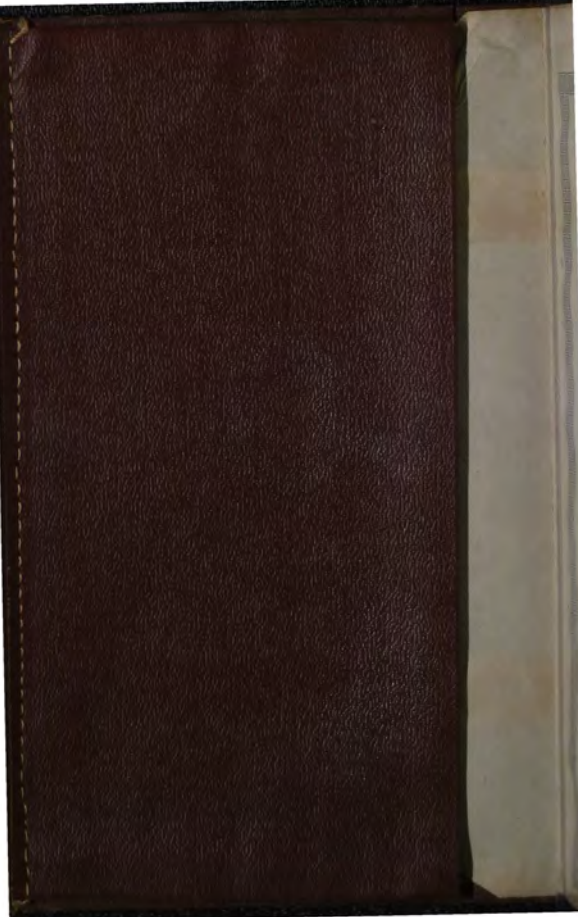


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By Command of the Army Council,

H. J. Creedy

THE WAR OFFICE,
30th April, 1932.

NOTES

1. THIS BOOK IS INTENDED TO BE A HANDY AND CONCISE REFERENCE FOR THE USE OF OFFICERS ON ACTIVE SERVICE AND AT MANŒUVRES AND ON INSTRUCTIONAL EXERCISES IN CONNECTION WITH OPERATIONS.
2. IT IS BASED ON THE OFFICIAL TRAINING MANUALS AND OTHER PUBLICATIONS, BUT WILL NOT BE QUOTED AS AN AUTHORITY IN OFFICIAL CORRESPONDENCE EXCEPT AS REGARDS APPENDIX I, ABBREVIATIONS, ETC.
3. THE BOOK IS NOT TO BE UTILIZED AS A TEXT BOOK FOR THE STUDY OF MILITARY SUBJECTS.
4. OFFICERS ARE EXPECTED TO KEEP THIS BOOK UP TO DATE IN ACCORDANCE WITH ANY CHANGES WHICH MAY APPEAR IN ARMY ORDERS AND OTHER OFFICIAL PUBLICATIONS.

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DEFINITIONS

(For special definitions of terms used in Combined Operations, *see* p. xi.)

ACCOUTREMENTS comprise belts, pouches, bandoliers, slings, packs, mess tins, haversacks, water-bottles and similar articles (other than arms) carried outside the clothing.

ADMINISTRATION. That function of command which deals with the maintenance of the forces in the field, divided into :—

i. *General administration.*—Controlled by the headquarters of the forces in the field.

ii. *Local administration*.—Controlled by the local commander.

ADVANCED BASE. A locality in which are situated the advanced depots of ammunition, supplies, animals and materials.

ALIGNMENT. Any straight line on which a body of troops is formed or is to form.

AREA. A locality or district organized under one authority for purposes of local administration.

ARM. A branch of the army whose primary duty is to fight.

BASE. A sub-area organized to include two or more depots of men, animals or material.

BASIN. i. A small area of level ground surrounded (or nearly so) by hills :

- ii. a district drained by a river and its tributaries.

BAY. The portion of a bridge between adjacent supports.

BEARING. True bearing is the angle a line makes with the true north line. Magnetic (or grid) bearing is the angle a line makes with the magnetic (or grid) north line. In each case the angle is measured from North by East and South.

BENCH MARK. A mark cut by surveyors on a stone or permanent structure to indicate that a level has been accurately fixed by instruments.

BERM. The distance between the edge of an excavation and the parapet formed of the excavated earth in a defence work.

BIGHT. The portion of a rope used double when the ends are not available.

BIVOUAC. An encampment without tents or huts.

CALIBRE. The diameter of the bore of a gun in inches, excluding the depth of the grooves.

CAMOUFLAGAGE. An artificial means employed to deceive the enemy's visual or photographic observation from the ground or from the air.

COL. A depression between two adjacent hills; a break in a ridge; the neck of land connecting an outlying feature with the main range.

COLUMN. Bodies of troops formed one in rear of another.

COMMUNICATIONS. Roads, railways, inland waterways, air routes or any other facility in a theatre of operations suitable as a route for the movement of men, animals or material.

CONTOUR. A contour is the representation on a map of an imaginary line running along the surface of the ground at the same height above mean sea level throughout its length.

COVERING FIRE. Fire by one unit or arm to engage the enemy's attention and force him to seek cover in order that another unit or arm may advance or retire.

CREST (Topo.). The edge of the top of a hill or mountain; the position at which a gentle slope changes to an abrupt one; also the highest point of a parapet.

DEFILE. A portion of the route which troops can only traverse on a narrow front, e.g. a mountain pass, a bridge, an embankment.

DELIVERY POINT. The point of transfer of loads to first line transport.

DEPLOY. To extend a unit or formation into a more open formation.

DEPOT. An installation in which personnel, animals or material are held.

DEPTH. The space occupied by a body of troops from front to rear.

DERRICK. A single spar held by four guys, used for lifting or moving weights.

DISTANCE. The space between men or bodies of troops from front to rear.

DUMP. A collection of material accumulated temporarily for some special purpose.

ECHELON. A formation of successive and parallel units facing in the same direction, each on a flank and to the rear of the unit in front of it.

ENFILADE FIRE. Fire which rakes the greatest length of a position or body of troops.

FIELD OF FIRE. The area of ground which any unit or weapon can sweep with fire.

FIGHTING TROOPS. Cavalry, artillery, engineers, signals, infantry and tank corps and any air force contingent co-operating.

FILE. A front rank man and his rear rank man.

FIRE, DIRECT LAYING. When the gun is laid by looking over or through the sights at the target.

FIRE, FRONTAL. Fire, the line of which is perpendicular to the front of the target.

FIRE, HIGH ANGLE. Fire from all guns and howitzers at all angles of elevation exceeding 25°.

FIRE, INDIRECT LAYING. When the gun is laid for direction on an aiming point or on aiming posts and elevation adjusted by sight clinometer.

FIRE, OBLIQUE. Fire, the line of which is inclined to the front of the target.

FIRE BAY. A length of trench from which it is intended to deliver rifle fire.

FORMATION. The smallest permanent formation is a cavalry or an infantry brigade, and the largest a division. Other formations are:—

i. The corps.

ii. The army.

FORWARD AMMUNITION POINT. The advanced point established by ammunition companies to facilitate supply of artillery ammunition to units.

FRONTAGE. The extent of ground covered laterally by a body of troops.

GORGE (Topo.). A rugged and deep ravine (Mil. Eng.)

GRADIENT. A slope represented by a fraction. $\frac{y}{x}$ represents a rise or fall of one unit measured vertically for every 30 units measured horizontally.

GUY. A rope fastened to the tip of a spar or frame, to support, raise or lower it.

GYN. A tripod with tackle, used for raising weights.

HEADQUARTERS. A unit, or part of a unit, upon the establishment of which is borne the commander, his staff and assistants of all ranks, escort, animals and transport.

HEAD OF SERVICE. The senior officer of a service in the theatre of operations.

HORIZONTAL EQUIVALENT. The distance in plan between two adjacent contours generally measured in yards.

HORSE-LENGTH. 8 feet.

HORSE-WIDTH. 3 feet, which includes 3 inches outside the rider's knee on either side.

IMPREST. An advance of public money for expenditure on the public service, e.g. payment of troops, local purchases, etc.

- INSTALLATION.** A locality organized for the specific purpose of a service.
- INTERCOMMUNICATION.** The means of transmission of all orders and information, by which the close co-operation of all forces in the field is ensured. The means include the service provided by the Royal Corps of Signals, by regimental signallers and orderlies, by liaison officers and by the postal service.
- INTERVAL.** The lateral space between men, units or corps measured from flank to flank.
- KNOLL.** A low detached hill.
- LINE(S) OF COMMUNICATION.** The system of communications in a theatre of operations between the bases inclusive and the rear limit of administration by formation commanders, along which the requirements of the field army are transported.
- L. OF C. UNITS.** Units allotted to the L. of C.
- MAINTENANCE.** The process of keeping the forces in the field complete in personnel, animals and material.
- MEETING POINT.** A place at which third or second line transport is met by guides and directed to delivery points.
- MOBILIZATION.** The process by which an armed force passes from a peace to a war footing. The mobilization, therefore, of a unit means its completion for war in men, horses and material.
- PACE.** The denomination of different degrees of speed; also a measure of distance (30 inches).
- PARK.** A unit holding a collection of spare war material, organized to facilitate rapid supply to troops.
- PATROL.** A small moving body of men, less than a troop and usually consisting of a N.C.O. and a few men, used for reconnoitring, protective and other purposes, such as visiting sentries, and connecting with other portions of our own troops.
Standing Patrol. A party of from two men to a troop, or even more, posted a considerable distance in advance of other troops, to watch either the enemy, a route by which he might advance or a locality in which he might concentrate unseen.
- PLATOON.** The quarter of an infantry company. Consists of four sections.
- PLOTTING.** The process of laying down on paper field observations and measurements.
- POSITION IN OBSERVATION** (artillery) implies batteries in action watching all ground in their field of fire and ready to open fire.
- POSITION IN READINESS** (artillery) implies batteries limbered up under cover with all possible alternative positions in the immediate neighbourhood reconnoitred and everything ready for their occupation.
- RAILHEAD.** The locality denoting the point of transshipment from railway to some other form of transport of personnel and stores sent forward from the L. of C. Railheads form part of the L. of C.
- RECONNAISSANCE.** Surveying and searching the country in order to discover and locate the enemy and to find out the lie of the land.
- RE-ENTRANT.** A valley or depression running into a main feature.
- REFILLING POINT.** In the case of material other than ammunition, the place where articles hitherto carried in bulk are reloaded in detail for units.
In the case of ammunition, the place where loads are transferred from third line to second line transport.
- REGULATING STATION.** The point on the line(s) of communication at which a transporting agency is given further directions as to destinations of transport.
- RELIEF.** The length of time that men have to work before being relieved, or a number of men who work, or are on duty, for a given length of time.
- RENDEZVOUS.** A place at which third line transport is met by guides and directed to refilling points.
- REPORT CENTRE.** A pre-arranged position to which reports intended for a commander must be sent.

REQUISITION. A mode of making inhabitants of a district contribute supplies, etc., to an army. Must be paid for (*see* page 180), but a Requisition Receipt Note implies no promise to pay.

SADDLE. *See* COL.

SANGAR. A parapet composed of dry built stone wall.

SCALE. The proportion which a distance between any two points on a map bears to the horizontal distance between the same points on the ground.

SECTION. Cavalry (and artillery). 4 front rank men with their coverers.

" Artillery. One of the divisions of a battery with its complement of men, horses and wagons.

" Engineers. The sub-division of a company.

" Infantry. The sub-division of a platoon.

" Tanks. 5 tanks. The sub-division of a company.

" Topography. The outline of the intersection of the surface of the ground by a vertical plane.

SERVICE. A branch of the army whose primary duty is to supply the fighting troops with what they require, or to perform some necessary service for them.

SHEERS. Two spars lashed together at the tip and raised to rest on their butts, which are separated. They are used to lift and move weights in one plane.

SPAN. The horizontal distance between the centres of any two supports of a bridge.

SPITLOCK. To mark out a line on the ground with the point of a pick-axe.

SPOIL. The material resulting from any excavations.

SPOT LEVEL. The record on a map of the exact height of a particular point.

SPUR (TOPOGRAPHICAL). A projection from the side of a hill or mountain running out from the main feature.

SQUAD. A small body of men formed for drill or for work.

STAFF, THE. Staff officers appointed to the General Staff, to the A.G.'s, Q.M.G.'s and M.G.O.'s branches of the staff, or as brigade-majors and staff captains, to assist certain commanders in the discharge of their duties.

STORES. Stores are war material other than supplies and are classified as Ordnance, Engineer, Transportation, R.A.S.C., Medical and Veterinary and Stationery Stores.

SUPPLIES. Food, forage, petrol, lubricants for mechanical transport vehicles, fuel, light, disinfectants and medical comforts.

TASK. The amount of work to be executed by a man, party or unit during a relief.

THEATRE OF OPERATIONS. The area within the command of a C.-in-C., as defined by His Majesty's Government.

TRACE. The outline of a work in plan.

TRANSPORT. The term *transport* is used in a general sense (i) to denote driver, animal, vehicle and such equipment (*e.g.* harness) as may be necessary to render the vehicle mobile, and (ii) to denote that portion of an organized unit, formation or service of which the primary duty is the transportation of personnel, animals or material.

Transport of formations and units is divided into :—

First line.—Unit transport.

Second line.—Transport normally working between R.Ps. and D.Ps.

Third line.—Transport normally working between railhead and R.Ps.

TROOP. A sub-division of a squadron, corresponding to a platoon in the infantry. Also used for certain units, *e.g.* field troop, signal troop.

UNIT. The smallest number of men, horses, vehicles, etc., all of the same arm, grouped together under one commander for both local administration and command, may be referred to as a unit. In cavalry, artillery and infantry, the smallest permanent unit is a squadron, battery or company. Other units are :—

Regiment of cavalry.

Brigade of artillery.

Battalion of infantry or tanks.

For statistical purposes the term "*Unit*" means any formed body of personnel having an authorized war establishment. The establishment need not be a fixed constant, but each component of it must be an authorized one.

Parent unit.—The unit to which an officer or a soldier belongs, *i.e.* to which he has been posted. Even though he may subsequently be attached to another unit, the unit to which he was originally posted remains the parent unit until he is *transferred and posted* to another unit, when the unit to which he is transferred becomes the parent unit.

VERTICAL INTERVAL. The difference of level between two adjacent contours usually expressed in feet.

WATERCOURSE. The line defining the lowest part of a valley, whether occupied by a stream or not.

WATERSHED. A ridge of high land separating two drainage basins; the summit of land from which water divides or flows in two directions. It does not necessarily include the highest points of a range.

X LIST is a list maintained for each corps on which all personnel of a corps, in a theatre of operations, are accounted for which are not serving with units of that corps.

DEFINITIONS OF TERMS FOR USE IN COMBINED OPERATIONS.

