..	Franc ..	Silver	0 9·38
Meile	..	8059 ..	Eimer	14·116..	7·0841..	Gulden = 60 kreutzen ..	Silver	1 7·9
Koss	..	2000 ..	.. Liquids are sold by Weight ..			Rupee ..	,,	1 10·29
.. ..		.. ..	Do.	Do. ..	Do. ..	Do.	,,	Do.
Mile		8297 ..	.. ..	.. ..	.. ..	Thaller ..	,,	4 0·8
.. ..		.. ..	.. .. .. See England ..		.. ..	Dollar ..	Silver	4 1·25
.. ..		.. ..	.. ..	,,	.. ..	Rix dollar = 8 skillings	,,	1 6
Li	..	609 ..	Shing	1·025.. (liquid)	sold by Weight	Tael	,,	6 8·625
Mile	4·68	8237·834	Potte	0·2339..	470 32	Rixdaler ..	,,	2 2·35
.. ..		.. ..	.. ..	.. ..	.. ..	Piastre ..	,,	0 2·47
Lieue.. ..		4374·552	Litre	·22 ..	454·545	Franc ..	Silver	0 9·38
Mile		1640 ..	Keramion ..	8·488 ..	11 7836	Drachm ..	,,	0 8 4
Long mile / Short do. ..		10126 / 6859	.. ..	.. ..	.. ..	Thaler = 30 groschen	,,	2 10·75
Mile		8237·834	Viertel	1·593585	62·7515	Rixdollar ..	,,	3 7
Mile		84 66 ..	Stubchen ..	0·85705	116·9609	Thaler ..	,,	2 10·75
Mile		10547 ..	Mass .. .. / Viertel	0 44 / 1·76	.. ..	Do.	,,	2 10·75
Myle		1093 638	Kan	0·2201..	454·3889	Florin.. ..	,,	.. .. ..
Do.		1093 ..	Boccale	0·1722..	.. ..	Lira-nuova	Silver	0 9 38
Same as China ..			.. ..	.. ..	.. ..	Itsiboo ..	,,	1 5·25
.. ..		.. ..	Caffiso	4·58 ..	.. ..	Scudo ..	,,	1 8
.. ..		.. ..	.. ..	.. ..	.. ..	Rupee ..	,,	1 10·29
.. ..		.. ..	Pinte	0·2201..	454 3889	Lira-nuova	,,	0 9·38
Millia ..		2024·236	.. ..	.. ..	.. ..	Ducat ..	,,	3 3·75
.. ..		.. ..	.. ..	.. ..	.. ..	Gulden ..	,,	1 8
Parasang ..		6086 ..	.. ..	.. ..	.. ..	Rupee ..	,,	1 6 (about)
Legua ..		6763 ..	Cantaro	3·6405..	27·47 ..	Milreis ..	,,	4 8·66
Long mile / Short do.		8101 / 6075	.. ..	.. ..	.. ..	Florin ..	,,	0 5·62
Mile		237·8347	Quart	0·252021	396·791	Thaler ..	,,	2 10·75
Miglia ..		1628 ..	Boccale	0·4012..	.. ..	Scudo ..	,,	4 2·5
Verst ..		1167 ..	Vedra	2·7049..	36·27 ..	Ruble.. ..	,,	3 1·53
Mile		7432 ..	Kann	0·2059..	485 6726	Thaler ..	,,	2 10·75
.. ..		.. ..	Salma	19·226 ..	.. ..	Scudo ..	,,	4 1·4
League ..		4565·461	Aroba major..	3·55 ..	28·169..	Piastre = 13 reals	,,	4 2·25
Mil		11689 ..	Kannor	0 576043	173·598	Rixdaler ..	,,	4 4 5
Lieue ..		4374·552	Setier	10·06 ..	9·94 ..	Franc ..	,,	0 9·38
Mile		1760 ..	Gallon	0·83311	.. ..	Dollar ..	Silver	4 1·25
Berri		1826 ..	Almud	1·152 ..	86·96 ..	Piastre ..	,,	0 2·25

FOREIGN MONEY WITH ITS VALUE IN BRITISH.

Austria and Bohemia.

GOLD.	£	s.	d.
Ducat	0	9	4·75
Souverain d'Or	1	7	10·5
SILVER.			
Thaler or 2 gulden	0	4	0·8
Gulden	0	2	0·4

60 Kreutzer=1 gulden.
4 Pfennig=1 kreutzer.

Bavaria.

SILVER.			
Gulden=60 kreutzen	0	1	7·9

1 Kreutzer=4 pfennigen.

Belgium.

SILVER.

Same as France.

Brazils.

GOLD.			
1 Moeda=10,000 reis	1	5	11
SILVER.			
1 Pataca or dol.=1,200 reis	0	4	2·25
1 Milreis=1,000 reis	0	3	$5\frac{7}{8}$

China.

1 Tael=10 mace	0	6	2·825
1 Mace=10 candereen	0	0	8·062
1 Candereen=10 cash	0	0	0·806

Denmark.

SILVER.			
Rigsbank thaler=96 skilling	0	2	2·35

East Indies.

GOLD (MADRAS).			
1 Gold mohur=15 rupees	1	9	$2\frac{7}{10}$
Do. in Bengal=16 do.	1	11	1
1 Rupee=16 annas	0	1	10·29
COPPER.			
1 Anna=12 pie	0	0	1·934

1 Lakh=100,000 rupees.
1 Crore=10,000,000 rupees.

A rupee is generally reckoned as 2 shillings; so by cutting off the last figure from any sum you convert it into pounds: thus 1000 rupees is commonly called £100.

Egypt.

	£	s.	d.
1 Piastre=40 paras	0	0	2·47

Or £1=97 piastres 20 paras.

France.

GOLD.			
1 Napoleon=20 francs	0	15	10·32
10 Franc piece	0	7	11·16
SILVER.			
5 Franc piece	0	3	11·58
2 do. do.	0	1	6·76
1 do. do. (legal standard)	0	0	9·38

1 do. do.=100 centimes.

Gibraltar.

1 Dollar=12 reals	0	4	2
1 Real=16 quartos	0	0	4·16

Greece.

GOLD.			
20 Drachmai piece	0	14	2·2
SILVER.			
5 Drachmai piece	0	3	6
1 do. do. =100 septa	0	0	8·4

Hamburg.

1 Rix-dollar=3 marks	0	3	7
1 Mark=16 schillings	0	1	2·33
1 Mark banco	0	1	5·5

Hanover.

1 Thaler=24 groschen	0	2	10·75

1 Groschen=pfennigen.

Italy.

The legal unit is now the lira nuova=100 centissimi	0	0	9·38

The pieces are as in France.

Malta.	£	s.	d.
1 Pezza=30 tari	0	4	2
1 Scudo=12 tari	0	1	8
1 Taro=12 grani	0	0	1·67

Mexico.			
1 Duro=8 reals	0	4	2
1 Real=12 dineros	0	0	6·25
1 do. =100 cent.			

Netherlands.

SILVER.

Gulden	0	1	8
1 do. =100 cents.			

Poland.

1 Florin=30 groschen	0	0	5·62

Portugal.

GOLD.

Crown=5000 reis	1	3	11·25
Crusado=400 reis	0	1	11

SILVER.

1 Milreis=1000 reis	0	4	8·66

Prussia and Zollverein.

1 Thaler=30 groschen	0	2	10·75
1 Groschen=10 pfennigen	0	0	1·16

Rome.

Scudo=10 paoli=100 bajochi	0	4	2·5

Russia.

GOLD.

Imperial=10 rubles	1	10	11

SILVER.

Ruble=100 kopeks	0	3	1·53

Spain.

GOLD.

Onze d'Oro or Doblon	3	4	8
Ochenta	0	16	10
Escudo	0	8	5
Durillo	0	4	2·5

SILVER.

Duro=20 reals	0	4	2·5
Real=maravedis	0	0	2·5

Sweden.

1 Daler banco=48 skillingar	0	1	7·93
1 Species daler	0	4	5·06
1 Biksgäld daler	0	1	1·28

Switzerland.

Same as France.

Turkey.

1 Piastre=40 paras	0	0	2·25

United States of America.

GOLD.

Eagle	2	0	10·8

SILVER.

Dollar=100 cents	0	4	1·25

Japan.

GOLD.

Cobang	1	5	11

SILVER.

Itsiboo	0	1	5·25

Canada.

GOLD.

Pound	0	16	5·5

SILVER.

Shilling	0	0	9·75
Dollar	0	4	1·25

COPPER.

Penny	0	0	0·75

Malta.—The Rottolo = 1·7503 lbs. The Foot = 0·93 ft. The Salma = 4·44 acres. The Caffiso = 4·58 galls. The Scudo = 1*s.* 8*d.*

Persia.—The Cherray = 0·7885 lbs. The Bushire Mau = 760 miscals = 7½ lbs. The Tabriz Mau = a little over 7 lbs. The Arish = 12·7566 ft.: the Guerze = 2·083 ft. The Parasang = 6086 yds. The Keran is the unit of money, and varies in value from that of a shilling to a franc.

Portugal.—Now the same as in France; the old weights, &c., were, 16 Onca = 4 Quarta = 2 Marco = 1 Arratel = 1·0119 lbs. The Braca = 2 Varas = 10 Palmos = 7·214 ft. The Geira = 4,840 sqr. varas = 1·445 acres. The Legua = 3·84 miles = 6·18 kilomtr. = 6763 yds. The Almude = 2 Cantaros = 3·64 galls. (at Lisbon): the Oporto Almude = 5·52 galls. The unit of money is the Rei: 100 reis = 1 Testoon: 400 reis = 1 Crusado = 1*s.* 11*d.*: 1000 reis = 1 Milreis = 4*s.* 8·66*d.*

Poland.—See Russia.

Russia.—1 Funt = 12 Lanas = ·9024 lbs.: 40 funt = 1 Pud: 30 puds = 1 Packen = 9·67 cwt. The measures are: 1 Sachine = 3 Archines = 6 Stopas = 48 Verchocs = 7 ft.: 500 sachines = 1 verst = 1167 yds. = ·663 miles. 1 Desatin = 2400 sq. sachines = 2·45 acres. The Vedra = 2·7049 galls.: 40 vedras = 1 Sarotowaja = 108·196 galls. The silver Rouble is the unit of money = 100 Kopeks = 3*s.* 1·53*d.*

Spain.—Now the same as France. The old standards were, the Libbra Castiliana = 16 onzen = 1·0144 lbs.: this varied a little in the various provinces. The Pie de Burgos = 12 Pulgadas = 11·128 in. The Fanegada = 1·1364 acres.