ADVANCED BASE. A base sufficiently close to the zone of operations to permit of supplies, etc., being sent direct from it to that zone. It may also be used for storing supplies, concentrating reinforcements and establishing hospitals, rest camps, etc.

BEACH. A beach is a portion of the coast on which a landing may take place. The main consideration in deciding the length of a beach will be the convenience of control by a beach master.

There may be any number of beaches in a sub-section.

COAST. The ordinarily accepted meaning of the word, *e.g.* the south coast of England.

COAST SECTION. A length of coast selected for reconnaissance will be divided, in the first place, into coast sections clearly defined by distinctive features, *e.g.* Beachy Head to Dungeness.

COAST SUB-SECTION. Each coast section will be sub-divided into clearly defined coast sub-sections. The length of a coast sub-section will depend on the ease with which the coast can be traversed, the importance from the point of view of the contemplated operation, etc. If the coast is easy to traverse, for instance, a coast sub-section may be as much as 10 or 12 miles. An important harbour will generally form a separate coast sub-section.

COVERING FORCE. The force which lands first to secure the *covering position*.

COVERING POSITION. A position to be occupied by the covering force, at such a distance from the landing-places as will reasonably ensure immunity from observed artillery fire upon landing-places and transports.

FIRST FLIGHT. Troops conveyed in the landing craft making the first trip to the beaches.

FLOATING RESERVE. That portion of the *covering force* retained in reserve, embarked in ships or landing craft and ready for immediate landing when and where required.

FORESHORE. That part of the beach which lies between high and low water marks.

FORMING-UP PLACE. A place of assembly for smaller units, clear of, but close to, the landing-place, to which troops proceed immediately they have landed.

LANDING-PLACES. Landing-places are the actual places selected for beaching craft or building piers.

RENDEZVOUS. The place of assembly for complete units, to which sub-units proceed from forming-up places.

ROUND TRIP. A trip which includes loading, travelling to destination, unloading and returning to the starting point.

SECTION. Beaches will be divided into sections suitable for control by assistant beach masters.

Tow. A number of boats or lighters secured to one another and towed by one steamboat or motor-boat.

TRIP. The passage of a *tow* from a ship to a landing-place. (*See also* ROUND TRIP.)

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CHAPTER I

ORGANIZATION

1. ESTABLISHMENTS OF UNITS

1. Information regarding the war establishments of units in personnel and animals is given in the War Establishment and Field Service Manual of the unit.

2. Details of war equipment of units, method of carriage and the authority for issue are shown in the following publications :—

- i. Unit equipment in the War Equipment Table of the unit (A.F. G 1098).
- ii. Personal equipment in the War Equipment Table (A.F. G 1098) and Field Service Manual of the unit.
- iii. Clothing and necessaries in Regulations for the Clothing of the Army and the Field Service Manual of the unit.
- iv. Supplies, forage and fuel in Regulations for Mobilization, Allowance Regulations and the Field Service Manual of the unit.
- v. Petrol in Regulations for Mobilization.
- vi. Lubricants in Regulations for Mobilization, and War Equipment Table of the unit (A.F. G 1098).
- vii. Medical equipment in Regulations for the Medical Services of the Army, and Field Service Manual for Army Medical Services.
- viii. Books, forms and stationery in Tables of Regulations, Army Books and Forms and Stationery (A.F. L 1398).

2. ORGANIZATION OF UNITS

The organization of units of fighting troops is as follows :—

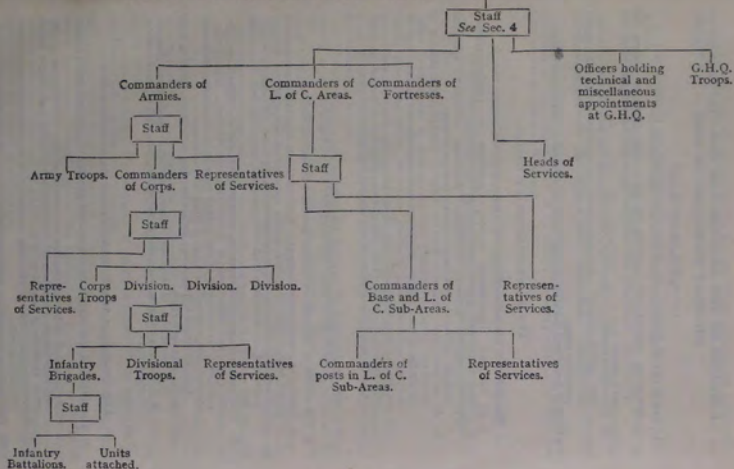
Arm 1	Units				Remarks 6
	Brigadier's Command 2	Lieut.-Col.'s Command 3	Major's or Capt.'s Command 4	Subaltern's Command 5	
Cavalry—	Brigade— Headquarters 3 regiments	Regiments— Headquarters 1 Machine gun troop *3 squadrons Cavalry Armoured Car Regiment— Headquarters 3 squadrons	Squadron— Headquarters 4 troops Squadron— Headquarters 2 sections	Troop— Section— 5 cars	* 3 sabre squadrons (1 M.G. with each troop).
Artillery— Horse	—	Brigade— Headquarters 3 batteries	Battery— Headquarters 3 sections	Section— 2 pieces	Light Artillery— 3 batteries a brigade
Field and Light	Divisional Artillery— Headquarters 4 brigades	Brigade— Headquarters 4 batteries	Battery— Headquarters 3 or 2 sections	Section— 2 pieces	
Medium	Corps Medium Artillery— Headquarters Medium brigades allotted to corps	Brigade— Headquarters 4 batteries	Battery— Headquarters 3 or 2 sections	Section— 2 pieces	
Heavy	—	Brigade— Headquarters 4 batteries	Battery— Headquarters 3 sections	Section— 2 pieces	
Super-heavy	—	—	Battery— Headquarters 2 or 1 section	Section— 1 piece	
Coast	—	Fire Commands— Headquarters Batteries as required	Battery— Headquarters Sections as required	Section— 2 pieces or 1 piece	
Anti-aircraft	—	Brigade— Headquarters 3 batteries	Battery— Headquarters 5 sections	Section— 2 pieces or 8 Lewis guns	

Engineers— Field	—	Divisional Engineers— Headquarters 3 field companies 1 field park com- pany	Field Company— Headquarters 4 sections Field Park Company.	Section.	
			Field Squadron— Headquarters H.Q. troop 3 field troops Bridging section	Troop.	
Non-divisional	—	—	Army Troops Company— Headquarters 4 sections	Section.	
			E and M Company— Headquarters 4 sections	Section.	
		Searchlight Battalion— Headquarters 4 companies	Company— Headquarters 4 sections	Section— 6 lights	
Signals—	—	G.H.Q. Signals Army Signals Corps Signals L. of C. Signals— Headquarters 4 or 3 companies Divisional Signals— Headquarters 3 companies	Company— Headquarters Sections variable	Section.	
			Company— Headquarters 3 or 4 sections	Section.	
			Cavalry Divi- sional Signals— Headquarters 7 troops	Troop.	

Arm 1	Units				Remarks 6
	Brigadier's Command 2	Lieut.-Col.'s Command 3	Major's or Capt.'s Command 4	Subaltern's Command 5	
Infantry—	Brigade— Headquarters 4 battalions	Battalion— Headquarters Headquarter wing *4 companies	Company— Headquarters 4 platoons	Platoon.	*3 rifle companies 1 M.G. company
Tanks—	—	Battalion— Headquarters 3 companies Radio-telephone Section.	Company— Headquarters 3 sections Section— 5 tanks		

3. SYSTEM OF COMMAND IN THE FIELD

C. in C.



4. DUTIES OF THE BRANCHES OF THE STAFF AND MILITARY SECRETARY IN WAR

THE GENERAL STAFF

1. The duties of the general staff branch in war include :—
 - i. *Operations sections*.—Preparation of plans and issue of orders for operations. Collection and distribution of information regarding our own forces.
 - ii. *Intelligence section*.—Collection, collation and dissemination of information about enemy. Arrangements to prevent enemy obtaining information. Deductions from information received of enemy's probable plans.
 - iii. *Staff duties and training section*.—Military training, war organization.

THE ADJUTANT-GENERAL'S BRANCH

2. The duties of the adjutant-general's branch in war include :—
 - i. *In the field. Organization section*.—Questions of reinforcements; medical service; graves registration; pay service.
 - Personal services section*.—Discipline; prisoners of war; spiritual welfare; philanthropic institutions; routine orders.
 - ii. *At the base (2nd echelon)*.—Routine work of strength and records of personnel of units, casualty returns, records of strengths of units, questions of man power, reinforcements, custody of effects of casualties, personal services, postings, transfers, promotion, pay, claims under the Pay Warrant. Detail of policy laid down in regulations or by C-in-C. at G.H.Q. Questions affecting prisoners of war. Custody and transmission of war diaries and other documents.

THE QUARTER-MASTER-GENERAL'S BRANCH

3. The duties of the quarter-master-general's branch in war include :—
 - i. *Under the heading of movement*.—Embarkations and landings (general staff responsible for policy in the presence of the enemy). Supervision of all systems of communication by road, rail, inland waterways and, by adequate staff arrangements, ensuring their maximum use.
 - ii. *Under the heading of maintenance*.—Supervision and co-ordination of the work of, and allocation of labour to, the services. Quartering; supplies; maintenance of the scale of reserve stocks except ordnance stores; employment of local civilian labour gangs.

Arrangements for messing, institutes, fire protection, bathing and postal arrangements.

The formation of engineer stores, remount and other depots, R.A.S.C. and engineer workshops, veterinary hospitals; the allocation of remounts.

THE BRANCH OF THE MASTER-GENERAL OF THE ORDNANCE

4. The duties of the branch of the master-general of the ordnance in war include :—
 - i. Supervision of ordnance service and maintenance of ordnance stores and workshops, including all mechanical vehicles and spare parts other than those required by R.A.S.C.
 - ii. Maintenance of scale of reserves of ammunition, explosives and other ordnance stores.
 - iii. Research in connection with ordnance stores, all mechanical vehicles and engineer and signal equipments.
 - iv. Salvage.
 - v. Baths, laundries, disinfectors and supply of clean clothing.

5. Below G.H.Q. the duties of the branch of the M.G.O. are undertaken by the Q.M.G.'s branch, while the A.G.'s and Q.M.G.'s branches are amalgamated in degrees varying with the formation.

THE MILITARY SECRETARY

6. The duties of the military secretary are to assist the C-in-C. They include :—

- i. Recommendations for temporary appointments and for the grant of acting and temporary rank.
- ii. Collecting information for submission to Army Council concerning permanent promotions.
- iii. Staff and extra-regimental appointments (in conjunction with general staff).

7. The duties of the military secretary are carried out by an assistant military secretary at the headquarters of an army; in lower formations they are carried out by the A.G.'s branch.

5. ORGANIZATION AND DUTIES OF THE SERVICES

1. The process of maintaining the forces in the field by the supply of all they require, other than personnel, is effected in the five stages given below :—

- i. Design, specification and initial inspection.
- ii. Provision.
- iii. Production.
- iv. Holding, repairs and local inspection.
- v. Distribution.

2. This process is greatly facilitated by the exercise of economy in the use of stores and by the recovery of abandoned and unserviceable stores with a view to their repair and reissue. Salvage must be regarded as an essential function of all troops.

3. The mechanism for supplying the force in the field with its daily requirements, other than personnel, but including unskilled labour, is furnished by the services in accordance with the distribution given below (arranged alphabetically).

i. *Canteen service.*—Provision of facilities for troops to purchase food, articles of kit, tobacco and other articles not provided free from army funds.

ii. *Chaplains service.*—Spiritual and moral welfare of all personnel in the field.

iii. *Engineer stores service.*—Provision, storage, maintenance and issue of engineer stores and operation of workshops in connection therewith.

iv. *Graves service.*—Burial of dead, registration of graves, provision of cemeteries, enquiries regarding dead and missing.

v. *Hirings service.*—All questions concerning the purchase, requisition and hire of billets, training grounds, buildings and lands and all claims in connection therewith, except such as may be dealt with by the claims commission, if one is established.

Where no hirings service is formed its duties will be carried out by the works service.

vi. *Labour service.*—The provision of unskilled labour for the forces in the field, especially for the other services.

Allocation of labour units.—If no labour service is formed the labour units will be controlled direct by the Q.M.G.'s branch.

vii. *Medical service.*—Care of the sick and wounded and their evacuation when necessary. Dental care of the soldier and provision and repair of artificial dentures. Administration of all medical units and advice as to their location. Application for, and provision of, specialized medical stores. Recommendations regarding all precautionary or remedial, medical and sanitary measures conducive to the prevention and mitigation of disease and the preservation of the health of the troops.

viii. *Ordnance service.*—Provision, storage, maintenance, issue and such inspection as is in the province of the D.O.S., of all stores and material including armament, ammunition, clothing, tanks, tracked and semi-tracked vehicles, and all M.T. vehicles other than those driven by R.A.S.C., but exclusive of supplies and specialized medical and veterinary stores and

appliances. Organization of store, ammunition and salvage depots in the theatre of operations. Responsibility for such ordnance stores as have been salvaged being reconditioned and utilized to the best advantage. Organization in the theatre of operations of laundries and repair workshops for the conditioning and reparation of all damaged or defective material.

Reception and disposal of captured arms, stores, material and trophies.

ix. *Pay service*.—Provision of funds. Issue of pay and allowances. Payment for services performed for the Army. Accounting for cash expenditure. Making of claims against individuals or others for repayment, securing punctual collection and accounting for cash receipts.

Central office for payment of requisitioning claims.

x. *Postal service*.—Arrangements with the civil postal authorities at home and in the theatre of war, excluding wireless telegraphs and telephones.

Transmission of letters and postal packets within the postal limit of weight. Carriage in the theatre of operations of traffic dealt with by the military forwarding organization.

Such other postal business as may be arranged.

xi. *Printing and stationery service*.—Letterpress printing, array forms, books and stationery, typewriting and duplicating machines. Distribution of general and army routine orders.

xii. *Provost service*.—Police matters. Executive control of road traffic. Military prisons and detention barracks.

xiii. *Remount service*.—Provision, training, distribution and general welfare of all descriptions of animals, including carrier pigeons and messenger dogs required for military purposes.

xiv. *Supplies and transport service*.—Provision and carriage of supplies of all kinds, i.e. food, forage, petrol, fuel, lubricants, light, disinfectants and medical comforts. Carriage of ammunition and ordnance stores in front of railhead. Provision, operation and maintenance and inspection of all mechanical transport vehicles driven by R.A.S.C. personnel. Replacement by complete turnouts of all first line horse transport.

xv. *Survey service*.—Trigonometrical, geological, and topographical field survey, and all work incidental thereto, including production, reproduction and supply of maps. Distribution of air photographs down to corps inclusive and to L. of C. areas.

xvi. *Transportation services*.—Executive action in connection with use of docks, railways and inland water transport, and control of the working of these services in all respects if required. Responsibility for the working of coastwise sea transport by small vessels. Subject to policy as laid down by D.Q.M.G., communications on technical and financial matters with civilian transportation agencies if friendly, and control of civilian transportation facilities in a hostile country.

xvii. *Veterinary service*.—Prevention of disease and care of sick and injured animals.

Organization of veterinary hospitals and convalescent depots.

Provision of specialized veterinary stores and appliances.

xviii. *Works service*.—Execution of all engineer work behind the areas of formations. This work includes:—

(a) The construction of buildings and installations, except when specialist engineer units are provided as part of another service for such work or when the work comes under the heading of "field engineering."

The term installations embraces store sheds, offices and workshop buildings, electric power stations, pumping stations with distributing mains, sanitary and fire protection systems, bakeries, laundries, baths and disinfecting stations, etc.

The machinery, except prime movers, for R.A.S.C., R.A.O.C., and transportation workshops, and for laundries, is supplied by the service responsible for operation.

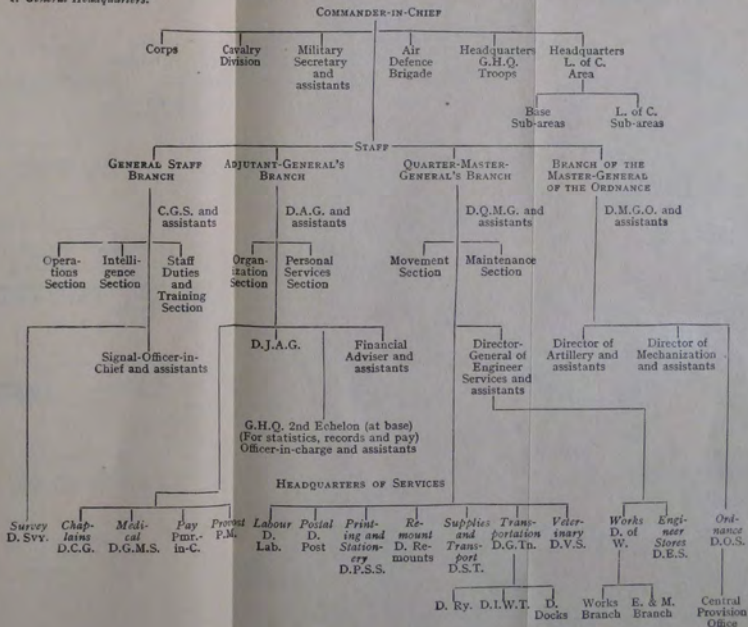
(b) Construction work necessary for the transportation service when the requisite transportation construction units are not provided.

(c) Construction of roads, bridges and cemeteries.

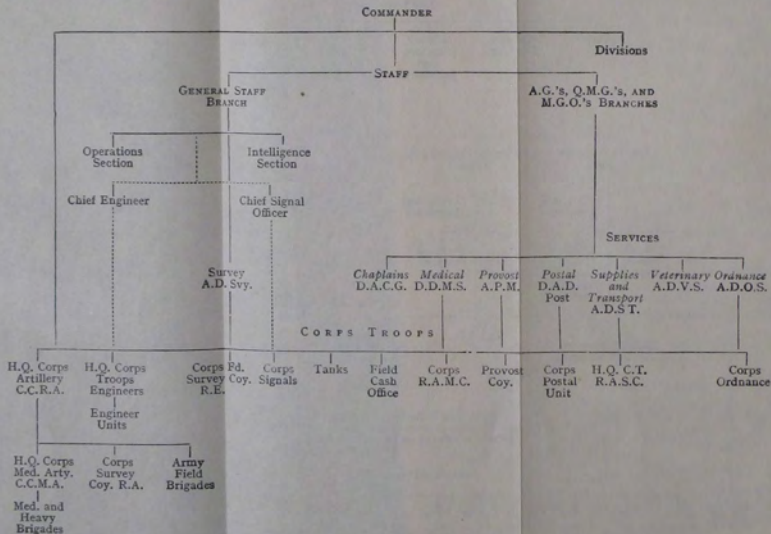
(d) Work of hirings service (see sub-para. v above) when no hirings service is established.

1. General Headquarters.

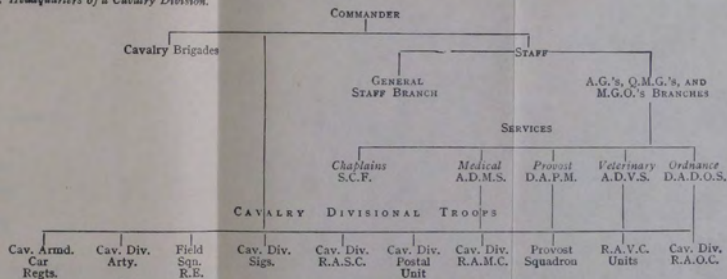
6. ORGANIZATION OF HEADQUARTERS



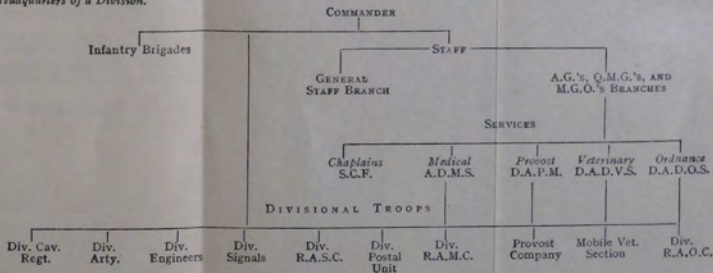
2. Headquarters of a Corps.

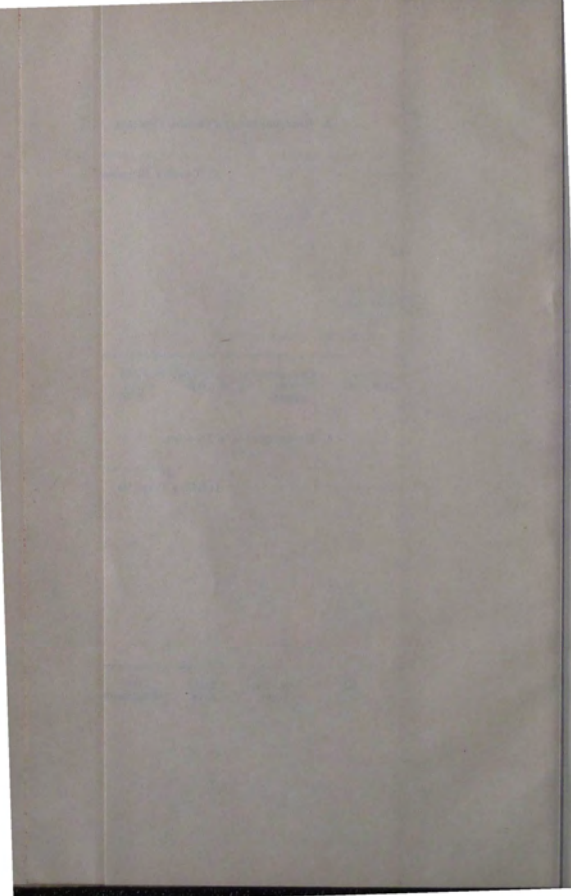


3. Headquarters of a Cavalry Division.



4. Headquarters of a Division.





4. It follows from the grouping of the duties of the services given in para 3, above, that the orders of the C.-in-C. will usually be communicated to the heads of services as follows :—

- i. *Through C.G.S.*
Royal Corps of Signals (*see footnote 1*).
Survey service.
- ii. *Through the D.A.G.*
Chaplains service.
Graves service.
Medical service.
Pay service.
Provost service.
- iii. *Through the D.Q.M.G.*
Canteen service (*see footnote 3*).
Engineer stores service (*see footnote 2*).
Hirings service.
Labour service.
Postal service.
Printing and stationery service.
Remount service.
Supplies and transport service.
Transportation services.
Veterinary service.
Works service (*see footnote 2*).
- iv. *Through the D.M.G.O.*
Ordnance service.

Notes.—1. The head of the Royal Corps of Signals in the field will be responsible to the C.G.S. for the efficient working of his service. He will be styled Signal-Officer-in-Chief or Chief Signal Officer according to the size of the forces in the field. He will receive instructions through the operations section of the general staff branch at G.H.Q. and, in subordinate commands, officers of the signal service will similarly receive their commander's instructions through the operations section.

The signal-officer-in-chief or chief signal officer, as the case may be, is also vested with the responsibilities and duties of a head of a service.

2. The D.G.E.S., assisted by the respective directors, will be responsible to the D.Q.M.G. for the operation of the engineer stores service and works service.

3. The D.S.T. will be responsible to the D.Q.M.G. for the supervision of the canteen service.

CHAPTER II

INFORMATION, RECONNAISSANCE AND MAP AND PHOTO READING

7. RECONNAISSANCE

(See F.S.R., Vol. II, 1929, Chap. V.)

1. Detailed and timely information about the enemy and the theatre of operations is a necessary factor of success in war.

Information is acquired principally by:—

- i. Air and ground reconnaissances.
- ii. Study of air photographs.
- iii. Examination of inhabitants, prisoners, deserters or papers.
- iv. The intelligent observation of all ranks.

The value of information depends on whether it can reach the authorities concerned in time to be of use.

2. The time and place of the receipt of information should always be noted, as well as the persons to whom it has been communicated, and the exact time when this was done. An officer taking or sending information to a headquarters must state to whom he has also communicated or is about to communicate it, the time of communication and the means employed. A subordinate commander to whom information is given should be informed as to the other commanders to whom similar intelligence has been given.

3. Information, whether positive or negative, acquired by direct contact with the enemy is that on which every commander mainly relies in making his tactical plans. Hence it is of supreme importance not only to establish contact from the earliest possible moment, but also to maintain it at all costs throughout operations. Once discovered the enemy must be kept under such close and continuous observation that he can make no movement without being detected. The achievement of this purpose is the primary object of all reconnaissance, whether on the ground or from the air.

4. The maintenance of contact aims not only at the acquisition of information about the enemy, but also at the interchange of information regarding the situation as a whole, including the progress of our own troops. The latter must not, therefore, merely keep touch with, and report on, the hostile forces, but must similarly keep touch with, and report on, their own neighbouring forces.

5. Reconnaissance is the service of obtaining information with regard to:—

- i. Topographical features and resources of a country.
 - ii. Movements and dispositions of an enemy.
- In the latter case it may be strategic or tactical.

Strategic reconnaissance is required before the opposing armies are within striking distance, to locate hostile columns and ascertain their strength and direction of march. Information of a strategic nature is constantly required during the course of a campaign, and will be chiefly obtained by air reconnaissance.

Tactical reconnaissance is required when two forces are within striking distance, to discover the tactical dispositions of the opposing force.

6. The principal means at the disposal of a commander for obtaining information about the enemy will be air and ground reconnaissance. The information obtained from the air must be confirmed and supplemented by ground reconnaissance; for this purpose cavalry or troops pushed forward in motor vehicles will be used so long as the enemy is at a distance. When opposing forces are closely engaged, dismounted troops will generally be employed for frontal reconnaissance, but mobile troops will still be of value on the flanks.

7. While the advanced troops are engaged with the enemy, information may also be obtained by:—

- i. Personal observation on the part of a commander and his staff.
- ii. Officers' patrols or scouts.
- iii. Unit intelligence sections.
- iv. Aircraft.

8. In modern warfare the quest for information is not the exclusive privilege of any particular arm or body of specialists; individuals and units of all arms and services are equally responsible. Their opportunities for acquiring information will naturally vary, but powers of observation should be developed in all officers and men, who must be systematically taught how to look, what to look for, and how to report in unmistakable language on whatever they may have seen.

9. Information may be gained by personal observation of the enemy; questioning inhabitants, prisoners and others; reading signs, such as tracks, dust, fires, deserted camping-grounds, uniforms; or by taking letters and newspapers from post offices, telegrams and telegraph registers from telegraph offices, registers of despatches from railway stations, etc.

A scout and the personnel of intelligence sections should be proficient in:—

- i. Ability to find the way by day or night.
- ii. Use of eye, ear and ground.
- iii. Concealment.
- iv. Movement across country.
- v. Reporting.
- vi. Map reading and sketching.

10. In questioning prisoners or hostile inhabitants it is well to take them separately out of hearing of others, to let them suppose that a great deal more is known by the questioner about the enemy than possibly is the case, and that questions are being put merely with a view to seeing whether they are speaking the truth or not, the answers being known.

As a rule detailed examination will be carried out only by interrogators selected by the general staff for this duty, careful arrangements being made for these examinations to take place as soon as possible after the individual's capture. Preliminary examination by subordinate commanders on the spot will be limited to information of immediate importance to the unit.

11. People not accustomed to seeing large numbers of troops are very apt to exaggerate their strength.

If troops are moving along a road or defile, they may be timed while passing a certain point. For each minute the following numbers would approximately go past:—

Cavalry, in sections, at a walk	..	..	..	..	120
at a trot	..	..	..	..	240
Artillery guns or wagons, at a walk	..	..	..	..	5
at a trot	..	..	..	..	10
Infantry in fours	..	..	..	..	200

Information as to the uniforms of the enemy, number of regiment on the buttons or badges, etc., may be of great use.

12. The following signs should be noticed as affording information:—

- i. *Clouds of dust* show movements of troops, baggage, or cattle. Cavalry raise a high light cloud. Infantry and vehicles a lower denser cloud. Motors, moving rapidly, a thick, high and continuous cloud. In some countries it is customary to set fire to grass or bush so that the smoke may hide the dust of a movement.
- ii. *Fires*.—In many countries it is customary to light signal fires, to send up a flare by night, or puffs of smoke by day. This latter is done by lighting a damp fire, and alternately covering and uncovering it with a blanket.
- iii. *Tracks*.—Much information can be gained by a good tracker from observing tracks on the ground.

Tracks may give warning of enemy's patrols; show the formation, direction and speed of his force, and almost the hour when the force passed by, by the marks of the feet, boots, wheels, etc.

- iv. *Sounds*.—Sound travels at the rate of about 380 yards a second. Roughly, four beats of the pulse to 1,000 yards is a fair calculation.

The sound of the explosion overtakes the modern pointed bullet at about 2,000 yards. A double report is heard when the bullet is fired by some one exactly facing the hearer.

13. In countries such as Egypt, Africa, India, heat vapour often has curious effects on the appearance of open country, lakes appearing where there is no

water, trees looking like mountains, cattle like cavalry, and so on. These are very liable to deceive persons who are not accustomed to them.

14. It must always be borne in mind that the primary duty of reconnoitring parties is to gain information and not to fight. At the same time, the importance of gaining "identifications" of hostile units cannot be over-estimated; the most economical method of obtaining these identifications is to employ vigorous offensive action against small isolated detachments.