INDEX.

ABA

ABATIS, 485
Accommodation afforded by houses, 251, 294
,, horse, 252
,, ladders, 189
,, prison, at sea, 189
,, storage, 146
Accounts to be kept in rear, 116, 128
Accoutrements, hooks at sea, 187
,, weight of, 30
Acids as poisons, 267
Acreage for crops, 77
Action, employment of artillery in, 355, 373
,, ,, cavalry, 359
,, ,, infantry, 364, 372
,, expenditure of ammunition in, 94
,, officers' conduct in, 6
,, position of general officers in, 140
,, staff duties in, 134
,, ,, ,, after an, 138
Advance of an army to attack, 353
,, infantry ,, 369
Advanced depots, 106
,, distance from main body, 327
,, guards, 26
Adjutant-general, 125, 131
Air, cubic space in barracks, 251
,, ,, ,, huts, 249
,, ,, ,, stables, 252
,, properties of, 491
,, required by man, 237
Alarm posts, 282, 532
Albuera, 135
Almanack, 12
Alphabet, Morse, 472
,, signalling, 471
Ambulance establishment, 99
,, waggon, 100, 113
Ambuscade, 301

ANI

Ammunition, 93
,, boxes, size and weight of, 94
,, carts, 16, 27, 56, 97
,, conveyance of cavalry, 16, 23
,, ,, infantry, 26, 95
,, custody of, 430
,, distribution of reserve, 96
,, expenditure of, in action, 94
,, for camel, 91, 97
,, for field guns, 39, 96
,, S.A., 94, 96, 97
,, for fortresses, 96
,, ,, mule, 68
,, Gatling, 98
,, gun, how carried, 95, 97
,, Henry Martini, 25, 94
,, load of, for pack animals, 94, 97
,, on board ship, 210, 213
,, pistol, 97
,, reserves of, 94
,, ,, regimental, 26, 93, 94
,, Sneider, 25
,, storage of, 188, 430
,, waggons, 93
,, ,, capacity of, 93, 97
Anchoring of bridges, 420
Anchors, 419
Aneroid barometer, 269, 493
Angles, salient and re-entering, 581
,, to lay out right, 494
Animals, depot of, 152
,, drinking of, time taken in, 243
,, inspection of, 80
,, on the march, 72
,, power of, 491
,, rations for, 74
,, supply of, 79

ANI

Animals, to find weight of, 80
,, transport, 65
,, watering of, 74, 243
Armistice, 287
Arm racks, 232, 245
,, on board ship, 187
Arms, broken, 266
Arms of cavalry, 14
,, infantry, 24
,, officers, 12
,, sick and wounded, 105
Army and navy signal book, 471, 472
Army corps, strength of, 176
,, ,, staff, 123
,, ,, veterinary establishment, 117
,, composition and distribution of, 173
,, discipline, &c., 4
,, duties at B. of O., 146.
,, hospital corps, 99
,, medical department, 98
,, order of march of, 313
,, organisation of, 14, 173
,, pay department, 115
Arrangements, medical, 109
Arsenic, poisoning by, 268
Art of tent-pitching, 239
Arteries, bleeding from, 265
Articles for troop use at sea, 190
Artillery, 36, 178
,, acting with cavalry, 335, 339, 376
,, axle, length of, 40
,, billeted, 251, 252
,, bivouac, 255
,, camps, 233, 238
,, captured, 138
,, carriages, track of, 40
,, charged by cavalry, 377
,, disembarkation from train, 466
,, draft per horse in, 40
,, embarkation of, 215
,, entraining of, 460
,, escort for, 375
,, fire, effect of, 112, 374, 375
,, ,, object of, 377
,, ,, rapidity of, 40, 44
,, floating bridges for, 408
,, in action, 355, 373
,, ,, space occupied by, 341

BAG

Artillery, in defence of redoubts, 288
,, ,, irregular warfare, 399
,, marching of, 304, 313
,, moving by rail, 460
,, ,, sea, 215
,, organisation of, 36
,, pace of, 312
,, parade of, time required for, 312
,, position of, 375
,, projectiles for, 38, 42
,, proportion of, 178
,, range of, effective, 39, 374
,, regimental staff, 46
,, space occupied by, on the march, 324
,, ,, in line, 233
,, ,, required in fieldworks by, 341
,, tonnage required by, 180
,, width of bridges for, 405
Assaults, 358, 388
Attacks, 369
,, false, 354, 356
,, general hour for, 282
,, in skirmishing order, 355
,, night, 281, 403
,, of positions, 352
,, on convoys, 393
,, on line of march, 356
,, on piquets, 283
,, ,, villages, 357
Augers, 489
Austrian rifle, 25
Awnings at sea, 189
Axes, weight, &c., of, 19, 28, 32, 90
Axle, artillery, length of, 40

BAGGAGE, 325
,, calculating tonnage of, 184
,, convoys of, 392
,, ,, in irregular warfare, 399, 400
,, during an action, 348
,, guards, 325
,, in hill warfare, 400
,, laagering of, 395

BAG

Baggage, loading of, on pack animals, 71
,, master, 325
,, ,, with rear guards, 329
,, measuring, 207
,, movement of, in retreat, 338
,, officers', 8
,, on the march, 315, 317, 325
,, parking of, 348, 394
,, personal allowance of, 325
,, room at sea, 188
,, staff-sergeant's, 91, 325
,, ton of, 207
,, trains, pace of, 312
Bakehouse at sea, 188
,, stores at sea, 192
Bakery waggon, 79
Baking, 79
,, gain of weight in, 81
Balaklava, battle of, 135
Balloon reconnaissance, 302
Bamboo poles, 406
Bands on the march, use of, 320
Barley, 77
,, ration of, 74
Barometer, to measure heights by, 493
,, use of, 269
Barracks, cubic space in, 251
Barrel anchor, 419
,, bridges, 411
,, cubic contents of, to find, 411
,, of gunpowder, 96
,, rifle, length of, 25
,, water, 244
Barricades, attack of, 396
Barrow, hand, 246
Base of operations, 106, 145
,, ,, division of duties of army and navy at, 146
,, ,, medical staff at, 105
,, ,, staff at, 145
Bastier pumps, 244
Bât animals, rations of, 74
,, ,, transport by, 54, 65, 71
Bathing, 242, 257
,, places, 242
Battalion, camp of, 232
,, conveyance of, by rail, 453
,, ,, sea, 180

BLA

Battalion, squares, 372
,, strength of, 373
,, tonnage required by, 182
,, transport, 31
Batteries, camp of, 233
,, in India, 38
,, number of guns in, 36
,, ,, to a division, 175
,, of position, 44
,, siege, 385
,, tonnage for, 182
Battering charges, 40
Battery establishments, detail of, 37
,, mountain, 37
Battle, order of, 174
Baulks for bridges, 404
Bay of a bridge, 406
Bayonet charges, 368, 371, 372
,, weight of, &c.,25
Beacons, 381
Beards, 4, 257
Bearer company, 99
Beams, to place over openings, 428
Beans, bushel of, 77
Beds, hospital, 192
Bedding, officers', 10
,, ,, at sea, 186, 192
,, N.C.O.'s, 192
Belts, brown, to clean, 15
Bengal, tents in, 89
,, equipment for regiments in, 90
Berdau rifle, &c., 25
Beam, width of, 180
Berme, width of, 482
Berthon's boats, 410
Berths, size of, 186
Besiegers, proportion of, 384
Bheesties, 24, 402
Bickford's fuse, burning of, 486
Billets, 251
Bill-hook, weight of, 90
Biscuit, inspection of, 81
,, ration of, 85
Bites, poisonous, 268
Bivouac, 253
,, selecting site for, 227, 254
Blanchard's pontoons, 409
,, ,, superstructure of, 410

BLA

Blankets, 11, 192
,, horse, at sea, 200
,, weight, &c., 90
Bleeding from artery, 265
,, wounds, 264
Blockades, 382
Boats, 184
,, Berthon's collapsible, 410
,, bridges of, 414
,, buoyancy of, 415
,, capacity of, 185
,, caulking of, 411
,, horse, 185
,, tonnage of, to find, 414
,, pontoon, 410
,, used in navy, dimensions and weights of, 415
,, life, with transports, 184
,, used in disembarkations, 183
Boiling, 259
,, temperature, 493
Bolsters at sea, 192
Book, pocket, 9, 480
Bombay, tents in, 90
Bones, broken, 266
Boots, examination of, 320
,, for officers, 8, 13
,, weight, &c., 9, 17, 30
Bottle, water, 9, 15, 17, 30
,, ,, for officers, 9
Boxes, loose, at sea, 192
,, S.A.A., 97
,, sentries', 246
Bran, bushel of, 201
,, cake, 77
,, ration of, 201
Bread, 81
,, fresh, at sea, 202
,, inspection of, 81
,, ration of, 85
,, room at sea, 188
Breaking ground in a siege, 385
,, strain of cables, 420
Breaks for carts, &c., 58
Breast harness, 55
Bridges, 404
,, boat, 414
,, anchoring of, 420
,, collecting materials for, 429

BUO

Bridges, destruction of, 487
,, ,, in retreats, 339
,, floating, 408
,, flying, 417
,, foreign,
,, frame, 426
,, military, 404
,, on line of march, 404
,, pontoon, 409
,, precautions in crossing, 407
,, protection of, 421
,, raft, 411
,, reconnaissance of, 296
,, selecting sites for, 408
,, superstructure of, 404, 409
,, trestle, 421
,, weights on, 407
,, width of, for guns, 405
Brigade adjutant, 247
Brigade major, 126
,, ,, duty of, 126
Brigades, staff of, 121
,, strength of, 173, 174
Brine, to make, 81
Broken limbs, 266
Broughs for embarkation, 215, 466
Brown belts, to clean, 15
Brush, use of in sketching, 476, 478
Brushes, whitewash, 189
Buckets, 33, 90, 100, 103, 190, 200
Buffaloes, rations for, 75
Bugle calls at sea, 217
Bulk of provisions, 83
Bullet, M. H., 25
Bullock, 68
,, draught, 68, 199
,, load of pack, 68, 199
,, pack, equipment of, 70
,, rations for, 75
,, to find weight of, 80
,, transport, 64, 68
,, trunk for officers, 9
,, wagon, load of, 68
,, watering of, 75
,, weight of, on bridges, 407
Buoyancy of boats, 215
,, ,, to calculate, 414
,, of casks, 411, 412
,, of timber, 416

BUR
Burial of the dead, 114, 138
Burning fluid, use of, 381
Burns and scalds, 266
Bushel measure, to make, 424
,, of grain, &c., weight of, 77
Bush fighting, 399

CABINS, fitments for, 186
,, size of, 186
Cables, 420
,, length, 420
Cacolets, weight of, 114
Cake, bran, 77
,, forage, 77
,, hay, 78
Camels, 68
,, equipment, 71
,, rations for, 75
,, saddle, 71
,, transport in India, 69
,, water required by, 76
,, weight of, 69, 407
Camp, 227, 256
,, artillery, 233, 238
,, cavalry, 233, 236
,, conservancy of, 246
,, duties in, 232, 246
,, equipment, 88
,, ,, conveyance of in India, 25
,, ,, for cavalry, 19
,, ,, infantry, 28
,, followers, 247
,, formation of, 247
,, infantry, 234
,, internal arrangements of, 231
,, kettles, 90
,, laying out, 232
,, march to from train, 466
,, marching into, 229
,, markets, 247
,, offences in, 248
,, paths, to make, 232
,, reports on, 229
,, rumours, 127
,, sanitary arrangements in, 241
,, selection of sites for, 227, 228
Campaigning, 255

CAV
Canals, bridging, 426
,, reconnaissance of, 296
Canteen, officer's, 8, 9
,, soldier's, 30
Capacity of H. M. troopships, 183
,, of railway carriages, 452, 452
,, of ships, 186
Captain of the day, duties of, 427
Captured artillery, 138
Carbine, Lancaster, 46
,, weight, &c., of, 14
Carbolic acid, 204
Carpenter's tools, weight of, 90
Carriages, gun, track of, 40
,, ,, weight of, 40
,, railway, capacity of, &c., 451, 452, 461
,, ,, destruction of, 447
Carrying capacity of ships, 186
Cartridges, weight of, 97
Carts, ammunition, 97
,, for transport, 56
,, laager of, 395
,, Maltese, 58
Case shot per battery, 97
,, range of, 97
Casks, 411
,, allowance for leakage of, 411
,, bridge of, 411
,, ,, superstructure of, 413
,, to find capacity of, 408
Cattle, to estimate weight of, 80, 407
Caulking of boats, 411
Caustic as a poison, 267
Cavalry, 14, 178
,, acting in masses, 362
,, ,, with H.A., 335, 339, 376
,, billeted, 251, 252
,, bivouac, 254
,, brigade of, 173
,, camp equipment, 19
,, camps, 233, 236
,, charges, 360, 363
,, commander, qualifications of, 362
,, distance at which distinguishable, 477
,, entraining of, 458
,, equipment of, 15, 17
,, in action, 359

CAV
Cavalry in pursuit, 335
,, marches of, 304, 313, 319
,, movement by rail, 458
,, native establishment for, 23
,, pace of, 65
,, parade of, time required for, 312
,, proportion of, 178
,, revolvers for, 14
,, reserves for, 362
,, scouts, 274, 300, 327
,, ships, 179
,, space occupied by, 233
,, ,, on the march, 323
,, staff, 121
,, time required for parade, 313
,, tonnage for, 181
,, transport, 19
,, use of, 327, 335, 360, 443
,, *versus* infantry, 361
,, war establishment of, 16
,, weight of, 15, 406
Centipede, bite of, 268
Certificates to masters of ships, 221
Chairs, Fyffe's water, 191
Chalk formation, camps on, 229
Charge, the moment to, 368
Chargers, height of, 15
,, shoeing of, 118
Charges, battering, 40
,, cheers during, 366
,, of cavalry, 360
,, guns, 40
,, infantry, 365, 368, 372
,, rifle, 25
Cheering during charging, 366
Cheese, ration of, 85
Chesses, size, &c., 405
Chests, veterinary, 117
Chevaux de frise, 485
Chief of the staff, 121, 131
Chinese coolie, rations of, 86
,, ,, corps, 148
Chloride of lime, 201
Circles, properties of, 489
Circular tent, 239
Cities, accommodation in, 251, 294
,, military occupation of, 390
,, police of, 390
,, reconnaissance of, 294
COM
Civil labourers, employment of, 148
,, population, treatment of, 247
,, ,, during sieges, 390
Classification of documents, 128
,, sick and wounded, 108
Clothes, washing of, 242, 257
Clothing, 87
,, weight of, 9, 17, 30
Climate, reports on, 301
Coal, ration of, 87
Coasts, examination of, previous to a landing in force, 223
,, reconnaissance of, 399
Coffee, 83
,, ration of, 85
,, to make, 261
Coinage, weights and measures, foreign, 500
Collapsible boats, Berthon's, 410
Collars, horse, 55
Collarbone, broken, 266
Collarmakers' tools, 117
Collisions, useless, to be avoided, 280
Column of route, 312
,, opening out of, 316
,, space occupied by, 315
Comforts, medical, at sea, 204
Command at sea, 216
Commandant at base, 145
,, headquarters, 123
,, station, 148
Commander's position in action, 140
Commissariat department, 52
,, train on the march, 317
Commissary-general, 54
Commissaries, 465
Communications, 141
,, maintenance of, 144
,, organisation of line of, 141
Companion ladders, 189
Company officers, importance of, 372, 400
,, of transport, establishment of, 60
Compass, measurements by, 492
,, prismatic, 475, 492
,, use of the, 475
,, variation of, 479
Compliments, no, from outposts, 283
Compressed hay and forage, 77

CON
Conduct in action, 6
Condy's fluid, 204
Cones, properties of, 491
Conservancy of camps, 246
,, the trenches, 386
Construction corps, 442
,, of field works, 484
,, embrasures, 484
,, loopholes, 484
,, roads, 436
Consumption of fuel by engines, 464
,, by steam sapper, 58
Contributions, to levy, 150
Convalescent depôt, 114
Conveyance of sick and wounded, 108, 113
,, by sea, 179
,, by rail, 441
Convoys, 392
,, of prisoners, 139
Cooking, 258
,, galley, 188
,, importance of good, 256
,, on board ship, 188
,, on piquet, 282
,, places, 232, 240
,, pots, men's, 258
,, ,, officers', 8
,, receipts for, 259
,, vegetables, 260
Coolie corps, 63, 148
Coolies, rations of, 86
,, transport, 63
Coolness in action, 6, 135
Copperas, poisoning from, 267
Coppers, required capacity of, 188
Corduroy paths in camp, 246
,, roads, 438
Corn, Indian, 77
,, loss in grinding, 81
,, sack of, 81
Corps, army, 176
,, ,, staff of, 123
Correspondence, 127
,, classification of, 128
,, registry of, 129
,, secret, 162
Correspondents, newspaper, 163, 171, 337
Cots, swinging, 190
Counting distances, 476

DEF
Country people, ill-usage of, 247
Courage, 120, 256
Courtesy, necessity of, 133
Court martial, 164
,, ,, form of procedure of, 164
Covering party, strength of, 388
Cow dung, use of, 250
Cribwork, 424
Crops, 77
Cross section on military road, 435
Cubic contents, to calculate, 416
,, ,, of a ton, 207
,, ,, gunpowder, 96
,, ,, water, 491
,, ,, railway waggons, 451
,, feet of water-tight compartments in lifeboats, 185
,, space per man in barracks, 251
,, ,, ,, huts, 249
,, ,, horse at sea, 186
,, ,, ,, in stables, 252
Curry-comb, 66
,, powder, 86
Custody of ammunition, 430
Cylinder, properties of, 491, 494
Cypher, use of, 133, 171, 472
Cyprus, transport of troops to, 181

DANDY, Indian, 114, 403
Dangerous services, volunteering for, 5
Dead, burial of the, 114, 138
Dead weight, 406
Defaulters, employment of, 5, 246
Defence of houses, 351
,, places, 390
,, positions, 346
,, posts, 281, 287
,, rivers, 380
,, villages, 349
Defensive formation, 367
,, operations, 366
,, positions, 346
Deficiency of stores, 221
Defile, advanced guard in a, 329
,, rear ,, 333
,, retreat through a, 333
,, on the march, passing a, 329

DEL
Delivery of orders in action, 133
Demands for stores, 87
Demolition of bridges, 487
,, doors, 396
,, engines, 446
,, gates, 489
,, guns, 487
,, iron bridges, 488
,, railways, 444
,, rolling stock, 447
,, stockades, 489
,, telegraphs, 468
,, trees, 488
,, walls, 489
Department, topographical, 176
Deployments of infantry, 370
Depôt, advanced, 106
,, for correspondence, 128
,, transport animals, 152
Depth for fords, 297
,, positions, 341
,, of water for ironclads, &c., 223
Deserters, 279
Despatches, transmission of, 129
Detailing duties, 132
Detonators, 486
Detraining of artillery, 465
,, cavalry, 465
,, infantry, 465
Dhoolies, 114
Diet, 256, 262
,, of horses, 65
Diggers, proportion of, 387, 486
Dirt pits, 240
Disable locomotives, to, without permanent injury, 447
Discipline, 4
,, of the mind, 257
,, on the march, 321
Discs of gun-cotton, 486
Disembarkations, 220
,, before an enemy, 222
,, from trains, 465
,, of horses, 222, 226, 465
,, returns, 221, 227
Disobedience of orders, when permissible, 137
Disinfectants, 201, 204
Dispensary, veterinary, 193