15. *Hints for commanders of patrols.*

- i. Make sure that what has to be done is understood, *i.e.* how far to go, and for what to look. As far as possible a patrol commander should make up his mind beforehand what he will do in various circumstances.
- ii. Patrols are not sent out with the primary object of fighting. Therefore do not fight if the object can be gained without doing so, but remember that if small parties of the enemy are suddenly met, the assumption of a resolute offensive may be the best course of action.
- iii. Take precautions against surprise; do not move or enter a village, copse, etc., in one compact body.

The formation of the patrol must be such that if it is cut off, at least one man can get back with the information already gained. For this reason, every member of a patrol, while advancing in an enemy's country, must take notice of landmarks and distances as he goes along, so as to be able to find his way back. When advancing look behind from time to time, so that the appearance of the country may be familiar.

- iv. When touch with the enemy is gained, do not be in too great a hurry to send back a man to report. Remember the number of messengers available is small and that as much information as possible must be conveyed by each man sent.

If the enemy is not found where he was expected, information to this effect should be sent back.

- v. Avoid drawing attention to movements of the patrol, *e.g.* keep off roads and in shadow as much as possible, cover up anything that will reflect the sun, avoid crest lines, etc.

Remember that to go and return by the same road may lead to being ambushed.

- vi. Do not halt all in one spot. Have men out watching the approaches. In the case of a mounted patrol the horses must not all be off-saddled at the same time.
- vii. In sending a written report think over what has to be sent before commencing to write; be accurate as regards statements concerning places, hours, numbers; do not waste time in writing a long story.

A verbal report should be as far as possible in the same form as a written report. Make the messenger repeat the message before he leaves.

16. Reconnoitring aircraft can be expected to distinguish troops in the open and artillery in action, and can dive near enough to the ground to clear up a definite point, such as the existence of a machine-gun emplacement or whether a trench system is occupied or not. Although observers may easily find the enemy's main body, it may be difficult for them in mobile warfare to discover isolated detachments of protective troops. Units cannot be definitely identified from the air; they can only be described from their general appearance. Negative reports from the air are not conclusive, as aircraft cannot force contact with an enemy who is determined not to be seen. Negative air reports should be confirmed, if possible, by other methods.

By night reconnaissance general indications of important troop movements can be obtained, and railway activity can be easily detected.

Observers are unable to reconnoitre in detail large areas by night, as visibility is limited by darkness and also varies greatly with weather conditions and the state of the moon.

Parachute flares are used to illuminate any well-defined focal point or small area, and detailed information can be obtained by means of them, but the number of parachute flares which an aeroplane can carry is limited.

Air photographs taken at high altitudes may be expected to show road movements, tracks, camps, new works, battery positions, dumps, hospitals,

light railways, telegraph lines, and other signs of military activity. If taken at lower altitudes in favourable weather they will enable experts to discover the smallest details of the enemy's defences.

8. PREPARATION OF RECONNAISSANCE REPORTS

1. In drawing up his report the reconnoitring officer should be as concise as possible and should be careful to confine his information to what is relevant. The most satisfactory method is to divide the report into two parts.

Part I should be written primarily for the use of the commander, and should contain a general description of the outstanding features of the reconnaissance to enable him to obtain a comprehensive view of the situation; it should present clearly and unencumbered with minor detail those points of which he will have to take account in arriving at his decision.

Part II should contain detailed information collected under headings, and, where possible, arranged in tabular form.

For Part I set headings are to be avoided, though it is possible to indicate for each class of reconnaissance certain points which should invariably receive attention. For Part II headings usually the same for the same nature of reconnaissance can be justified. The disadvantages in the case of a regular form are counterbalanced by the greater ease with which the report can be analysed and diverse reports collated. Care should be taken to distinguish between impressions or hearsay and facts. It is important to know the time of day and year when a reconnaissance is made.

The time will be described on the system of the 24-hour clock (*see* Sec. 11, 43).

2. Where the names of foreign places or towns are spelt in various ways, the spelling should be in accordance with that used on the map, or where no map is available the anglicized form should be used, followed by the local form in brackets.

(*See* Sec. 11, 33 to 60, for the general rules for the preparation and despatch of reports and messages.)

3. A map, or sketch, is an invaluable adjunct to a reconnaissance report. It is a graphical presentation, by the use of conventional signs, of certain information regarding the area represented. In it can be recorded: (a) the existence of certain features, natural or artificial; (b) their positions relative to one another; (c) certain facts regarding them, *e.g.* the forms of hill features, the extent and outline of woods, the shape of buildings, or the course of streams.

A report without a map or sketch for reference is of little value; whereas by supplementing the information which can be conveyed through conventional signs, by the addition of a few written notes on the face of the map, it may often be possible to dispense with the separate report.

4. Sketches to explain reconnaissance reports of roads, rivers and positions in attack and defence are usually on scales of from 1 to 4 inches to 1 mile. Sketches in connection with the defence of a town or village or for the selection of a camp or billeting area are usually on a scale of 4 inches to 1 mile or larger.

Reconnaissance of Roads

5. *Outside hostile zones.*—Reconnaissance of roads may be ordered for a variety of purposes; the relative importance of the different considerations will vary according to the object of the reconnaissance. Thus, if it is made with a view to a march remote from the enemy, the comfort of the troops and, therefore, the characteristics of the road as a channel of communication demand first consideration.

Such points as the following must be reported:—

i. Surface condition.

ii. Width, particularly of metalled portion.

iii. Gradients. (Mention such only as are steep enough to affect rate of marching or to present a difficulty to transport.)

iv. Bridges, with a view to the loads they will carry.

v. Points where special measures for control of traffic may be required, particularly very narrow or winding ways through a town or village.

vi. Watering places, with a statement of the facilities and number of horses that can be watered at a time.

vii. Towns or villages on or near the route, from the point of view of billeting.

- viii. Local administration, names and addresses of mayors and chief civil functionaries.
- ix. Telegraph and telephone lines and offices.

6. *In the presence of the enemy.*—Where the road has to be reconnoitred with a view to a march in the presence of the enemy, or when the possibility of encountering him is not precluded, first importance has to be given to tactical considerations. The character of the country through which the road passes becomes then of more importance than the actual details of the road itself. The point of view from which the country has to be regarded will vary to a certain extent according to whether the march contemplated is an advance or a retreat.

Part I of the report should deal in general terms with such subjects as:—

- i. The general nature of the country—whether open or enclosed, and the extent to which it favours delaying action by a small mobile force.
- ii. The extent to which the road is under observation either from the ground or air and commanded by surrounding features.
- iii. Defiles.
- iv. Points where special measures for protection against attack by A.F.Vs. or aircraft must be taken.
- v. Tactical points which must be secured, in the case of an advance, before the main body can pass any particular point; or which, in the case of a retreat, must be held until it is past a certain point.
- vi. In the case of an advance, any positions particularly favourable to the enemy for opposing the advance, with a brief statement of the considerations that constitute the strength of such positions and affect the decision as to the best mode of attack on them.

In Part II information may usefully be given in addition on the following:—

- vii. Particulars of the roads as for a march under peace conditions. More especially in the case of an advance, greater detail should be given regarding bridges; for example, the possibility of executing temporary repairs and of constructing alternative crossings should receive ample treatment.
- viii. Obstacles to deployment from the road.
- ix. Obstacles to movement across country, such as woods, swamps, rivers and streams, railway cuttings and embankments.
- x. More detail regarding positions favourable for delaying action by the enemy or opposition by him to an advance.
- xi. In the case of a reconnaissance for a retreat, a more detailed report on positions favourable for rearguard action.
- xii. In the case of a retreat, points where delay could be caused with little labour but with considerable inconvenience to the enemy, either by demolitions or by blocking the road where movement off it is restricted.

7. In any sketch illustrating the report, roads may be classified as follows:—

- i. As regards width by the letters—

"A"—Denoting that two streams of traffic can pass.

"B"—Denoting that there is only room for one stream, but occasional vehicles can pass.

"C"—Denoting that there is only room for one stream, passing being effected at specially prepared points, which should be shown.

- ii. As regards surface, foundations, etc., by the figures—

"1"—Heavy M.T., i.e. 3-ton lorries, heavy guns, etc.

"2"—Light M.T., i.e. lorries up to 30 cwt.

"3"—Horse transport only.

"4"—Pack transport only, e.g. bridle-paths.

The combination of a suitable letter with a suitable figure thus describes the road, e.g. A2—a road capable of taking two streams of traffic, but because of surface difficulties or its passage over only light bridges, suitable only for mechanical transport up to 30-cwt. lorries.

When the condition of a road is such as to deteriorate rapidly in the wet

season its present category should be shown, followed in brackets by the category into which it would fall in the altered conditions, *e.g.* A2 (A3).

The material of the surface may also be shown, after the classification, *e.g.* A1 (asphalt) or B2 (B3) (dried mud).

RIVER RECONNAISSANCE

8. Headings used in Part I will vary according to the tactical object; those in Part II, which normally contain nothing but facts about the river, need not vary. In reporting on a river the most material considerations are:—

- i. Average width and depth in different stretches.
 - ii. Nature of bottom.
 - iii. Approximate strength of current.
 - iv. Character of banks.
 - v. Existing crossings, nature and dimensions of bridges, loads they will carry, and particularly their practicability for mechanical transport, heavy guns or tanks. In the case of fords state depth, nature of approaches, bottom and strength of current. The nature of the ferries should be described and the load which the vessel will take.
 - vi. If some time may elapse before the report is utilized, the effect of a heavy rain or thaw and the liability to flood should be ascertained by enquiry or observation.
9. The velocity of a river can be found by throwing a piece of wood well out and timing it over a measured number of feet. Mean velocity = $\frac{1}{2}$ surface velocity; $\frac{2}{3}$ mean velocity in feet a second = number of miles an hour.
10. When the object of the reconnaissance is to report on the river from the point of view of the *defence*, the following points should be considered:—
- i. Tactical considerations affecting the enemy's probable choice of a point of attack, *e.g.* cover on his side facilitating surprise, sections in which the course of the river or the configuration of the ground on his side favour concentration of fire in support of an attack, any stretches in which the river cannot easily be covered by the fire of the defence.
 - ii. Locks, dams and weirs, and other artificial means of controlling the waters of the river, their influence on the water level and the possibility of utilizing them to form inundations.
 - iii. Existing crossings. These should be reported on from the point of view of possible destruction, and the extent to which their destruction would impede the enemy. Details required are the nature of the bridge, number and width of spans, nature and dimensions of piers, nature and height of abutments, thickness of arch in a masonry bridge and number and detailed dimensions of girders in a steel bridge.
11. *In attack* the points on which information is required are similar to those above, with the difference that facilities for attack should be reported instead of those for defence, stretches of the river favourable to the construction of improvised crossings should be reconnoitred and reported in greater detail, and the existence of material on the spot suitable for the construction of these crossings should be noted and particulars given.

RECONNAISSANCE OF A POSITION

In attack

12. In reconnoitring a position on which an attack is contemplated, definite information will rarely be obtained without fighting, since it will be necessary to drive in the enemy's covering troops. The troops engaged in this task will often have opportunities for acquiring information of value to the commander of the force, and special reconnoitring parties may be attached to them for this purpose. It will rarely be possible for one party to obtain all the information about a position which is wanted. Definite instructions should be issued by the commander of the force to each party employed on reconnaissance work.

13. Careful co-ordination of the action of reconnoitring detachments and of R.A.F. reconnaissance machines is essential if the best results are to be obtained.

14. The following are the principal points on which information will be required :—

- i. Extent of the position and location of the flanks.
- ii. Enemy's defensive dispositions :—
 - (a) Defensive posts, and obstacles.
 - (b) Machine gun emplacements.
 - (c) Gun positions.
 - (d) Observation and command posts.
 - (e) Assembly positions for counter-attack and probable lines of approach ; cover available for tanks, etc.
- iii. Features of the ground before the position affecting the plan of attack :—
 - (a) Available cover, including dead ground.
 - (b) Lines of approach.
 - (c) Forming-up positions for infantry and tanks.
 - (d) Artillery positions.
 - (e) Locations for headquarters.
 - (f) Lines for signal communication.
 - (g) Positions for reserves.

15. The following are the principal points on which information will be required :—

- i. *As regards enemy positions :—*
 - (a) Extent of the position.
 - (b) The enemy's dispositions.
 - (c) Topographical weaknesses of the position. The nature of the weaknesses of any particular area of the defence should be stated, e.g. defective field of fire ; lack of depth ; difficulty of, and exposure to, observation ; conditions unfavourable to co-operation between the arms or between adjacent sectors of the defence.
 - (d) Machine-gun emplacements, defended localities, headquarters and communication centres.
 - (e) Artillery positions, mortar emplacements and observation posts.
 - (f) Obstacles, both natural and artificial.
 - (g) Probable lines of movement for the enemy ; assembly positions for his reserves, including tanks.
- ii. *Information affecting organization of the attack :—*
 - (a) Best forming-up places for the attacking troops and approaches thereto. Areas to be avoided owing to possibility of hostile gas concentrations.
 - (b) Best lines of attack. The report must include notes on areas most favourable to co-operation between the arms, including good observation, and will also indicate tactical localities, loss of which by the enemy will weaken his hold on his positions ; the possibility of attack from a flank must be considered.
 - (c) Positions for the artillery.
 - (d) Areas most suitable for attacks by armoured fighting vehicles and approaches thereto.
 - (e) Successive positions for headquarters and suitability of country for landing grounds.
 - (f) Best lines for signal communications.
 - (g) Best position for reserves.
 - (h) Suitability of ground and system of roads for administrative arrangements, e.g. supply of ammunition, food, water, evacuation of casualties.

In defence

16. The object of the reconnaissance may be to estimate the capabilities of a position for defence and the force that would be required to occupy it, or may have in view its occupation by a specified force. In the latter case definite proposals as to the location of defences, preparations required and distribution of troops will be required in addition.

17. The report will deal with :—

- i. Extent of the position.
- ii. Defensive capabilities of flanks.
- iii. Observation over country to be traversed by attacker. His probable assembly positions.

- iv. Concealment of the defence.
- v. Observation by the attack.
- vi. Tactical points the loss of which will prejudice the conduct of the defence.
- vii. Weak points of the position—*cf.* Reconnaissance for attack of a position (para. 15, I. (c)).
- viii. Points favourable to development of flanking or surprise fire, and other factors adding to the strength of the position.
- ix. Facilities for counter-attack.
- x. Positions for reserves and for tanks.
- xi. Obstacles, especially against attacks by armoured fighting vehicles.
- xii. Estimate of force required to hold position.
- xiii. Sub-division into sectors.
- xiv. General line of localities for the forward line of defence.
- xv. Concealment and mutual support.
- xvi. Positions for artillery observation posts and for the different natures of artillery.
- xvii. Nature of the soil as affecting construction of defences.
- xviii. Communications leading up to and within the position.
- xix. Drinking water.