DUT
Dispensary on board ships, 190
,, stores for, 191
Distance indicator, 478
Distances, judging, 476
,, measurement of, 476, 478, 492
Disinfectants, 204
Distilling water at sea, 189
Distinguishing flags for generals, 140
,, transports, 185
Distribution of army into corps, 173
,, battalions into divisions, 174
,, wharfage and storage, 148
Ditches, size of, 484
Division, medical staff for, 98
,, order of march of a, 316
,, staff for a, 122
,, strength of, 175
Doctors, proportion of, to sick, 113
Donkey, ration of, 75
,, fire-engines, 189
Dooly, Indian, 114
Doors, to demolish, 396, 489
Doubling, evils of, 320
,, rate of pace, 311
Dragoon, weight of, 15
Drainage of camps, 245
,, fieldworks, 483
,, roads, 435
Draught, calculation of, 55
,, for transport purposes, 55
,, on plank roads, 439
,, of ironclads, 223
Dress, 4
,, of officers in the field, 9
,, for soldiers ,, 17, 30
Drill, 257
Drinking, time taken by animals, 243
,, tanks at sea, 188
,, water on the march, 320
Driving *versus* riding, 55
Drowned, half, to restore, 268
Drunkenness, 321
Dust indicating movements, 302
Duties, detailing, 132
,, division of, at B. of O., 146
,, general staff, 124
,, in camps, 232, 246
,, staff, after an action, 138

DUT
Duties, staff, encamping, 230
,, ,, in action, 134
,, ,, on the march, 319
Dynamite, 486

EARTH, excavation of, 483
Edmond's ventilating system, 189
Effects of artillery and infantry fire, 112, 369, 371, 375
Elcho sword bayonet, 40, 48, 399
Electric telegraph, 467
,, ,, wires in sizes, 467, 485
Elephant, 69, 199
,, at sea, 199
,, equipment, 71
,, rations for, 76
,, water required by, 76
,, weight of, 70, 407
Embarkations, 206
,, of artillery, 215
,, horses, 214
,, orders for, 212
,, returns, 216
,, when opposed, 220
,, when unopposed, 212
Embrasures, dimensions of, 484
Emetics, 266
Employment of R. A. in action, 355, 373
,, cavalry ,, 359
,, infantry ,, 364, 372
Encamping, staff duties when, 230
,, ground, report on, 229
Enceinte, proportion of men to, 288, 482
Enemy, embarkation in presence of, 220
,, landing in face of, 222
Engineers, entraining of, 461
,, organisation of, 46, 47
,, proportion of, 179
Engines, destruction of, 446
,, fuel and water required by, 464
,, fire, at sea, 190
,, pilot, 465
,, traction, 58
,, weight of, 451
Entanglements, wire, 485
Entraining of troops, 458, 460, 461
Entrenching tools, 25
Entrenchments, construction of, 483

FIE
Entrenchments for villages, 349
Equipment, camp, 88
,, for officers, 8
,, personal, of cavalry, 15, 17
,, ,, infantry, 30
Escalading, 389
Escorts for R. A., 375
,, prisoners, 139
Esprit de corps, 3
Establishment, war, of R. A., 36
,, ,, cavalry, 16
,, ,, engineers, 47
,, ,, infantry, 27
,, ,, to calculate, 40
Evacuation of sick and wounded, 107
Excavation of earth, 483
Expeditions, hill, 401
Expenditure of ammunition, 94
,, fuel and water by engines, 464

FAINTNESS, to treat, 266
False alarms, 284
,, information, 162, 337
Farmhouses, reconnaissance of, 298
Farriers, proportion of, 117
,, tools, weight of, 117
Fascines, 298, 484
Fatigue-parties, officers with, 256
Feeding of horses, 65
,, soldiers during movement by rail, 463
Feet, care of the, 267, 320
,, sore, treatment of, 267
Ferries, 417
,, reconnaissance of, 296
Fevers, to treat, 266
Field companion, medical, 114, 269
,, equipment for officers, 8
,, fortification, 481
,, guns, British and foreign, 38, 43
,, hospitals, 103, 352
,, ,, stationary, 104
,, magazines, 431
,, officers of the day, 230, 246, 279
,, ovens, 241
,, post-office, 155
,, works, construction of, 481
,, ,, time required to make, 482

FIG
Fighting line, 370
Filters, 243, 244
Filth-holes, 240
,, disposal of, 240
Finger-posts, 253
Fire, effect of R.A. and infantry, 112, 371, 374
,, balls, 443
,, buckets at sea, 190
,, engines at sea, 190
,, rapidity of artillery, 40, 44
,, ,, infantry, 94
Fireplaces, 240, 249
,, proportion of, to inhabitants, 252
Firewood, 241
Fires, grass, protection from, 397
,, with outposts, 282
Fittings on board ship, 196, 187
Flags, distinguishing, for generals, 140
,, ,, transports, 185
,, of truce, 279, 284
,, signalling, 469
Flanking parties, 328, 393
Flanks, protection of, 280, 342
,, to be turned, 329
Floating bridges, 408
,, ,, protection of, 421
,, burning liquid, 381
Flying bridges, 417
Flour, 81
Fluid, burning, use of, 381
Followers, native, 35, 23
,, rations of, 86
Food, 74, 78
,, bulk of, 82
,, how packed, 82
,, necessity of good, 256
,, rations of, 85
Forage, cake, 77
,, compressed, 77
,, green, 74, 65, 201
,, on board ship, 201
,, rations of, 74
Foraging parties, 247
Forced marches, evils of, 305
Fords, 297
,, precautions in crossing, 389
,, reconnaissance of, 297
GEN
Fords, to improve, 298
Foreign money, weights and measures, 495, 499, 502
Forests, fighting in, 400
,, reconnaissance of, 298
Forges, for infantry, 117
,, proportion of, 117
Forlorn hope, 392
Formation, defensive, 367
Formulæ, useful, 489
Fortification, field, 481
Fortresses, 382
,, ammunition required for, 96
Fougass, 485
Fractured limbs, 266
Frame bridges, 426
Freezing point, 491
French weights and measures, 495
,, rifle, &c., 25
Freight required for troops and stores, 182
Frontage of troops in position, 341
Frostbite, to treat, 267
Fuel, for cooking, 87
,, locomotives, 464
,, traction engine, 58
,, ration of, 86
Fumigation of ships, 204
Fuze, Beckford's, rate of burning, 486
Fuzes, 40
Fyffe's water chairs, 191

GABIONS, 484
Galley, cooking, 188
Galley, stores for, 191
Gallop, rate of, 65
Garrison of field-works, 483
,, fortified posts, 288
,, villages in positions, 349
Gates, to destroy, 489
Gatling ammunition, 98
,, gun, 44
Gauges of railways, home and foreign, 452
General hospitals, 147
,, of communications, 142.
,, officers, billets, 252
,, ,, distinguishing flags, 140
,, ,, duty of, 124, 246

GEN
General officers, position in action, 140
,, orders, 131
,, service waggon, 56
Geological formations, 229
German rifle, &c., 25
Gloucester huts, 249
Gradations for manœuvres, 341, 342
Gradients of roads, 434
,, table of, for railways, 451
,, ,, roads, 440
Grain, inspection of, 77
,, loss in grinding, 81
,, weight of, 77
Gras rifle, &c., 25
Grass-cutters, establishment of, 23
,, fires, to prevent, 397
,, ration of, 74, 75
Graveyards, 114, 138
Gravity, specific, of timber, 416
Grease, allowance of, 55
,, for traction engines, 58
Green forage, 65, 74, 201
Grinding wheat, loss in, 81
Grog, use of, 263
Grooming horses, 66
Ground for camps, 227, 228, 254
,, knowledge of, 125, 475
,, reports on, 229
Grumblers, 5
Guards, advanced, 326
,, ,, distance from main body, 327
,, baggage, 325
,, over prisoners, 139
,, rear, 247, 329
Guides on the march, 293
,, treatment of, 294
Guns, ammunition, 39
,, captured, 138
,, charges for, 140
,, destruction of, 487
,, field, British and foreign, 38
,, Gatling, 44
,, in defence of posts, 288
,, in field works, 483
,, number of, per battery, 36
,, ,, in siege trains, 41, 389
,, proportion of, 389
,, range and weight of, 38

HEA
Guns, rapidity of firing, 40, 44
,, with outposts, 276
Gun-carriages, track of, 40
,, weight of field, 406
Guncotton, 486, 488
,, use in demolition, 445
Gunpowder, 96, 487
,, barrels, size and weight of, 96
,, cubic feet of, 96
,, magazines, 96
,, power of, 488
,, storing of, 430
Gypsum, use of, 201

HAIR to be short, 4, 257
Hale's rockets, 40
Halts on the march, 311, 319
Hammers, stone, 437
Hammocks hooks, 187
,, horse, 198
,, soldiers', 192
,, storage of, 188
,, to measure decks for, 186
Handbarrow, 246
Harbourmaster's duties, 147
Harding, Lord, at Albuera, 135
Harness, 55
,, breast, 55
,, packing of, 215
,, to clean, 15
Hatches, booby, at sea, 190
Hatchets, allowance of, 28, 32, 33
,, weight of, 90
Hatchways, size of, 179
Haversack, weight of, 17, 30
Hay cake, 78
,, compressed, 77
,, inspection of, 76
Headquarters, commandant of, 123
,, in billets, 252
,, selection of position for, 124
,, staff officers' attendance at, 132
Headstalls at sea, 199
Health, attention to, 256, 320
Heat, effects of, in marches, 322
Heaths, reconnaissance of, 298

HEI

Heights, measurement of, 493
Helmets, stowing of, at sea, 188
,, weight of, 30
Hill, ascending a, 329
,, expeditions in India, 401
Holes for filth, 240
Hoof ointment, 66
Horse, 65
,, after the march, 66
,, at sea, 219
,, blankets, at sea, 200
,, ,, size of, 200
,, boats, 185
,, boxes, 192, 219
,, ,, portable, 199
,, depôts, 152
,, disembarkation of, 222, 226
,, ,, from railways, 465, 466
,, draught per, 55 439
,, drinking, time required for, 243
,, embarkation of, 214
,, ,, on railways, 452, 459
,, entrainment of, 452
,, feeding of, 65
,, grooming of, 66
,, hammocks, 198
,, headstall, 199
,, height of the, 65
,, length of the, 65
,, lines in camp, 237
,, measurement of the, 65
,, medicines at sea, 200
,, ,, chests of, 117
,, paces of the, 65
,, picketing, 233, 235, 237
,, power of the, 55, 491
,, proportion of veterinary surgeons to, 117
,, rations for the, 74
,, ,, at sea, 201
,, remedies, 66
,, ships, fitting of, 192
,, ,, utensils for, 200
,, shoeing the, 66, 117
,, shoes, weight of, 67
,, sick, 65
,, ,, disposal of the, 219
,, slinging the, 214