RECONNAISSANCE OF RAILWAYS

18. Although an expert would be required to write an adequate report on which to work a railway or estimate its capacity, information, preferably accompanied by dimensioned sketches, under the following heads will suffice for most purposes.

19. *Important stations.*—

- i. *Approaches and forming-up places.*—Area, water-supply, latrine and urinal accommodation, etc.
- ii. *Passenger and goods sidings.*—Number, length and road access.
- iii. *Passenger and goods platforms.*—Number, length, breadth and height.
- iv. *Endloading and other ramps.*—Number.
- v. *Facilities for extension of station yard.*—Areas available.
- vi. *Goods sheds, engine sheds, locomotive turning arrangements and water-supply.*—Areas or capacities.

20. *Line between important stations.*—Gauge; steepest grade; type of track, including weight of rail; whether ballasted or not; details of bridges and tunnels of importance; if single line, distance apart of crossing stations and number and length of their loops.

BILLETING RECONNAISSANCE

21. A billeting reconnaissance may be made with a view to a record of the capacity of an area or to the definite allotment of billets to a specific force within a specified area. In reconnoitring areas for billeting purposes the population of the town, village or parish, whichever is available, must be taken as the basis of calculation. In addition to estimating the number of men to every inhabitant that can be accommodated, the number of vehicles should also be given.

22. *Billets without subsistence can be provided at varying rates.*

The best class of village in a rich agricultural district will take up to 10 men to every inhabitant; a residential town or village with good houses and wide streets about 5 men to every inhabitant; while industrial towns with a dense population and a poor type of house will take still fewer. As regards horses, a good agricultural village in Europe will provide accommodation for 3 horses to every 4 inhabitants; this will entail using all barns, sheds and outhouses.

23. Part I of the report should include a general description of the character of the area from a billeting point of view, whether agricultural, residential or industrial, and the predominant type of house. The area may be divided if necessary into sub-areas of different characters. A rough statement should be made out, in terms of units, of the capacity of towns, villages, hamlets and any particularly large isolated farms or country houses. The source, quality, abundance or scarcity of the water-supply should be noted, where facilities for watering animals are good and where they are deficient, and the health of the civilian population. Suitable positions for headquarters and the best means for parking vehicles concealed from observation from the air should be recorded.

24. In many civilized countries chief officials of localities keep detailed lists showing billeting accommodation. Efforts should be made to obtain these lists.

25. In a billeting report based on the population of each parish the small hamlets in each parish should be mentioned by name, as well as the parochial headquarters.

26. *Headings for Part II :—*

Name of parish, town or village, or reference No. of area.	Billets.			Water-supply.	P.O.		Large public or other buildings.	Parks and open spaces.	Buildings suitable for H.Q.	Remarks.
	Men.	Horses under cover.	Horses in open.		Tele-graph.	Tele-phone.				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)

9. MAP READING AND FIELD SKETCHING

1. *Map reading.*—Always examine a new map systematically. Look at the following in the order given :—

- Scale.
- Directions of true, grid and magnetic north.
- Grid. The size, numbering and relation to the sheet edges.
- Contour interval (V.I.) or method of representing relief.
- Conventional signs.
- Date of publication and other marginal information.

2. *Bearings.*—The bearing to any point is the angular interval between the line joining that point to the position of the observer, and a north and south line which may represent true, grid or magnetic north.

- Grid bearings.*—The amount by which grid bearings vary from true bearings is called grid convergence.

On most military maps the amount of convergence at the centre of the sheet, which is sufficiently accurate for most purposes, is given in the margin (see Fig. 1).

When this is not given, or to find the grid convergence towards the edges of the sheet when great accuracy is required, proceed as follows :—

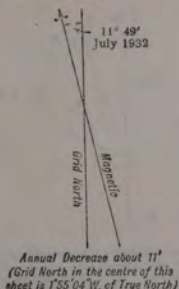
Measure the linear distances between the north and south grid line nearest to the point from which the bearing is taken and the nearest meridian at the north and south edges of the sheet. The difference between these two distances divided by the total distance from the north to the south edges, measured in similar units, gives the tangent of the angle of convergence. Inspection will show whether this angle must be added or subtracted.

- Magnetic bearings.*—Magnetic bearings vary from true bearings owing to three causes :—

- Magnetic variation.*—Appendix II gives the magnetic variation and its rate of increase or decrease yearly at selected places.
- Local attraction.*—Iron, steel and electrical currents affect compass bearings. Where magnetic material is present in the form of steel helmets, steel-rimmed spectacles, box respirators, rifles, etc., these articles should be removed before bearings are taken. In cases where removal is not possible,

such as underground pipes, underground or overhead cables, guns and fields of magnetic ores, bearings should be checked by other observations taken elsewhere.

FIG. 1



- (c) *Compass error.*—Every compass has an individual error, which can be determined as follows. A good circular protractor and a large-scale (say 1 : 20,000) map are needed to give the requisite accuracy. Identify on the map and the ground the standpoint A and distant object B. Take the compass bearing and measure from the map the true bearing of B from A. Compare the difference between the bearings obtained, with the magnetic variation. If they agree the compass is correct. If they vary the difference is the amount of compass error E. or W. of magnetic north.

Note.—The same procedure should be carried out at B. If the same result is obtained it may be assumed that the observations were free from any local attraction. If the results differ disturbance must have been present at A or B or both, and further tests must be made from other points until satisfactory agreement is obtained.

3. *Conversion of bearings.*—Whenever a magnetic or grid bearing has to be converted to true, or vice versa, a rough diagram should be drawn.

Example.—Convert a compass bearing of $67^{\circ} 30'$ of a point P to a grid bearing when the following are known :—

Compass needle points $1^{\circ} 30'$ W. of magnetic North (compass error).

Magnetic North is $8^{\circ} 20'$ E. of true North (magnetic variation).

Grid north is $2^{\circ} 40'$ W. of true North (grid convergence).

- (a) Conversion of compass bearing to magnetic bearing (Fig. 2) :—
 $67^{\circ} 30'$ (compass bearing) $- 1^{\circ} 30'$ (compass error) gives 66° as the magnetic bearing.
- (b) Conversion of magnetic bearing to true bearing (Fig. 3) :—
 66° (magnetic bearing) $+ 8^{\circ} 20'$ (magnetic variation) gives $74^{\circ} 20'$ as true bearing.
- (c) Conversion of true bearing to grid bearing (Fig. 4) :—
 $74^{\circ} 20'$ (true bearing) $+ 2^{\circ} 40'$ (grid convergence) gives 77° as grid bearing.

4. *The prismatic compass.*—The dial of the compass is graduated with two sets of figures, the inner circle being for direct readings, the outer for reading through the prism.

The reading obtained when the compass is "laid" on an object is the magnetic bearing \pm the compass error. If it is required to find the angle between two points, the bearing to each is taken and the smaller subtracted from the larger gives the angle required.

FIG. 2

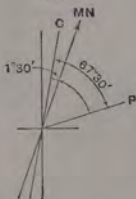


FIG. 3

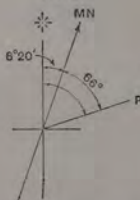
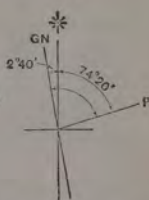


FIG. 4



For use in night marches.—Turn the luminous direction mark to the required bearing as shown on the external ring. (Note.—On this ring 26 corresponds to 260° and so on.) When the luminous arrow-head corresponds with the direction mark, the line joining the two luminous patches on the inside of the cover shows the direction of march.

When it is known that a compass will be required for use at night, it should be left exposed to the sun or daylight for a couple of hours beforehand. This strengthens the luminous effect in the dark.

The direction of march being ascertained from the compass, a point should be chosen on which to march, or a man sent forward as marker, to prevent the direction being lost again.

5. Approximate methods of finding true north:—

i. *By the compass.*—Magnetic variation obtained from Appendix III.

ii. *By a watch.*—

In the northern hemisphere.—If the hour band of a watch, held face upwards, is pointed at the sun, the line bisecting the angle between it and twelve o'clock will point roughly north and south.

In the southern hemisphere.—Hold the watch face upwards. Point the line from the centre of the dial to the figure 12 towards the sun. The line bisecting the angle between the hour hand and twelve o'clock will point roughly north and south.

iii. *By the Pole star* (in the northern hemisphere).—In Fig. 5 the line joining two stars indicated in the constellation of the Great Bear if produced five times its length ends at the Pole star.

In ordinary latitudes the Pole star is always within 2° of the true north and may be taken as the pivot round which all the other stars revolve. Hence the Great Bear may appear in any of the positions seen if this page is revolved about a pin stuck through the Pole star.

iv. *By the Southern Cross* (in the southern hemisphere).—Consider the Southern Cross as a kite (Fig. 6). Prolong the greater axis $4\frac{1}{2}$ times in the direction of the tail and the point reached will be approximately the South Pole.

If a piece of paper marked off along its edge by 12 lines at equal intervals apart be held so that the first and third scale lines coincide with the head and tail stars of the kite, the twelfth scale line will mark the approximate position of the South Pole.

There is no bright star there.

6. *Slopes*.—Slopes can be expressed by angles, e.g. a slope of 4° , or as a gradient, e.g. $\frac{1}{15}$, or 1 in 15, which means a rise of 1 unit vertically for every 15 units travelled horizontally. Note that $\frac{1}{15}$ is the tangent of the angle of slope.

FIG. 5

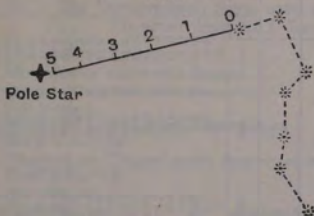
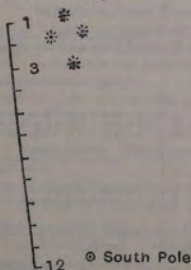


FIG. 6



An approximate rule for expressing as a fraction a slope given in degrees is to divide the number of degrees by 60. Thus a slope of 3° is equivalent to $\frac{1}{20}$. This rule does not hold good for steep slopes.

The table on page 22 gives the vertical rise or fall corresponding to distance travelled along the slope, for use in interpolating contours when field sketching. This is the sine of the angle of slope.

7. *Field sketching*.—Every sketch should show the following references :—
 - i. Heading, stating the purpose of the reconnaissance.
 - ii. Scale, about 6 inches in length, and divided into units to suit the purpose of the sketch.
 - iii. Statement of V.I. used or other method of showing relief.
 - iv. North point, showing true and magnetic north and giving magnetic variation.
 - v. The clear signature of the sketcher.
 - vi. Date.
 - vii. Statement of the weather conditions under which the sketch was made.
 - viii. Method used in making the sketch and the time taken, in order that the user may judge of its accuracy.

TABLE GIVING DIFFERENCE IN HEIGHT DUE TO SLOPE





















Example :—In pacing 200 yards up a slope of 4 degrees, a rise of 14 yards is made

Angle of slope	Distance along the slope								
	20	40	60	80	100	200	300	400	500
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1°	0.3	0.7	1.0	1.4	1.7	3.5	5.2	6.9	8.7
1° 30'	0.5	1.0	1.5	2.1	2.6	5.2	7.8	10.4	13.1
2°	0.7	1.4	2.1	2.8	3.5	7.0	10.5	14.0	17.5
2° 30'	0.8	1.7	2.6	3.5	4.3	8.8	13.1	17.4	21.9
3°	1.0	2.1	3.1	4.2	5.2	10.5	15.7	20.9	26.2
3° 30'	1.2	2.4	3.6	4.9	6.1	12.2	18.3	24.4	30.5
4°	1.4	2.8	4.2	5.6	7.0	14.0	20.9	27.9	34.9
4° 30'	1.5	3.1	4.7	6.3	7.8	15.7	23.5	31.3	39.2
5°	1.7	3.5	5.2	7.0	8.7	17.4	26.1	34.8	43.5
6°	2.1	4.2	6.3	8.4	10.5	20.9	31.4	41.9	52.3
7°	2.4	4.9	7.3	9.7	12.2	24.4	36.6	48.8	61.0
8°	2.8	5.6	8.4	11.1	13.9	27.8	41.8	55.7	69.6
9°	3.1	6.3	9.4	12.5	15.6	31.3	46.9	62.5	78.2
10°	3.5	6.9	10.4	13.9	17.4	34.7	52.1	69.5	86.8
11°	3.8	7.6	11.4	15.3	19.1	38.2	57.2	76.3	95.4
12°	4.2	8.3	12.5	16.6	20.8	41.6	62.4	83.2	104.0
15°	5.2	10.4	15.5	20.7	25.9	51.8	77.6	103.5	129.4
20°	6.8	13.7	20.5	27.4	34.2	68.4	102.6	136.8	171.0
25°	8.5	16.9	25.4	33.8	42.3	84.5	126.8	169.1	211.3













PLATE I

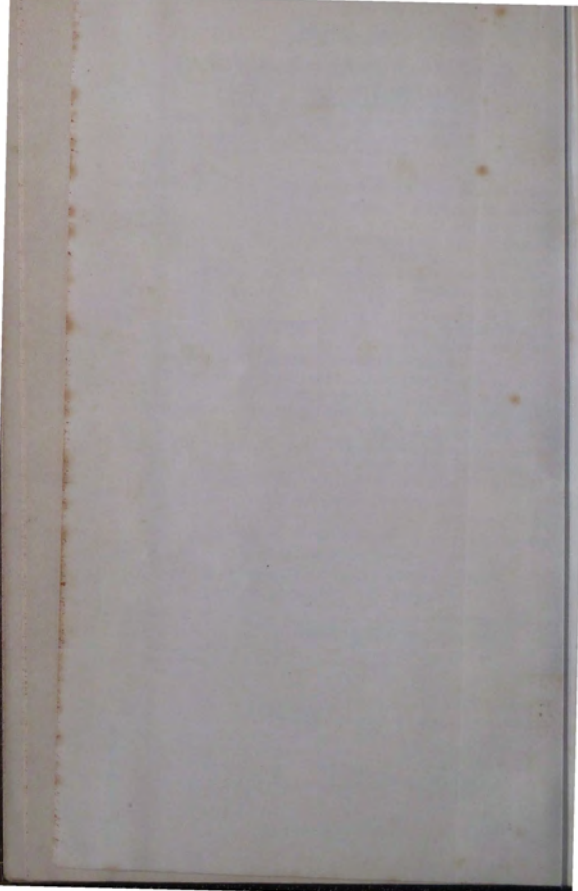
SPECIAL ROYAL AIR FORCE CONVENTIONAL SIGNS

The Conventional Signs used upon the
Quarter Inch R.A.F. Series

Main Roads between Towns.....	
Other Metalled Roads.....	
Railways.....	
Mineral Lines and Tramways.....	
Race Course.....	
Church or Chapel with Tower or Spire.....	
Golf Course.....	
Windmill.....	
Lighthouse.....	
Aerodrome.....	
" with Direction Finding W/r. Station.....	
Seaplane Station (dotted over the land).....	
Landing Ground (permanent).....	
W/r. Station with masts exceeding 150 in Height.....	
Air Navigation Light.....	
Prominent Landmarks or Ground Signs.....	
Prohibited Flying Area.....	
Name of Aerodrome, Landing Ground or Seaplane Station.....	
D.F. Station.....	
Height in feet of Aerodrome or Landing Ground above M.S.L.	