IND

Horse slings, 198, 220
,, space of, in stables, 252
,, ,, when picketed, 233
,, stalls, fitting in a ship, 196
,, ,, size of, 193
,, ,, ,, at sea, 187, 193
,, swimming the, 227, 379
,, watering the, 220
,, water required by, 75
,, weight of draught per, 55
,, weight of the, 67
Hose, powder, rate of burning, 487
Hospital, 103
,, accommodation for, 104, 113, 464
,, ,, on railways, 464
,, ambulance, 101
,, army corps, 99
,, at sea, 190
,, ,, stores for, 191
,, attendants, proportion of, 113
,, beds at sea, 190
,, equipment, 113
,, field, 103, 352, 402
,, ,, in action, 103
,, general, 147
,, marquee, 89, 103
,, ships, 107, 180
,, waggons, 100
Hot meals, importance of, 256
Hour for the reveillée, 218
,, tattoo, 218
Houses, accommodation in, 251, 294
,, defence of, 351
,, reconnaissance, of, 298
Hussar, weight of, 25
Huts, 248
,, cubic space in, 249
,, for hospitals, 104
,, stables, 250
,, Gloucester, 249
,, log, 250
,, Sardinian, 249
Hythe theories, 368

ICE, bearing powers of, 296
Inaccessible places, measurement of, 492, 493
India, hill expeditions in, 401

IND
Indian establishments, 26, 35, 38, 174
,, troops at sea, Bengal scale of victualling, 205
,, ,, rations for, 86
Indications, military, 302
Indicator, distance, 478
Individuality of the soldier, 4
Infantry ambuscades, 301
,, arms of, 24
,, attacking in line, 369
,, brigade of, 174
,, camp of, 234
,, charges, 365, 368
,, distance at which distinguishable, 476
,, division of, 175
,, entraining of, 458
,, equipment, 28, 30
,, establishment of, 27
,, fighting in line, 370
,, fire, effect of, 112, 369, 371
,, in action, 364, 372
,, ,, space occupied by, 232
,, in a defensive position, 341
,, mounted, 363
,, movement by rail of, 458
,, native, 35
,, on the march, ground covered by, 323
,, organization of, 24
,, pace of, 311
,, parade of, time required for, 313
,, scouting parties, 301
,, soldiers' kit, 30
,, squares, 372
,, time required for parade by, 313
,, tonnage required for, 180, 182
,, transport, 31
,, *versus* cavalry, 361
,, weight carried by, 30
,, weight of, 24, 406
Information to be in pocket book, 7
,, to be remembered, 13
,, to obtain, 160
Inhabitants of besieged places, 390
,, to question, 293
,, ill-usage of, 247
,, proportion of, to fireplaces, 252

KIC
Initial velocity of M. H. rifle, 25
Inkermann, 133
Inspection of animals, 80
,, meat, 80
,, parade, time required for, 313
,, troopships, 206
,, ,, report of, 207, 209
,, troops ordered to embark, 211
Inspector, field, of L. of C., 106
Instructions written during an action, 133
Instruments for surveying, 475
,, medical, at sea, 204
Insurrection, suppression of, 396
Intelligence department, 159
,, false, 162, 337
Intelligent departure from orders, 135
Interrogating prisoners, 161, 290
,, the inhabitants, 293
Intervals between troops, 316, 317
,, in encampments, 232
Intrenching tools, weight of, 25
,, ,, carriage of, 25
Investment of places, 384
Iron bridges, destruction of, 488
Ironclads, draught of, 236
Irons, leg, 191
Irregular warfare, 396
Issue of stores, 87
Issuing room at sea, 188
,, ,, stores for, 191
Italian rifle, &c., 25
Itinerary, 480

JACK, lifting, weight of, 90
Journal, 13, 127, 150
Journey of troops by rail, 463
Judging distances, 476

KAFFIR wars, 396
Kahars, 403
Kajawahs, 402
Kettles, camp, 90
,, officers', 8
Kicking boards, 198
Kicks, treatment of, 66

KIL
Killed and wounded, list of, 138
,, ,, proportion between, 112
Kit, officer's, 9
,, cavalry soldier's, 17
,, infantry ,, 30
Kitchen, 240
Knapsacks at sea, 213
Knots, to tie, 429
Knowledge, topographical, 475

LAAGER of waggons, 395
Labourers, 148
Ladders, accommodation, 189
,, step, 189
Lakes, reconnaissance of, 298
Lamps and lanterns at sea, 190, 200
Lancaster carbine, weight of, 46
Lances, weight of, 14
,, conveyance of by rail, 459
Lancers, weight of, 15
Land, yield of, 77
Landing in face of an enemy, 222
Land transport, 54
Languages, knowledge of, 8
Lashings for bridges, 423, 427, 430
Lasso, weight of, 17
Latrines, 241
,, in the trenches, 386
,, on board ship, 187
Launches, steam, 185, 224
Laying out a road, 435
Lazarette deck, 188, 224
Leakage, allowance for, in casks, &c., 411
Leather, brown, to clean, 15
Leg, fractured, 266
Leg irons, 191
Lemonade, to make, 262
Length of columns on the march, 315
,, teams, 394
Letters, prepayment of, 156
Life boats, 185
,, buoys, 189
Lifting jack, 90
Lift pumps at sea, 188
Light, ration of, 87
Lightning conductors, 189
Limber, gun, 97
,, ammunition in, 97

MAR
Limbs, broken, 266
Lime, use of, at sea, 189
Lime juice, 83, 204
Line, fighting, 370
,, to pass across a river, 419
,, of communications, 141
,, medical staff on, 105
,, field inspector of, 106
,, veterinary arrangements for, 152
,, remount depots on, 152
,, troops to guard, 156
Linen, table, at sea, 186
,, bed ,, 186
Loading of pack animals, 71
Loads for pack animals, 65, 97
,, ,, waggons, 451
,, on bridges, 407
Lock for frame bridges, single and double, 426
Locomotive, fuel and water for, 464
,, destruction of, 446
,, power of on gradients, 451
,, weight of, 451
Log huts, 250
Loopholes, 484
Loose boxes at sea, 192
Luxuries, 8

MAGAZINES, formation of, 430, 431
,, on board ship, 188
,, powder, 430
McDougall's powder, 204
Maltese cart, 58
Mange, to cure, 66
Mangers at sea, 197
Maori wars, 396
Manganese, 205
Manœuvres, gradients admitting of, 341, 342
Maps for service, 7
,, scale of English, 479, 480
,, ,, foreign, 479, 480
,, use of, 300
,, ,, in road-making, 436
Marauding, 248
Marches, 303
March, attacks when on the, 356
,, time occupied on the, 315

MAR
March, discipline on the, 321
,, forced, 305
,, from train to camp, 466
,, of an army corps, order of, 313
,, a division, order of, 316
,, hour of starting on, 318
,, halts during the, 311, 319
,, in unhealthy localities, 321
,, length of, 310
,, night, 318, 397, 466
,, obstruction on the, 322
,, opening out on the, 306
,, orders for the, 305, 307, 312
,, space occupied on the, 324
,, staff duties during the, 319
,, to attack, 352
Marching into camp, 229
,, practice in, 257
,, rate of, 311
Markets in camp, 247
Marquee, hospital, 89, 103
Marshes, reconnaissance of, 298
Martini Henry ammunition, 25, 94, 96
,, ,, rifle, 14, 24
,, ,, ,, barrel, 25
,, ,, ,, range and penetration of, 25
Masses of cavalry, 362
Matches, lucifer, 9
Materials for field magazines, 433
,, for bridges, collecting, 429
Mathematical formulæ, 489
Mats for horse ships, 219
,, for tents, 239
Mauser rifle, 25
Maxims for reconnoitring, 302
Meals, hours for, 218
Measures, English and foreign, 495, 406
,, supply of at sea, 191
,, to be remembered, 13
,, to construct, 494
Measuring baggage, 207
,, distances, 476, 492
,, heights, 493
,, practice of, 13, 476
Meat, 80
,, how to cook, 259
,, inspection of, 80
,, ration of, 85

MOR
Meat, salt, 80
,, supplies of, 79
Medical arrangements, 109
,, comforts at sea, 204
,, department, 98
,, equipment, 113
,, ,, at sea, 204
,, field companion, 114
,, hints, 264
,, panniers, 114
,, staff on L. of C. and B. of O., 105
,, stores, 113
,, ,, at sea, 204
Medicines for horses at sea, 200
,, chests, veterinary, 117
Memorandum book, size, &c., 9, 480
Men and officers, number a ship can carry, 186
Mensuration, 489
Mess, officers', in the field, 13
,, ,, kit, 9
,, on board ship, 186
,, soldier's, kit at sea, 187
Messages, important, 133
,, to be numbered, 133
,, sent by orderlies, 132
,, sent in action, 133
,, wording of, 133
Metalling of roads, 437
Metric system, 497
Military bridges, 404
,, considerations in encamping, 227
,, conveyances, 55
,, indications, 302
,, roads, cross section on, 435
,, science, essential for S. Os., 118
,, secretary, 125, 131
,, spirit and discipline, 3
,, surveys, 474
,, trains, speed of, 450
,, units, tonnage required for, 182
Money, supply of, 116
,, table of foreign, 499
,, prize, 158
Moon's influences, 270
,, phases, 12, 270
Morale of soldiers, 5, 256
Morse alphabet, 472

MOR

Mortars, range of, 41
Mountain battery, 37
Mountains, reconnaissance of, 298
Mounted infantry, 363
Movement of an army, orders for, 305, 307, 312
,, of troops by rail, 449
,, influence of slopes on, 341
,, indication of, 302
Mud roofs, 250
Mule, the, 67, 118
,, equipment, 70
,, rations for, 75
,, water required by, 75
Muleteers, proportion required, 55
,, arming of, 55
Musketry fire, effect of, 112, 369, 371
Mustard emetic, 266
Music, importance of, 320
Mutiny, 247

NAILS, to treat ingrowing, 320
Names of persons and places to be printed, 133
Naphtha for burning bridges, 381
Narcotics, poisoning from, 268
Nations, railway rolling stock per mile of several, 450
Native regiments, establishment of, 26, 35, 38, 174
,, followers, 35, 23
,, rations, 86
,, ,, at sea, 205
Navy, 146
,, boats used in, dimensions and weights of, 415
,, duties of at B. of O., 146
,, communicating with by signal, 472
Newspaper correspondents, 163, 171, 337
Night attacks, 278, 283, 397, 403
,, caps for campaigning, 11
,, marches, 319, 466
,, reconnaissances, 301
,, surprises, protection against, 278, 283
Nitre for horses, 200
North, S.E., and W., expressions to be used in orders, &c., 133

OFF

North, to find the true, 478, 479
Norton's tube wells, 244
Nose-bags, 17, 70
Number of troops, to estimate, 302
,, for transports, 185
,, orders and messages, 133
,, telegraph poles per mile, 467

OATS, 77
Obedience to orders, 137
Obstacles, 281, 343, 484
,, abatis, 281
,, chevaux de frise, 485
,, entanglements, 485
,, value in positions, 343
,, on the march, 322
,, use of, 484
,, ,, to guard against night attacks, 484
Occupation of a position, 344
Offal, allowance to be made for, 80
Officers' arms, 12
,, advice to, 1
,, ,, ordered on service, 8
,, cabins at sea, 186
,, canteen, 8, 9
,, carrying flag of truce, 284
,, chargers, height of, 15
,, company, importance of, 372, 400
,, and men, number a ship can carry, 186
,, dress for service, 8
,, employed on outpost duty, 274, 281
,, field, of the day, 230, 246, 279
,, general, 140
,, of the day, 246
,, horses, shoeing of, 66, 117
,, kettles, 8
,, kit, 9
,, made prisoners, 137
,, mess at sea, 186
,, messing of, in the field, 13
,, staff, 118
,, ,, duties of, 124
,, what they should remember, 13
,, with working parties, 256
Offences on line of march, 150

OFF

Offensive operations, 368
Official letters, &c., 129
,, ,, twaddle in, 129
Oil, ration of, 87
Ointment, hoof, 66
Onions, bushel of, 77
Opening out on the march, 306
,, trenches, 386
Openings, to place beams over, 428
Operations, base of, 106, 145
,, defensive, 366
,, offensive, 368
Opium, poisoning by, 268
Opposed embarkation, 220
Order of march, 312
,, battle, 174
Orderlies carrying messages, 132
Orders, delivery of verbal, 133
,, for embarkation, 212
,, for the march, 305, 307, 312
,, general, 131
,, issue of, 131, 231
,, numbering of, 133
,, obedience to, 137
,, receipt of, 132
,, wording of, 133
,, written during an action, 133
Ordnance, captured, 138
,, charge for, 40
,, commonly in use, 43
Organisation of lines of communication, 141
,, transport, 72
O.S.D., 92, 117
Otter, an, 417
Outposts, 272
,, must not shut itself up, 281
,, no compliments paid by, 283
,, relief of, 283
,, signalling with, 231, 277
,, strengthening of, 281
,, to be under arms before daylight, 282
Ovens in use, 78
,, field, 79, 241
Owners of ships, stores supplied by, 186
Oxen, 64, 68, 75
,, load for, 68
,, pack, 70

PIC

Oxen, rations for, 75
,, water required by, 75

PACE of artillery, 312
,, baggage trains, 312
,, cavalry, 65, 312
,, infantry, 311
,, length of, 476
,, pack animals, 68
,, transport, 64
,, the horse, 65
Pacing, method of, 476
Pack animals, 65
,, load of S.A.A. for, 97
,, loading of, 71
,, rations for, 74
,, supply of, 62
,, *versus* carts, &c., 54
,, watering of, 73
Pack-saddles, 70
Packages, food made up in, 79, 82
Pad, ox, 70
Panniers, medical, 114
Parade, time required by 3 arms for, 312
Parallel, the first, 387
Parapets, 482
Parking baggage, 348, 394
Park, R.A. and R.E., position for, 385
Passage of bridges, 407
,, fords, 297, 380
,, rivers, 377
Passports, 169
Paths in camp, to make, 245
Patients, proportion of to doctors, 113
Patrolling, 283
Pay, army, department, 115
Paymaster, 124
Peas, weight of bushel of, 77
Penetration of rifle bullets, 25
,, shells, 40
Pepper, ration of, 85
Personal cleanliness, 4, 257
Pharmacy waggon, 114
Photographs on passports, 168
Phosphorus, poisoning by, 268
Physical memoranda, 491
Physique, importance of, 120
Pickaxes, weight of, 90
,, per regiment, 19, 28, 32

PIC
Picketing horses, 233, 235, 237
Piers, crib, 424
,, of casks, pontoons, or boats, 212, 408
,, to launch, 423
Pig, weight of, 80
Pilot-engine, 465
Piquets, 275
,, inlying, 246
,, relief of, 282
,, when attacked, 281, 283
Pitch of roof, 250
Pitching tents, 235
Plains, formation in, 367
,, reconnaissance of, 298
Plans of cities, 395
,, positions, 345
,, scales for, 475
Plank roads, 439
Platforms, railway, 450
,, gun, 484
,, slope of, 484
Plum-pudding, to make, 261
Pocket-book for service, 9, 480
Points of the compass, 133
Poisonous bites, 268
Poisons, 267
Poles, telegraph, 467
Police, 163
,, in besieged cities, 390
,, in cities at B. of O., 144, 147, 170
,, on railways, 464
,, on board ship, 217
Ponds, reconnaissance of, 298
Ponies, 68
,, rations of, 75
Pontoon bridge, to cross, 407
Pontoons, 409
,, proportion of, required, 179
,, tonnage required by, 410
,, train, 410
,, troop, establishment of, 468
Population, to estimate, 252
Portable horse-boxes, 199
Positions, 340
,, attack of, 352
,, defence of, 346
,, defensive, 346
,, frontage of troops in, 341

PRO
Positions, occupation of, 344
,, of generals in action, 140
,, military consideration in selecting, 340
,, troops to extent of, 340
,, reconnaissance of, 289, 385
,, sanitary considerations in selecting, 228
,, the keys of, 348
,, ,, where to be sought for, 348
Posts, defence of, 281, 287
Post-office, 155
Potatoes, bushel of, 77
Powder barrel, 96
,, contained in sandbag, 487
,, gun, 96, 287
,, hose, rate of burning, 487
,, magazines, 430
,, *versus* guncotton, 480
Power, animal, 491
,, horse, 491
Practice in marching, 257
,, measuring distances, 13, 476
Praise, bestowal of, 2, 6, 389
Precautions against grass fires, 397
,, in selecting sites for encampments, 228
,, night surprises, 278
,, sanitary n the Terai, 321
Printing-press waggon, 47, 128
,, of names and places, 133
Prismatic compass, measurements by, 475, 492
,, ,, use of, 475, 492
Prisons at sea, 189
Prisoners, care of, 139, 161
,, escorts for, 139
,, interrogating, 161, 290
,, officers made, 137
Prize-money, 158
Proceedings of courts martial, 164
Proclamation, 443
Profile of works, 482
Projectiles, artillery, 38, 42
Proper names to be printed, 133
Prophylactic against fever, 266, 321
Proportion between the three arms, 178
,, of batteries to divisions, 175

PRO

Proportion of doctors to sick, 113
,, gunners to guns, 198
,, guns to men, 178
,, men to enceinte, 288, 482
,, ,, fires at night, 255
,, ,, yards, 367, 387
,, ,, ,, in positions, 288, 341
,, reserve to garrison, 384
,, shoeing smiths to horses, 117
,, veterinary surgeons to horses, 117
Protection against grass fires, 397
,, ,, night surprises, 278
,, of bridges, 421
,, railroads, 443
Provisions, bulk of, 83
,, conveyance of, by sea, 184
,, for transports, 186
,, how packed, 79, 82
,, rations of, 85
Provost-marshal, 163
Prussic acid, poisoning from, 268
Puddings, to make, 260, 261, 262
Pukals, 402
Pulse, rate of, 492
Pumps, at sea, 188
,, Bastier, 244
,, field, 244
,, for floating bridges, 408
,, Norton's tube, 244
Punishment, 5
,, in the field, 169
Purification of water, 243, 244
Pursuits, 335
,, use of cavalry in, 335

QUALIFICATIONS for command, 119, 362
,, ,, staff officers, 120
Quarter and grand guards, 247
Quarters of generals in billets, 252
Quartermaster-General, 125, 131
,, ,, duties when encamped, 230
Questioning prisoners, 279, 290, 293

RAT

Questioning the inhabitants, 293
Quicksands, 298
Quick time, rate of, 311
Quinine, as a ration, 266, 321

RACKS, arm, 232, 245
,, ,, at sea, 187
,, sea-kit, 187
Rafts, 410, 411
,, to find floating power of, 411
Rail, stores brought by, 465
Railroads, 295, 441
,, capacity of carriages on, 451, 452
,, destruction of, 444
,, moving troops by, 449, 452, 461
,, protection of, 443
,, reconnaissance of, 295
,, repair of, 448
,, rolling stock required for, 450
,, working of, 441
Rails, to twist, 445
,, to unbend, 448
,, weight of, 446
Railway station, march to, 453
,, to render temporarily useless, 447
Rammers, 483
Ramps, 405
Range of guns, 38
,, ,, effective, 374
,, finders, 475
,, mortars, 41
,, rifle muskets, 25, 371
Rapidity of artillery fire, 40, 44
Rations, 74, 85, 263
,, care of by soldiers on service, 86
,, for Indian troops, 86, 205
,, of coal, 87
,, coolie, 86
,, for transport animals, 74
,, ,, lights, 87
,, native soldiers, 85, 205
,, ,, followers, 206
,, at sea, 202, 205
,, of oil, 87
,, returns, 207, 221
,, scale of substitutes for, 203
,, of soldiers on service, 85