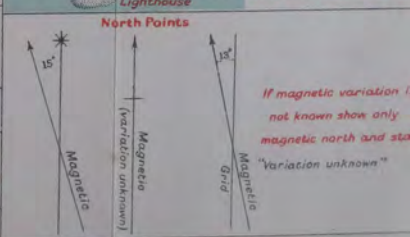
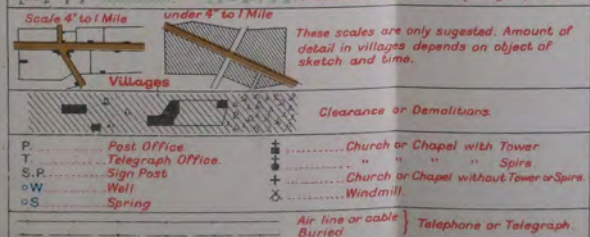
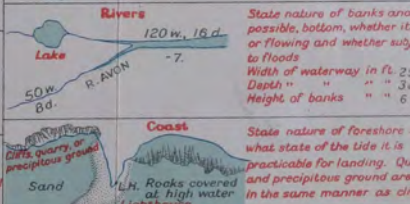
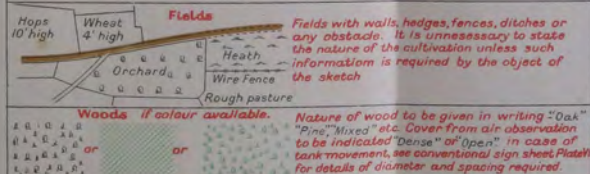
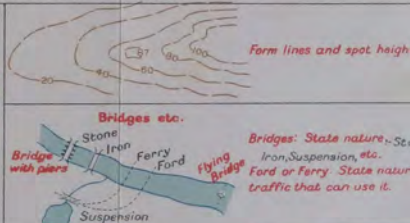
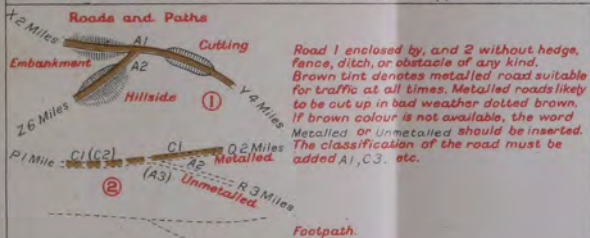
Administrative Signs on Maps, Sketches or Annotated Photographs

Aerodrome.....	
Temporary Landing Ground.....	
Note:— The internal symbol denotes character and the outline gives the actual shape on the ground. This outline is given only on large scale maps.	
Army Co-operation } Squadron.....	
Bomber, day or night }	
Fighter }	
Air Stores Park.....	
Aircraft Depot.....	
Port Detachment.....	
Wing H.Q.....	
Group H.Q.....	
Airship.....	
Balloon.....	



CONVENTIONAL SIGNS FOR TOPOGRAPHICAL DETAIL

Lettering to be modelled on that of this plate. In no case is fancy lettering to be used.
Words which should appear in the sketch are shown in black.



When there is not sufficient time to draw the crossbars, a railway may be shown by a broad black or red line with the word "Railway" written along it. The gauge of the railway must be inserted: as broad, standard, narrow, or tramway.

CONVENTIONAL SIGNS

Batteries and Gun Emplacements.

General

When scale allows individual Emplacements, fixed by photograph, are to be shown.



Nature of Arty.:-

6" How., 18 Pdr.
12" etc.

Anti-aircraft Guns



Anti-tank

Artillery



Cavalry or Infantry



Machine

Trench Mortars



Dumps :-

Supply



Petrol



Ammunition



Engineer



Hutments



Dug-outs



Searchlight



Observation Post



Signal Office (Telephone or Telegraph)



Wireless Telegraph Station



Radio Telephony Station



Beam Station



Direction Finding Station



Visual Signalling Station



Hospital, Clearing Station or Aid Post



Gas :-

Gas Projectors



Gassed Areas

(shade YELLOW when possible)



SIGNS WILL BE SHOWN IN

S FOR MILITARY FORMATIONS AND DETAIL.

(see also Plate II.)

Notes :-

Entanglement { on posts
coiled

Chaux de Frise

Notes of Trenches :-

disused trenches
shown dotted.

Trap
lock

strewn with Rocks
siders of 18 inches
water Diameter.

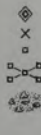
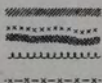
capacity of Bridges
inverts in tons.

aments and Cuttings :-

of Embankment in feet
of Cutting

of Water-way in feet

diameter of trees in inches
spacing - - - feet



TROOPS and HEADQUARTERS.

Titles will be written alongside the appropriate sign and the authorized abbreviations will be used.
Troops :- Where necessary (M) will be inserted against mechanized units.

	Cavalry	Artillery	Infantry	Tanks	Armoured Cars	Transport
Individual	♂	⦿	○	⚡	⚡	⚡
Units :- General	♂	⦿	⦿	⚡	⚡	⚡
Column of Route	♂	⦿	⦿	⚡	⚡	⚡

Headquarters :-

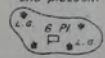
♂ G. H. Q.	♂ Bde. (Cav. or Inf)	♂ 5 Inf. Bde
♂ Army	♂ Regt., Bn. or Arty. Bde	♂ 3 R Tanks
♂ Corps	♂ Sqn., Coy or Sty.	♂ 8 Coy.
♂ Div.	♂ Tp. or Pl.	♂ 5 Pl.

Examples :-
Fd. Bde. N.A.
(mechanized)

Unit deployed -
one company.

Defended Locality -
one platoon.

17 Fd. Bde. (M)



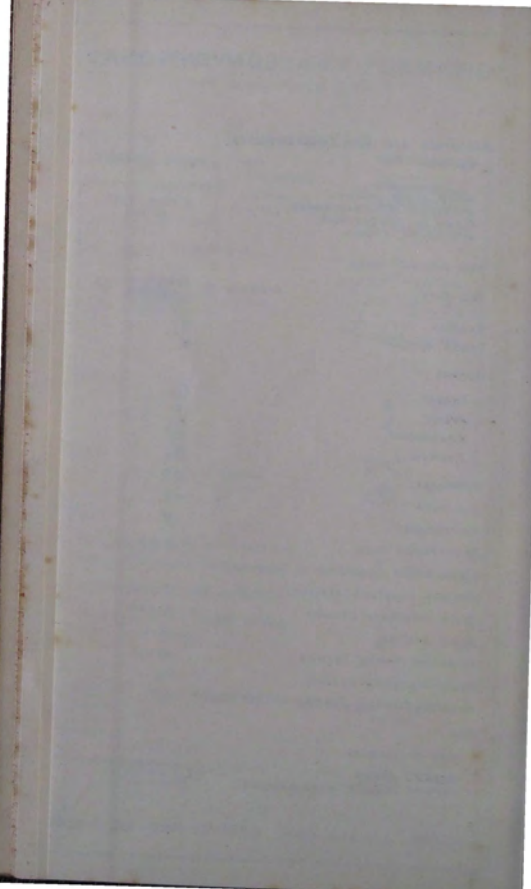
Troops in defence :- showing portions of two battalions.



Note :-

These examples show the use of signs and are not to be taken as standard dispositions.

FOR BRITISH (AND ALLIES) AND IN BLUE FOR ENEMY.



8. *Conventional signs.*—Conventional signs are used to economize space in explanatory writing. They fall into the following classes :—

- i. Those used upon ordinary civil maps in times of peace. These are usually explained in a reference table in the margin of each sheet.
- ii. Those overprinted on the above maps in time of war to give additional military information. (See Plates I and III.)
- iii. Those used for field sketching to show :—
 - (a) Topographical detail. (See Plate II.)
 - (b) Military formations and detail. (See Plates I and III.)

10. AIR PHOTOGRAPHS AND THEIR INTERPRETATION

GENERAL

1. Air photographs are of two main types :—

- i. Vertical.
- ii. Oblique.

The former are sometimes made up into mosaics and both types, if taken in an appropriate manner, can be viewed in a stereoscope to give the effect of relief.

Verticals show the ground as seen from above and are the type most generally useful. For the examination of natural ground features convenient scales vary between 1/10,000 to 1/20,000. For the examination of defence works such as trenches or batteries a larger scale is desirable.

Obliques are panoramic views usually taken at low altitudes. They are easier to read than verticals and are valuable to give troops and staffs an idea of the ground over which they are to operate. Objectives, routes and points of importance can be marked on the photographs to facilitate recognition on the ground. They are also of value for the reconnaissance of bridging sites; or this, in addition to the approaches, the gap should also be photographed from the side.

All prints have printed on them the following data :—

R.A.F. unit and photo index number; map reference.

Date and hour when taken; focal length of lens and height from which taken.

Demands for air photographs should state :—

- Areas to be photographed.
- Type required, i.e. vertical or oblique.
- Purpose for which required.
- Scale (see below).
- Order of priority.
- Number of prints and time by which required.

In the case of verticals it should also be stated if they should be taken at any particular time on account of shadows.

In demanding obliques it will be necessary to state, in addition, the direction in which the photograph is to be taken and any particular piece of ground to be included. If an overlapping series is required the line on which the photographs should overlap should be stated.

Verticals and obliques can be taken in the course of one flight.

The standard scales for air photographs, to be included in demands, are as follows :—

- "Large," (1/3,000 to 1/6,000).
- "Medium," (1/6,000 to 1/10,000).
- "Small," (1/10,000 to 1/20,000).

INTERPRETATION OF VERTICAL PHOTOGRAPHS

2. When vertical photographs are examined they must be held so that the shadows fall towards the person examining them and away from the light; otherwise the relief appears inverted, i.e. mounds and hills appear as holes and valleys.

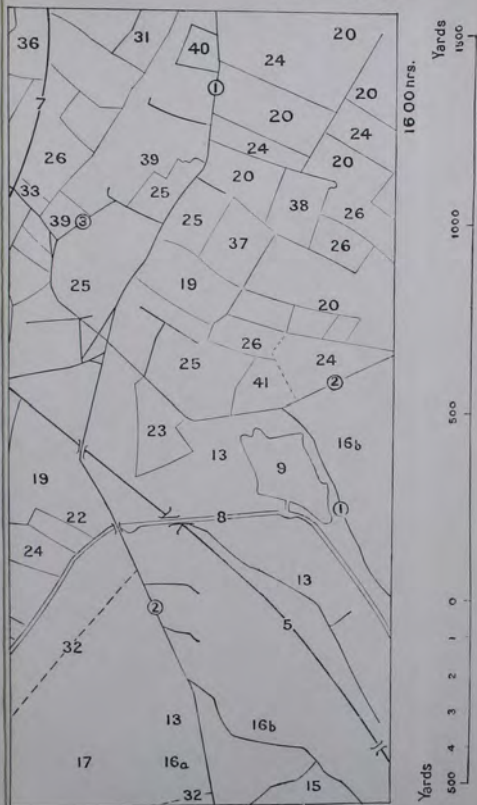
The prints should normally be examined in conjunction with a map, on which they should be located by means of the reference indicated on the print, the direction of the north point and the identification of some prominent features common to the map and the photograph.

PLATE IV
VERTICAL AIR PHOTOGRAPH
(With key and key diagrams)

KEY

- | | |
|--|---|
| 1. Tarmac road. | 24. Mangolds. |
| 2. Macadam road. | 25. Allotments. |
| 3. Lanes. | 26. Rough grass. |
| 4. Main railway, 4 lines (signals overhead). Embankment. | 27. Meadows. |
| 5. Main railway, 4 lines. Cutting. | 28. Roots. |
| 6. Single line railway. | 29. Roots, more advanced. |
| 7. Double line railway. | 30. Culvert under railway. |
| 8. Canal. | 31. Water meadows. |
| 9. Pond. | 32. Field path. |
| 10. River (about 12 ft. wide). | 33. Level crossing. |
| 11. Water works. | 34. Station. |
| 12. Church. | 35. Wayside halt (no buildings). |
| 13. House and lawns. | 36. Sun-dried meadow. |
| 14. Gravel pit. | 37. Sports ground. |
| 15. Bare heath. | 38. Fallow. |
| 16A. Coniferous trees. | 39. Permanent pasture, much trodden down. |
| 16B. Deciduous trees. | 40. Large building with macadam surround. |
| 17. Heather. | 41. Old potato cultivation (now disused). |
| 18. Roots being pulled (light shows work done). | |
| 19. Hayfields. | |
| 20. Young crops. | |
| 21. Scrub. | |
| 22. Haystacks. | |
| 23. Stacks of fertilizer on fallow. | |

Bridges, houses and small detail
not specially indicated.
Scale 1/12,000.
N. Point.







The scale is found by comparing the distance between easily recognizable objects on the photograph and the map.

$$\text{R.F. of photograph} = \frac{\text{Distance on photo}}{\text{Distance on map}} \times \text{R.F. on map}$$

If this method is not possible an approximate scale can be obtained from the following formula :—

$$\text{R.F. (of photo)} = \frac{\text{Focal length of lens}}{\text{Height of camera}} \quad (\text{both being measured in inches})$$

North point, if not shown, can be found roughly from the position of the shadows and the time at which the photograph was taken.

Identification of an object depends principally on :—

- i. *Its shape*.—This appears on the photograph in plan, but, unless the sun is overhead, raised objects will cast a shadow from which the shape and nature of an object can be determined.
- ii. *Its tone or shade of grey*.—The tone of an object varies with the light it reflects to the camera and is principally determined by the texture of its surface.

Smooth surfaces such as concrete, tarpaulins, fields of roots with large leaves show white or light in tone. Similarly, trampled grass or earth trampled flat, such as paths, reflect more light upwards and show white.

Undisturbed natural objects such as grass, brushwood, trees, etc., reflect little light and cast many small shadows. Their tone is dark.

Plate IV indicates the appearance of many topographical features in a vertical photograph as indicated in the key diagrams.

Some indications for the identification of works of military importance are as follows :—

- (a) *Trenches*.—Lines of alternate traverses and fire bays combined with the shadow cast in excavations. In dummy and incompleated trenches there is comparative absence of shadow.
- (b) *Rifle pits*.—Marks of excavation and spoil. Tracks.
- (c) *Wire obstacles*.—When recently erected parallel light lines show where the erecting party moved. Later dark lines show where the vegetation is undisturbed.
- (d) *A.T. mine fields*.—Series of parallel lines of small white dots.
- (e) *M.G. emplacements*.—Marks of excavation. Tracks. Often in pairs or sited in a systematic manner or in enfilade of wire obstacles.
- (f) *Battery positions*.—Four or six marks systematically arranged. Tracks. Turning marks of vehicles. If guns are emplaced blast marks and signs of excavation and spoil may show.
- (g) *Observation posts*.—Tracks.
- (h) *Headquarters*.—Tracks. Turning marks of vehicles.
- (j) *Air lines*.—Series of regular white dots, connected, if recently erected, by a white track.