RAT
Rations, table giving bulk of, 83
,, of water, 203
,, wick, 87
,, wood, 86
Reaping-hook, weight of, 90
Rear guards, 247, 329
,, ,, distance from main body, 333
Receipts for cooking, 259
Reconnaissances, 289, 291
,, by cavalry officers, 300
,, minor, 301
,, of bridges, 296
,, encamping ground, 229
,, places, 385
,, positions, 289, 385
,, reports of, 301
Redoubts, construction of, 288, 483
Refuse holes, 240
Regimental entrenching tools, 25
,, reserve ammunition, 26, 93, 94
,, transport, 32
,, repairs to waggons, &c., 72
,, shoeing of, animals, 66, 67
Regiments, distribution of in divisions, 174
Registry of correspondence, 129
,, strangers in camp, 168, 169
Reinforcements, demand for, in action, 351
Relief of outposts, 282
Remounts, demands for, 154
,, depôts, 152
Repair of railways, 448
,, roads, 440
Report of inspection of troopships, 207, 209
Reports and orders, wording of, 126, 133
,, on camping-ground, 229
Requisition for rations, 150
,, stores, 150
,, on inhabitants, 143, 150
Reserves, 45
,, ammunition, 94
,, employment of, 351
,, for outposts, 276
,, necessity of, in bush fighting, 400

ROA
Reserves, necessity of, in cavalry action, 362
,, in assaults, 358, 388
,, sieges, 384
,, position of, 348
,, regimental, of S. A. A., 26
,, strength of, 350, 370
Residences of gentry, reconnaissance of, 298
Retaining walls, 438
Reticence, importance of, 127
Retreat, rear guard in a, 331
Retreats, 337
,, arrangements to be made for, 339
,, necessity of a good staff during, 340
,, of a beaten army, 333
,, through defiles, 333
Returns, complicated, 128
,, disembarkation, 221, 227
,, embarkation, 216
,, for captains of ships, 210
,, ration, 207, 221
Reveillée, hour for, 217
Revêtements, 438, 484
Revolver, ammunition for, 97
,, as an arm for cavalry, 15
,, ,, drivers, 51
,, ,, infantry, 402
,, weight of, 14
Rewards, 6
Rheumatism, 266
Ribands in bridging, 404
Rice pudding, to make, 262
Rifle, ammunition, 25
,, foreign, 25
,, penetration of bullet, 25
,, range of, 25, 371
,, stowing of, at sea, 213
,, weight, &c., of, 14, 25, 46
River, to pass line across, 419
Rivers, defence of, 380
,, passage of, 377
,, reconnaissance of, 296
,, velocity of, 297
,, width of, to measure, 492
Roads, construction of, 434
,, corduroy, 438

ROA
Roads, length of columns on, 315
,, metalling, 437
,, over swamps, 439
,, plank, 439
,, rail, 441
,, reconnaissance on, 295
,, repair of, 435, 440
,, reports, 480
,, stone for, 437
Roasting, 259
Rockets, 40
,, in bush fighting, 400
,, signal, 41, 469
Rolling-stock, destruction of, 447
,, railway, 450
,, required, 450
,, table of, 450
,, weight of, 451
Roofs for huts, 249
,, pitch of, 250
Ropes, picketing, 90
,, strength and weight of, 420
Rot in sheep, 80
Rounds carried by batteries, 39, 97
,, ,, cavalry, 16
,, ,, infantry, 30
,, expended in action, 94
,, per gun in fortresses, 96
Routine on board ships, daily, 217
,, in camps, daily, 246
Rubbish, disposal of, 246
Rum, 402
,, bulk of, 83
,, ration of, 85
Rumours, spreading false, 127
Ruses, 226, 468

SA. A. boxes, 97
,, carts, 97
,, load of for animals, 97
,, Martini Henry, 25, 94
,, number of rounds for cavalry, 16
,, ,, ,, infantry, 30
,, Sneider, 25
,, waggon, 93, 94
Sabugal, affair of, 135
Sack, cavalry corn, weight of, 90

SEN
Saddles, camel, 71
,, in boat bridges, 406
,, weight of, 17
,, pack, 70
Saleetahs, 69, 70, 71
Salt, 205
,, inspection of, 83
,, meat, 80, 264
,, ,, ration of, 85
,, ,, to cook, 260
,, ration of, 85
Sandbags, quantity of earth will hold, 484
,, quantity of powder will hold, 487
,, size, &c., of, 484
Sanitary arrangements in camp, 241
,, considerations for camps, 228
,, precautions in the Terai, 321
Sappers and miners, 51
Sardinian huts, 249
Savage treachery, 392, 397
,, warfare, 396
Scalds and burns, 266
Scale of medical comforts at sea, 204
,, rations, 202
,, substitutes in rations at sea, 203
,, shade, 478
Scales, foreign map, 479, 480
,, for plans of positions, 475
,, surveys, 475
Science, military, use of, 118
Scorpion bites, 268
Scouting, 299
Sea-bags, stowing of, 213
,, kits, 211
,, rations at, 202
,, transport, 179
Secretary of State for War, 129
,, military, 125, 131
Secret correspondence, to conduct, 162, 473
,, signals, 468
Security of prisoners, 139
Selection of sites for camps or bivouac, 227
,, staff officers, 119
,, troops for work, 280, 398,
Sentences of courts martial, 166
Sentries and vedettes, 256, 278
,, boxes, or shades, 246
,, connecting, 280

SEN
Sentries, dress of, at sieges, 392
Shade, scale of, 478
Sheep rot, to discover, 80
,, weight of, 80
Sheets, waterproof, 90
Shells, 39, 96
,, double and star, 96
,, fuzes, 40
,, penetration of, 40
,, shrapnell, 97
Shelter trenches, 358, 367
Ship of war at B. of O., 147
Ships, carrying capacity of, 186
,, fitting up horse stalls in, 196
,, hospital, 107, 180
,, to find tonnage of, 414
Ship's stores for officers, 186
Shoeing of chargers, 118
,, horses, 117
,, regimental animals, 118
,, smiths, proportion to horses, 117
,, weight of tools, 117
Shoes, horse, weight of, 67
Shooting theories, fallacy of, 361
Shovels, number of, allowed, 29, 32, 33
,, weight of, 90
Shrapnell, 97
Sick, conveyance of, 108, 113
,, evacuation of, 104
,, horses, 65
,, number of, to be calculated for, 110
,, on board ship, 225
,, proportion of, to doctors, 113
Sickle, weight of, 90
Sieges, 384, 390
,, duties of staff at, 385, 386
Siege trains, 41, 389
Signal alphabet, 471
,, book to be kept secret, 471
,, ,, Army and Navy, 471, 472
,, flags, 469
,, rockets, 41, 463
Signalling, 468
,, to outposts, 231, 277
,, without apparatus, 470
Sines, table of, 495
Sites for camps, selecting, 227, 228
,, bivouacking, selecting, 227, 228
Skeleton sketches, 477

SPH
Sketch-book, block, 475, 476
Sketching ground, 475, 477
Skids to be provided, 456
Skirmishing, 364, 371
,, order, attacks in, 355, 369
Slabs, guncotton, 486
Sleeping on piquet, 282
,, places, 254
Slings, horse, 198, 220
,, for frame bridges, single and treble, 426
Slinging horses, 114
Slope of ramps, 405
,, influence of, on manœuvres, 341
Slow match, rate of burning, 486
Small arm ammunition, 94
Smiths' tools, 117
Snake bites, 268
Sneider rifle, 25
,, ammunition, 25
Soap, 8
,, marine, 15
,, soft, to make, 15
Socks, examination of, 320
Soft soap, 15
Soldier, weight carried by, 30
,, treatment of the, 4
Sore feet, 267
Sorties, 391
Sound, velocity of, 491
Soup, 259
South Africa, transport of troops to, 181
Space for troops in action, 341
,, ,, on the march, 324
,, cubic, in barracks, 251
,, ,, billets, 251
,, ,, cabins at sea, 186
,, ,, huts, 249, 251
,, ,, stables, 251
Spades, allowance of, 29, 32, 33
,, weight of, 90
Spare stalls, proportion of, 192, 193
Spars, lashing of, 430
Special correspondents, 163, 171, 337
Specie, care of, 116
Specific gravity of timber, 416
Speed of military trains, 450
Spelling names of places, 133
Spheres, properties of, 490

SPI
Spies, 144, 160, 162, 171, 279
Spikes, iron, 439
Spirits, issue of, 263
Sprains, to treat, 66
Squares, infantry, 372
Stables, cubic space in, 251
,, duties at sea, 220
,, hut, 250
,, size of stalls in, 187, 193, 251
Staff, the, 118
,, chief of, 131
,, college, 119
,, French, 120
,, for divisions, &c., 122
,, officers, duties of, 124
,, ,, ,, after an action, 138
,, ,, ,, at sieges, 385, 386
,, ,, ,, in action, 134
,, ,, ,, on the march, 319
,, ,, kit, 12
,, ,, made prisoners, 137
,, ,, selection of, 119
,, sergeants, baggage of, 90, 325
Stalls, size of, 187, 193, 251
,, ,, at sea, 193
,, spare, at sea, 193
Star shells, 96
Starting for a march, hour of, 318
Station commandant, 148
,, ,, on railways, 464, 465
Steamers as transports, 180
Steam launches, 185
,, sapper, 58
Step ladders, 189
Stew, Irish, 259
Stockades, demolition of, 489
Stone, broken, size of, 437
,, for roads, 437
Storage accommodation, division of, 148
Storehouses, 148, 151, 465
Stores, 149
,, brought by rail, 465
,, deficiency of, 221
,, demands for, 87
,, department, 143
,, disembarkation of, 146, 221
,, embarkation of, 146, 456
,, for ships, 186, 187, 190
,, lost, 221
SWO
Stores, medical, 113
,, supplied by shipowners, 186
Storming party, 388
Stragglers, punishment of, 170, 325
Straggling, 170, 325
Straightening rails, 448
Strangers in camps, 151
Stratagems of savage races, 392, 397
Straw, 76, 239
,, for bedding, 87
,, mats, 239
Streams, reconnaissance of, 296
Street fighting, 395
Strength of ropes, 420
Stretcher, temporary, to construct, 265
,, weight, &c., of, 114
Striking tents, 237
Strychnine, poisoning by, 268
Subaltern of the day, duties of, 247
Substitutes for anchors, 479
,, scale of, at sea, 203
Sugar, inspection of, 83
,, rations of, 85
Sulphuric acid, for fumigation, 204
,, poisoning by, 267
Summary court-martial, 164
Sunstroke, to treat, 267
Superstructure of bridges, 404, 409
,, ,, of casks, 413
Supplies, collection, in fortresses, 390, 391
,, of ammunition, 39, 93
,, of food, 74, 78
,, of horses, 152
,, of money, 116
,, requisition for, 150
Supply company, establishment of, 52
,, trains on the march, 72
Supports, demand for, in action, 351
Surgeons, proportion of, to sick, 113
,, vety. ,, to horses, 117
Surgical and medical hints, 264
Surprises, night, 278
Surveying, 474
,, instruments, 475
Surveys, military, 474
Swamps, roads over, 439
Swimming horses, 227, 379
Sword, cavalry, 14
,, infantry officer's, 12

SWO
Sword, uselessness of, for R.A., 40
Syces, establishment of, 23
Symbols for spies, 161

TABLE LINEN at sea, 186
Tangents, table of, 495
Tanks, water, at sea, 188
Tapping telegraph wires, 160, 468
Tattoo, hour for, 217
Tea, advantages of, 402
,, inspection of, 83
,, to make, 261
Teams, length of, 64
Telegraph, construction of, 467
,, destruction of, 461
,, equipment, 50
,, poles, 467
,, ,, number of per mile, 467
,, reports on, 294
,, troop, establishment of, 50
,, use of the, 162
,, ,, on the march, 318
,, wire, weight, &c., of, 467
,, ,, quantity required of, 467
,, wires, tapping, 160, 468
Temperance, benefits from, 263, 402
,, men at sea, 202
Tenders, engine, to destroy, 447
Tents, art of pitching, 239
,, circular, 89, 239
,, d'abri, 89, 239, 282
,, digging-out, 239
,, drainage of, 236
,, in Bengal, 89
,, in Bombay, 90
,, issue of, 89
,, operating, 100, 114
,, pitching, 235
,, striking, 237
,, unportable in modern wars, 253, 305
,, ventilation of, 237
,, wet, weight of, 90
Terai, sanitary precautions in the, 321
Theatre of war, knowledge of, 7, 248
Thermometers, 493
Tickets of residence for followers, 168

TRA
Timber, specific gravity of, 416
,, to find cubic contents of, 416
Time required for parades, 312
Tires of carts and waggons, 56
Tobacco, 86
Ton, cubic feet in, 207
Tonnage hired to send troops to Cyprus, 181
,, hired to send troops to South Africa, 181
,, hired to send troops to The Transvaal, 181
,, of baggage, measurement for, 184, 207
,, of boats and ships, to find, 414
,, required for troops, 180, 182
,, ,, stores, 184
Tools, carpenter's, weight of, 90
,, collar maker's, weight of, 117
,, entrenching, for infantry, 25
,, smith's, weight of, 117
,, wheeler's, weight of, 117
Topographical department, 126
,, knowledge, advantage of, 475
Torpedoes, 487
"Touch," the, importance of, 305, 335
Tourinquet, substitutes for, 265
Towns, accommodation in, 251
,, billeting in, 251
,, fighting in, 395
,, occupation of, 390
,, reconnaissance of, 294, 385
Traces, weight of, 55
Track of R.A. waggons, &c., width of, 40
Traction engine, 58
,, coal and water consumed by, 58
Train to camp, march from, 466
Trains, journey of troops by, 463
,, length of march for, 315
,, on the line of march, position of, 315, 317, 325
,, rate of march of, 312
,, number of carriages in, 450, 461
,, rate at which railway, can be despatched, 450
Tramways, wooden, 440
Transport animals, 65

TRA
Transport animals, allowance in India, 73
,, ,, care of, 73
,, ,, depôts of, 152
,, ,, equipment gear, 70
,, ,, on the march, 72
,, ,, shoeing, 66, 67, 117
,, by rail, 465
,, cavalry regimental, 19
,, company, establishment of, 52
,, coolies, 63
,, for bearer company, 100
,, general, 62
,, infantry regimental, 31
,, land, 54, 59
,, ,, embarkation of, 215
,, ,, length of march for, 315
,, of sick and wounded, 108, 113
,, ,, ,, by sea, 190
,, of stores, 54, 59
,, ,, by sea, 180
,, organisation of, 72
,, regimental, 32, 59, 94
,, sea, 79
,, two-wheeled, 58
Transports, fitting up of, 186, 187, 190
,, numbering of, 185
,, report on, 207, 209
,, Royal Navy, capacity of, 183
Transoms of bridges, 406
Transvaal, transport of troops to the, 181
Travelling gentlemen in camp, 170
Treasure, conveyance of, 116
Treatment of soldiers, 4
Trees, necessity of knowing names of, 298
,, specific gravity of, 416
,, to destroy, 488
Trenches, conservancy of, 386
,, opening, 386
,, reserves in the, 388
,, shelter, 358, 367
,, staff duties in the, 385
Trestles, 421
Triangles, properties of, 490
Triangulation, surveying by, 477
Troopships, inspection of, 206
,, H.M.'s, carrying capacity of, 183

VER
Troopships, numbering of, 185
Troops at sea, fittings required for, 187
,, before embarkation, inspection of, 211
,, decks, stores for, 190, 191
,, disembarking from trains, 465
,, during voyage, 216
,, entraining of, 458
,, feeding, when moving by rail, 463
,, guarding L. of C., 156
,, in action, space required by, 341
,, in positions, distribution of, 342
,, marching to attack, 352
,, moving by rail, 449
,, number in railway carriages, 451
,, number of carriages required for conveyance of, by rail, 461
,, number of, for positions, 341
,, routine of at sea, 217
,, space covered by, marching, 324
Tropics, marching in the, 322
Trot, pace of the, 65
Troughs for watering horses, 243, 244
Truce, flag of, 279, 284

UNHEALTHY districts, marching in, 321
Urinals at sea, 187
Useful formulæ, 489
,, weights and measures, 494

VALISE, bed, for officers, 10
,, infantry, weight of, 9, 13
,, stowing of, at sea, 187, 213
Variation of compass, 479
Vedettes on outposts, 273, 283
Vegetables, to cook, 260
,, ration of, 85
Velocity of falling bodies, 491
,, rivers, 297
,, sound, 491
Ventilation of huts, 249
,, ships, 189
,, tents, 237
Verbal orders, delivery of, 133

VET

Veterinary arrangements for L. of C. 152
,, chests, 117
,, department, 116
,, dispensary at sea, 193
,, hints, 66
,, surgeons, proportion of, 117
Victoria Cross, bestowal of, 6
Victualling troops at sea, 202
,, natives at sea, 205
Villages, accommodation in, 251, 294
,, attack of, 357
,, defence of, 349
,, entrenching of, 349
,, included in positions, 349
,, in rear of positions, 349
,, reconnaissance of, 294
,, to be burnt in retreats, 239
Vinegar for horses at sea, 201
Vision, powers of, 280
Vitriol, poisoning from, 267
Volunteering for dangerous services, 5
Voyage, troops during, 216

WAGGON ambulance, weight of, 113
American, 57
,, ammunition, 93
,, bakery, 79
,, bullock, 57
,, carrying capacity of, 451
,, embarkation of, 215
,, gun, 39, 41
,, ,, ammunition in, 39, 41
,, ,, weight of, 56
,, pontoon, 406
,, S.A.A. rounds in, 26
,, space occupied by, 324
,, table of, 56
,, track of, 40, 56
Walls, retaining, 438
,, to destroy, 489
Wars against savage nations, 396
,, small, 400
Washing clothes, 242, 257
,, the body, 242, 257
,, places, 242
,, ,, at sea, stores for, 191
Wasp bites, 268

WHE

Water, 203
,, amount of, required, 84, 87
,, barrels, 244
,, bottle for officers, 9
,, ,, soldiers, 9
,, bottles to be filled, 264 322
,, ,, weight of, 9
,, closets at sea, 186
,, consumed by locomotives, 464
,, ,, steam sappers, 58
,, cubic foot of, 491
,, depth of, for ironclads, 223
,, effects of bad, 264
,, filters, 243
,, inspection of, 84
,, parties in camp, 247
,, physical properties of, 491
,, purification of, 84, 243
,, ration of, at sea, 188
,, ,, for animals at sea, 201
,, ,, asses, 75
,, ,, camels, 76
,, ,, elephants, 76
,, ,, horses, 75
,, ,, men, 84
,, ,, mules, 75
,, ,, oxen, 75
,, tanks and pumps at sea, 188
,, troughs, 243, 244
Watering of animals, 74, 243
,, places, 242
,, ,, inspection of, 243
,, troughs, 242, 243
Waterproof composition, 411
,, sheets, 90
Wattle and daub houses, 249
Weather, 269
,, presages, 270
Wedges, properties of, 491
Weight, dead, 406
,, of timber, 416
Weights and measures, 494
,, ,, foreign, 495, 496
Wharfage, distribution of, 148
Wharves of cribwork, 426
,, numbering of, 212
Wheat, crop per acre, 77
,, loss in grinding, 81
,, weight per bushel, 77

WHE
Wheeler's tools, 117
Wheels, size of, 40, 56, 58
,, track of, 40
,, weight of, 56, 57, 58
Whitewash brushes at sea, 189
Wick, ration of, 87
Width of gates for artillery, 40
,, rivers, to measure, 492
Windsails at sea, 189
Wines, light, 263
Wire entanglements, 485
,, fences, 485
,, sizes of, 467, 485
,, telegraph, weight of, 467
Wood, ration of, 86
Wooden bridges, destruction of, 487

WRI
Wooden tramways, 440
Woods, reconnaissance of, 228
Wording of orders and reports, 133
Working parties, 387, 485
,, ,, officers with, 256
,, ,, of railroads, 441
,, ,, telling off, 386
Wounded, evacuation of, 107
" proportion to be provided for, 101, 111
" ,, of to killed, 112
,, transport of, 108
Wounds, bleeding from, 264
Wrench, substitute for a, 445
Writing names in printed characters, 133

LONDON :
PRINTED BY WILLIAM CLOWES AND SONS, LIMITED,
STAMFORD STREET AND CHARING CROSS.