STEREOSCOPIC EXAMINATION

3. Single photographs give no indication of relief.

Vertical photographs are normally taken with an overlap of 60 per cent. in order that they may be examined stereoscopically. By this means the relief is clearly seen and additional indications to assist identification are brought out.

A simple stereoscope consists of a pair of prisms or half-lenses mounted in a suitable frame.

To use the stereoscope mark the centre of each print and place one print over the other so that the detail on the overlap matches. Draw the line of flight by joining the centres. Place the prints so that the shadows fall away from the light and towards the eye and the line of flight is parallel to the line between the eyepieces. Hold the stereoscope in the left hand and with the right hand withdraw the right print along the line of flight until a well-defined feature on each print appears to fuse into one. A "ghost" picture is seen on each side of the overlap but should be neglected. The portion which is common to both prints will now be clearly seen in relief; the comparative heights and other detail will stand out.

CHAPTER III

ORDERS AND INTERCOMMUNICATION

11. GENERAL RULES REGARDING ORDERS, INSTRUCTIONS, REPORTS AND MESSAGES

1. All orders, instructions, reports and messages will whenever possible be in writing. They should always be :—

- i. Legible in a bad light.
- ii. Clear in meaning.
- iii. So worded that they will be quickly understood.
- iv. Precise as regards time and place.
- v. As brief as possible consistent with clearness.
- vi. Signed by the sender, giving rank, appointment and formation or unit.

2. An important order or message given verbally should be recorded in writing by the recipient and confirmed in writing by the issuing officer at the earliest opportunity. If sent by telephone the order should be checked over before ringing off.

3. The orderly should always be made to repeat the message before leaving. The recipient must give a receipt for the message, noting on it the hour and date.

RULES REGARDING THE EXECUTION OF ORDERS IN THE FIELD

4. Notwithstanding the greatest skill and care in framing orders, unexpected local circumstances may render the precise execution of an order unsuitable or impracticable. In such circumstances the following principles will guide the recipient of an order in deciding his course of action :—

- i. A formal order will never be departed from either in letter or spirit—
 - (a) so long as the officer who issued it is present ;
 - (b) if the officer who issued it is not present, so long as there is time to report to him and await a reply without losing an opportunity or endangering the command.
- ii. If the above conditions cannot be fulfilled a departure from either spirit or letter of an order is justified if the subordinate, who assumes the responsibility, bases his decision on some fact which could not be known to the officer who issued the order, and if he is satisfied that he is acting as his superior would order him to act were he present.
- iii. If a subordinate neglects to depart from the letter of his orders when such departure, in the circumstances of (ii) above, is clearly demanded, he will be held responsible for any failure which may ensue.
- iv. Should a subordinate find it necessary to depart from an order he will immediately inform the issuer of it and the commanders of any neighbouring units likely to be affected.

CLASSIFICATION OF ORDERS AND INSTRUCTIONS

5. Orders in the field are classified as :—

- i. Standing orders.
- ii. Routine orders.
- iii. Operation orders.

Instructions are classified as :—

- i. Operation instructions.
- ii. Administrative instructions.

In addition "*Orders of the day.*"

STANDING ORDERS

6. The object of standing orders is to adapt existing regulations to local conditions and to save frequent repetition in routine and operation orders.

They must be confined to essentials only and additions made as circumstances require. They are not suitable for use in formations the composition of which is subject to frequent change. Repetition of existing regulations is to be avoided.

They are prepared by all branches of the staff in consultation and issued by the A.G.'s branch. They must be kept up to date.

ROUTINE ORDERS

7. The object of routine orders is to facilitate the normal working of the administrative services and to ensure co-ordination, thereby reducing correspondence and the duplication of returns. They should be used in place of circular letters whenever possible.

They are prepared by all branches of the staff and issued by the A.G.'s branch on a fixed distribution list and on a wide scale in order to reduce the necessity for repetition in the orders of subordinate formations and units.

Routine orders are designated by the title of the issuing formation, viz., General Routine Orders issued by G.H.Q., Army Routine Orders issued by an army headquarters, etc. They are numbered consecutively, each subsequent issue continuing the serial numbers.

OPERATION ORDERS

8. Operation orders deal with all strategical and tactical operations.

The object of an operation order is to bring about a course of action in accordance with the intentions of the commander, and with full co-operation between all arms and units.

9. Operation orders are prepared and issued, in the case of formations, by the G.S. branch in consultation, as necessary, with the other branches of the staff and with the subordinate commanders concerned. Orders to subordinate commanders and heads of services, which it is unnecessary for all recipients of an operation order to know, will, after co-ordination by the G.S. branch, be issued in the form of instructions by the responsible branch of the staff to those concerned.

10. *An operation order must contain only what the recipient requires to know.* Any attempt to prescribe to a subordinate at a distance anything which he, with a fuller knowledge of local conditions, should be better able to decide on the spot is likely to cramp his initiative in dealing with unforeseen developments and will be avoided. Such expressions as "will await further orders" will not be used.

Operation orders will enter into details only when absolutely necessary.

11. It may sometimes be convenient for a commander to distribute a sufficient number of copies of his operation orders to his immediate subordinate commanders for distribution to the formations or units under their command; the distribution list will then show what copies are available for such distribution.

Otherwise the distribution of copies of operation orders received from a superior, or the repetition of portions of such orders in the orders of a subordinate, can rarely be justified. As a rule the latter will require framing in greater detail and mere repetition will be insufficient.

12. In order to facilitate co-operation, the whole of the directions to each portion of a force taking part in an operation will normally be embodied in one operation order. When, for any reason, separate orders are issued instead of a combined order, each separate order will include such information regarding other troops as the recipient requires to know for purposes of co-ordination and co-operation.

13. If any portion of the force is to be detached for protective or other duties, the commander of the detachment will, if possible, be specified in the order. In the case of a detachment made up of different units, a rendezvous, where representatives of units will meet the commander, and also the time, should be arranged.

14. During the course of operations if it is necessary to modify the original orders all other units or commands affected should be informed.

15. *Sequence and form.*—An order will always be arranged in a logical sequence. This applies not only to written orders but also to those sent telegraphically or given verbally.

The most suitable form and sequence is that given below.

Adherence to this sequence is important, as it ensures that nothing is omitted by the originator and enables the recipient to grasp the contents with the minimum trouble and delay.

In a written order, to admit of easy reference, paragraphs will be numbered consecutively throughout and sub-paragraphs lettered. Sub-paragraphs will not be sub-divided by further lettering or numbering.

The insertion of headings to indicate the sequence of an order or the contents of paragraphs may not always be necessary, but a long order is often easier to grasp quickly if this is done.

16. The following is a suitable form for operation orders :—

SECRET

....Div. Operation Order No.....

Ref. Map.

Copy No.

Date.

Information.—

Regarding the enemy.—A statement of facts and deductions. To be limited to that necessary for the recipients to know to carry out their tasks.

Regarding our own forces.—In this connection the future indicative will not be used when referring to troops not under the command of the commander issuing the order, e.g. "the corps is advancing"; "is to attack" but not "will attack", etc.

Boundaries.—Boundaries laid down by the higher command.

Intention.—

This paragraph must give clearly and concisely what the commander issuing the order intends to achieve within the period covered by the order.

Alternative plans and conditional statements, depending on developments, will be avoided.

The future imperative tense will be used, e.g. "will advance", "will attack".

Method.—

Paragraphs in logical sequence dealing with the tasks allotted to the fighting troops and aircraft based on the intention paragraph and in sufficient detail to ensure co-operation.

Administrative.—

Paragraphs limited to what is necessary for all recipients to know, giving general instructions as regards supplies, ammunition, transport, repairs, medical and veterinary arrangements, traffic control, etc. Detailed instructions for the services will be issued separately by those directly concerned.

Intercommunication.—

Paragraphs as necessary regarding intercommunication, e.g. :—

Location of headquarters.

What routes the H.Q. of subordinate formations are to follow.

Liaison duties with flank formations.

Wireless control.

Method of communication to and from the air.

Details of special means of intercommunication.

Acknowledge.*

A. B.

Col., G.S.,

..... Div.

Method of issue.

Time of origin.†

Distribution.‡

* An operation order must be acknowledged by all recipients as a matter of routine, though not necessarily by message.

† The time at which the orders are signed by the originator.

‡ Distribution.

The distribution list should be in logical order, e.g. :—

Own formations and units.

Own subordinate commanders and services.

Own commander.

Own staff.

Attached troops.

File and war diary.

Formations and units co-operating.

17. *Appendices.*—It may often be advisable to place in appendices details such as the hostile order of battle, the composition of a detachment, the order of march, or the artillery plan of attack, leaving only the important essentials in the body of the order. Tabulation of such details tends to clearness.

18. *Maps and appendices* should be marked with the same copy number as the order to which they are attached and arranged to be read the same way up. *Maps* should unfold clear of the order so that both may be read together.

OPERATION ORDERS FOR MARCHES

19. Troops will be detailed in their order of march. If a separate commander is appointed for a body of troops, *e.g.* an advanced guard, he will be specified and the troops placed under his command will be detailed in order of seniority of arms and units, their order of march being left to the commander to arrange.

The detail of troops will be shown either in the body of the order or on a separate march table attached to the order as an appendix.

20. The following is a suitable form of march table.

SECRET

March Table issued with

1 Div. OPERATION ORDER No. dated.....

Copy No.....

Serial No.	Date	Formation or unit	Place		Starting point	Time	Route	Remarks
			From	To				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

Each unit or formation will be given a serial number to allow of easy future reference, and for this reason also each column is given a number. Any necessary instructions for the movement not given in the body of the order will be shown in the column for remarks.

21. Special orders will be required for the march of mechanized units and for the mechanized portion of mixed units. In the case of large formations using a single road, the move of all mechanical transport may require co-ordination by the H.Q. of the formation. (See also Sec. 14.)

OPERATION INSTRUCTIONS

22. Operation instructions are of two kinds, and for two purposes.

- Instructions which, while defining the general idea in the mind of the superior or the object which he wishes to obtain, give to the subordinate liberty to exercise his command in such manner as he may himself decide to further or to secure that object.
- Instructions given with special reference to a certain order and intended to assist the subordinate commander in carrying it out.

23. The heading of an operation instruction will be in the form :—

SECRET

1 Div. Operation Instruction No.

(Issued in conjunction with 1 Div. Operation Order No.
dated.....)

To..... Copy No.....
Date.....
Ref. Map.....

24. Operation instructions will always be arranged in the same sequence as that given for operation orders, only such headings being used as are necessary.

25. They will be addressed personally to subordinate commanders and will often be couched in less formal terms than orders, e.g. "your role is . . .".

If it is necessary that a subordinate commander should be informed of the scope of the instructions given to another subordinate commander, such information should be embodied in the operation instructions given to that commander.

Copies of operation instructions will not be issued.

ISSUE OF ORDERS AND INSTRUCTIONS

26. Orders and instructions must be in the possession of recipients in sufficient time to enable subordinate commanders in turn to frame and distribute their own orders, so that the troops may carry them out at the appointed hour. The hour of issue is the responsibility of the superior who issues the order and who must make due allowance for the time taken in distribution in the circumstances obtaining at the moment.

27. When detailed operation orders cannot be issued in sufficient time to enable the troops to make the necessary preparations, a preliminary "warning order" should be issued as soon as the general outline of the action has been decided. This order should be confined to such instructions only as will enable any necessary preparations to be made.

In addition, if lengthy orders are to be issued, a staff officer should be sent in advance to subordinate units to give them the lines on which they will have to work when the complete orders are received, unless this has been done at a conference.

28. Normally orders will be issued through the usual official channel. In cases of exceptional urgency an order may be given by a superior to a subordinate commander without passing through any of the intermediate authorities. In such cases the officer issuing the order will inform any neighbouring formations likely to be affected, and will confirm it through the usual official channel. The recipient in turn will inform his immediate superior of the receipt of the order and of the action he is taking on it.

ADMINISTRATIVE INSTRUCTIONS

29. Administrative instructions deal with such matters as medical arrangements, supply, transport, ammunition and other administrative details in connection with operations. They are drawn up by the branches of the A.G., Q.M.G. and M.G.O., each in its particular sphere.

30. Administrative instructions are issued to each recipient of the operation order concurrently with it, or as soon after as possible, to assist recipients in the execution of the order. They must be issued in ample time for the necessary administrative arrangements to be made.

31. The heading of an administrative instruction will be in the form :—

SECRET

1 Div. Administrative Instruction No.

(Issued in conjunction with 1 Div. Operation Order
No. dated.....)

Ref. Map..... Copy No.....
Date.....

32. The following are the principal matters to be considered by the several branches in the preparation of administrative instructions:—

- i. *A.G.'s branch*.—Reports and replacements of casualties; medical arrangements for evacuation of sick and wounded and location of medical posts and dressing stations; disposal of battle stragglers and prisoners of war; traffic control and sign-boarding; administration of captured areas and control of civilians; disposal of captured documents; supply of cash; burials.
- ii. *Q.M.G.'s branch*.—Accommodation of troops and prisoners of war; arrangements for water-supply; engineer services; supply arrangements; transport; veterinary and remount; allotment of transportation facilities; positions of depots, etc., for stores other than ammunition and ordnance.
- iii. *M.G.O.'s branch*.—Arrangements for ammunition supply; location of ordnance field parks and mobile workshops; arrangements for the supply of ordnance stores; salvage.

REPORTS

33. It is more important that the information contained in a report should be accurate and relevant and arrive in time to be of use than that the report should be long or elaborate. A summary containing the deductions drawn from the points of detail will be placed at the beginning of the report.

34. *Information*.—In reporting on an enemy, accuracy as regards times, places, the position, approximate strength, branch of the service, formation and direction of march of the troops reported on is of the first importance. The information contained in a report (or sketch) should be relevant.

35. The origin of the information should always be stated in the text of the message, *i.e.* whether it is the result of personal observation, of observation on the part of subordinates, or of statements made by inhabitants, and whether the last named are considered reliable or not.

Information obtained by personal observation, or by the observation of a trustworthy subordinate, is called "direct"; that obtained by statements of others is called "indirect."

36. "Negative" information is information as to the absence of the enemy from certain places at certain times, and is most valuable.

37. A plan or panorama sketch is a useful adjunct to a report, and it is often possible and convenient to dispense with the report and to convey all essential information on the plan or panorama. Clearness and relevancy are required, not artistic effect. Ranges in yards to conspicuous points should be indicated on such sketches.

A plan should be drawn roughly to scale, the scale being indicated both by drawing and in words, and plan sketches may take the form of enlargements of existing scale maps, such additional information as is relevant being shown on the enlargement.

38. Important points, *e.g.* width of a road or stream, whether a railway is single or double, should be described in words or figures.

39. The true north should always be indicated.

40. The place from which a panorama sketch is executed and the direction in which the sketcher is looking should be clearly indicated. (*See also* Sec. 9, 7.)

DETAILED RULES FOR PREPARING MESSAGES, ETC.

41. *All orders, instructions, reports and messages must be dated*.—Dates will be written in the form "3 Sep 25" and not in the numeral form "3/9/25." The names of months will be abbreviated by the use of the first three letters.

When using the message form (A.F. C 2128) neither the month nor the year will be inserted in the "date" space, which is for the day of the month only.

42. A night will be described thus:—

- "night 29/30 Sep" or
- "night 30 Sep/1 Oct"
- "night 31 Dec/1 Jan"
- "midnight 29/30 Sep"

43. Time will be described by reference to the 24-hour clock. Groups of four figures followed by "hrs" will be used. The first two figures represent the hour and the last two the minutes past the hour.

Example :—"0001 hrs" : one minute past midnight.

"0900 hrs" : nine o'clock in the morning.

"1200 hrs" : noon.

"1635 hrs" : twenty-five minutes to five in the afternoon.

The hour 2400 will not be used. Messages despatched at midnight will be timed 2359 hrs or 0001 hrs.

The abbreviation "hrs" is not necessary in the "Time of origin" space on the message form (A.F. C 2128), and will not be used.

In verbal messages each number is to be pronounced separately, "0" being named "owe."

Example :—"0317" : pronounced "owe-three-one-seven."

44. Unless otherwise stated the time of arrival of a body of troops at a point is the time of arrival at that point of the head of the main body.

45. The name of a place at which a headquarters is situated or from or to which a report or message is despatched will never be given, unless it is essential to ensure correct transmission or delivery, or to make the sense plain.

46. *Names of places* will be in block capitals, thus LONDON, and are to be described exactly as spelt on the maps in use. Care must be taken to prevent misunderstanding resulting from the existence of more than one place of the same name.

47. *Map references*.—If a map is referred to, the one used must be specified, unless, in the knowledge of the sender, no confusion can arise by the omission of the information. When stated the identity of the map used will be given under the heading of an order, instruction or report at the commencement of a message.

If the map referred to is squared or gridded the first time a place is mentioned it will always be followed by its co-ordinates and full use should be made of co-ordinates in giving locations. If no squared or gridded map is available the most suitable of the following methods should be used :—

i. Point of compass and distance from a reference point.

Example :—"Cross roads $\frac{1}{2}$ mile S.W. of HASELEY."

ii. Actual compass bearings, all bearings being true bearings.

Example :—"Cross roads true bearing 225° from HASELEY Church."

iii. By description.

Example :—"Cross roads $\frac{1}{2}$ mile S.W. of second E in (NOT of) HASELEY," the letter referred to being underlined, except in messages to be transmitted by signal, in which the underlining of individual letters of a word cannot be transmitted.

The four cardinal points of the compass are to be written in full, the abbreviations "N," "S," "E," and "W," only being used in denoting intermediate points.

Example :—"South of HASELEY" not "S. of HASELEY."
"S.W. of HASELEY" not "South-West of HASELEY."

48. *Roads* will be indicated by place-names on them, care being taken to name sufficient places to ensure that the road intended is followed. They will be described as "road BAGSHOT-CAMBERLEY" and not "BAGSHOT-CAMBERLEY road."

49. *Positions and areas*.—All positions will be described from right to left looking towards the enemy.

An area will be described by taking the northernmost point first and giving the remaining points in clockwise order.

50. *Boundaries*.—If generally parallel to the line of advance, will be described from rear to front, and in defence and withdrawal from front to rear. If generally parallel to the front line they will be described from right to left as in the case of a position.

In detailing boundaries between units or formations, the words "inclusive" or "exclusive", abbreviated to "incl" or "excl", will be used. These

words should be written *before* the place to which they refer and a locality should be described as inclusive or exclusive to the unit or formation to which the writer belongs, rather than as exclusive or inclusive to another.

51. *River banks* may be described as "right" or "left," it being assumed that the writer is facing down stream. Alternatively they may be described with reference to the compass, as for example the "North bank" or "N.E. bank" being that bank which lies generally to the north or north-east of the river.

52. The terms "right" and "left" applied to our own forces in retirement will be taken to refer to the original right and left flanks, as they were when facing the enemy.

53. Except in the above cases, indefinite terms, such as "right," "left," "before," "behind," "beyond," "front," "rear," "on the side of," must not be used unless it is made quite clear to what they refer.

54. Compass bearings will invariably be given as true bearings, except when a gridded map is used, when grid bearings will be given.

55. Unless otherwise stated, when troops are described as passing a place the reference is to the head of the main body.

56. Units and formations will always be described by the authorized abbreviations given in Appendix I, cardinal numbers being used to denote the particular formation or unit, except in the case of First (Second, etc.) Army. In all other cases numbers will be written as words, e.g. :—

"Two med btys are placed under the command of 3 Div . . ." but

"5 Div will advance . . ."

When it is desired to refer to a unit or formation from which a portion is excluded, the unit or formation will be named and the words "less . . ." used, e.g. :—

"2 Div less two Inf Bdes".

"1 RF less two Coys".

57. Abbreviations other than those authorized in Appendix I will not be used, except when no authorized abbreviation exists and if it is not possible that the abbreviation will be misunderstood.

58. Personal names and the word "NOT" should always be written in block capitals.

59. Ambiguous or conditional terms such as "dawn," "dusk," "as soon as possible," "should," "may," are inadmissible in an order and are only to be used in an instruction or report when there is a deliberate intention to be indefinite.

60. The following is a specimen report not intended for transmission by signals :—

"To :—1 LOYALS

Ref. Map *

No. 7

3 Sep 25

1.—(a) Enemy (estimated one pl.) holds FAIRLEY COPSE.

(b) Forward pls "C" coy now established MILES HILL. "D" coy making progress towards GREAT WOOD apparently unopposed. My forward pls about cross roads $\frac{1}{2}$ mile S.W. BEAR COPSE.

2. Intend turn enemy's right flank in FAIRLEY COPSE.

3. Am sending two pls to GREAT WOOD to assault FAIRLEY COPSE from that flank under cover smoke and small-arm fire from forward pls. Assault signal two white Very lights, probable time 1230 hrs.

4. Casualties 3 killed 8 wounded.

5. Present H.Q. FARM L. 3229. Propose moving S.W. corner FAIRLEY COPSE when captured.

B. JONES, Capt.

Comdg. "A" Coy.

1 LOYALS."

1140 hrs.

* Unnecessary, if no confusion can arise from its omission.

12. INTERCOMMUNICATION

1. The service of intercommunication is provided by :—

- i. Units of the Royal Corps of Signals.
- ii. Signallers and orderlies forming part of other units.
- iii. The postal service.

The postal service deals with private postal matter and those official letters of which the urgency does not justify their despatch through the signal service.

For further details of the postal service see Sec. 5, 3, x.

2. The responsibility for intercommunication in the field is governed by the following general principles :—

- i. The higher formation is responsible for the provision and maintenance of communications to the next lower formation or unit.
- ii. Responsibility for lateral communications is normally from right to left.
- iii. Fighting units are responsible for their own internal communications.
- iv. An infantry formation or unit is responsible for the provision and maintenance of communication with its supporting artillery.

When, for any reason, it has not been possible for communications to be provided in accordance with these principles it is the duty of any commander to take all steps which lie in his power to provide the communications required by the tactical situation.

3. To enable headquarters of formations to provide and maintain communications in accordance with these principles units of the Royal Corps of Signals are allotted to each formation and are known by the designation of the formation which they serve.

Fighting units either carry signallers on their establishment for the same purpose or are provided with sections or troops of the Royal Corps of Signals to take the place of regimental signal personnel.

4. In order to co-ordinate the various means of intercommunication, other than postal service, and to ensure that messages are dealt with systematically, a signal office is always established at the headquarters of every formation and at the headquarters of such units as carry signallers on their establishment or are provided with a signal section. Signal offices are also established at centres on the L. of C., and in rear areas when feasible, to deal with signal traffic from administrative units and services.

5. Intercommunication between aircraft and the ground is dealt with in Sec. 19.

SIGNAL TRAFFIC IN THE FIELD

6. No message should be handed to a signal office for transmission when it would serve the purpose if it were sent by post, and no message should be handed to a signal office to go as a telegram when it would serve the purpose if it were sent by despatch rider letter service.

It is the duty of senior signal officers of formations to make a periodical check of messages handed in to signals and to bring to the notice of the general staff infringements of this rule or of the rules laid down for the writing of messages (see paras. 19 to 29, below).

7. Telegrams are sent in the order in which they are handed in unless a special degree of priority is indicated by the writer. The different priorities for telegrams are shown below, and a space is provided in the form for the writer to fill in the priority of any except ordinary telegrams :—

- i. "Emergency signal service" messages connected with the working of the system.
- ii. "Emergency operations" messages.
- iii. "Priority" messages.
- iv. "Signal service" messages connected with the working of the system which require precedence.
- v. Other official messages.

(Note.—The Royal Navy and Royal Air Force recognize an additional category known as "Important." If any such messages are transmitted by Army Signals they will be given precedence after "Priority" messages.)

8. Any officer may originate a message for transmission by signals, and the message will be accepted by a signal office, provided that it is clearly written and signed with the name and appointment of the originator. The officer is responsible that the message is urgent enough to justify its being sent by signals and not by post.

9. Messages to go by the despatch rider letter service are marked "D.R.L.S." by the sender and are sent off by signals in batches at suitable times.

Very urgent messages may be marked "Special D.R." by certain officers entitled to do so and are sent at once by a special despatch rider.

10. The senior signal officer on the spot is alone entitled to send "emergency signal service" messages.

The appointments of other officers entitled to frank telegrams with the various degrees of priority or to send messages by special despatch rider will be published in standing orders and signal office personnel must be kept informed on these appointments.

In urgent circumstances any officer may mark a telegram "Priority" or a message for "special D.R.," but he will be responsible that his action is justified by the urgency of the message.

11. Important messages should, when there is a danger of their non-delivery or delay, be sent by more than one route or method and an acknowledgement of receipt obtained.

The fact that a message is important should be notified by the officer concerned to the signal office; signals are then responsible for selecting the methods of despatch to be employed, and for reporting to the originator if there is undue delay in the delivery of the message to the signal office of destination.

12. The originator of a message for transmission by signals is responsible for indicating whether:—

- i. the message may be sent as written by any method;
- ii. if sent by wireless the message must be enciphered;
- iii. the message must not be sent by wireless.

Spaces are provided on the message form for this purpose. The originator will be guided in his decision by the rules laid down as to the security of messages in the particular operations in progress and by the circumstances of the case.

13. Special arrangements will be made by the general staff at G.H.Q. regulating the censorship and despatch of private or press telegrams. They will not be accepted unless it has been officially notified that the signal offices are open for such messages, and they will not be allowed to delay official messages.

14. Communications of a secret nature should usually be in cipher if there is danger of their interception by the enemy, but it must be remembered that ciphering and deciphering cause loss of time. Messages giving warning of an enemy attack or calling for support may always be sent in clear.

RULES FOR PREPARING MESSAGES FOR DESPATCH BY SIGNALS

15. The large volume of signal traffic, due to the size of modern armies, the variety of arms composing them and the necessity of enciphering W/F messages, renders brevity, clearness and the strict observance of rules in writing of messages of great importance.

16. Copies of all messages will be kept by the originator.

17. A.F. C 2123 and, when necessary, envelope C 398 will be used for messages when available.

18. Nothing must be written above the space provided for the address "To."

19. Formations and units are allotted code names by the general staff.

In signal messages passing in front of corps headquarters originators will use code names in the addresses and text.

Code names will similarly be used in all telephone conversations in front of corps headquarters and in all radio telephone conversations throughout the theatre of war.

In messages from corps to corps, and in messages behind corps headquarters, originators will use the authorized abbreviations to denote formations and units.

20. *Multiple addresses.*—If a message is to be delivered by signals to more than one addressee, one copy of the message should normally be handed in to the signal office for each addressee* and all addresses must appear on each copy. For this reason, multiple addresses must be kept to a minimum.

It may often be convenient for multiple addresses to be arranged in lists, e.g. "List A," "List B," all concerned being informed of the composition of such lists. These lists are particularly useful for routine and movement orders, but are dangerous if used during active operations.

21. *Text.*—The text will commence with the originator's number, which includes distinguishing letters in the appropriate space.

Originators for whom no distinguishing letters are allotted in Appendix I may employ any combination of letters up to three in number, provided they have not already been allotted and do not give any indication of the identity of the sender, or his unit or formation.

22. Following the distinguishing letter a serial number will be given. This number pertains to the office or appointment held by the originator. On relief the series will be continued by his successor. A series will be repeated on reaching the figures 9999.

23. Reports and messages will always be arranged in the same sequence as that given for operation orders.

24. In the text roman numerals and the signs for yards, feet, inches, degrees, percentages, plus and minus are forbidden; a full stop will be indicated by the letters AAA, but the letter group AAA will not be used at the end of the text. Letter ciphers and important words will be written in block letters, letter ciphers being arranged in groups of five letters. Punctuation signs are not transmitted in signal messages; care must therefore be taken that their omission will not alter the sense of the message.

Underlining and the use of dashes or oblique strokes should only be resorted to when absolutely necessary, e.g. :—

"w/r", "Night 2/3 Sep".

Only one word, or abbreviated word, or combination of letters undoubtedly meaning one thing will be written in each space of the message form, e.g. :—

"KOVL", "LINCOLNS", "arty", "CRA", will each occupy one space.

25. *Ending.*—In the case of multiple addresses, when it is desired to inform addressees that the message has also been sent to other addressees, it will be ended thus :—

(Using code names) "Addsd KOLIN LOPTA KIRON"

(In clear) "Addsd 1 and 2 divs 4 cav bde" or "Addsd List A".

When action is required by some addressees only and the message is to be sent to others for information, the message will be ended thus :—

(Using code names) "Addsd KOLIN rptd LOPTA KIRON NOTIT"

(In clear) "Addsd 1 div rptd 2 div 4 cav bde 1 corps".

If an acknowledgment is required from those who have to take action on a message, i.e. those to whom it is "addsd", "ACK" will precede "addsd"; if an acknowledgment is also required from those to whom the message is "rptd", "all ACK" will precede "addsd". But in order to reduce the volume of signal traffic to a minimum, an acknowledgment will be asked for only when it is urgently necessary for the sender to know that a particular message has been received.

26. The time at which the message is signed by the originator will be entered in the "Time of Origin" space.

27. The "ror" (Time of Receipt) space is for use in signal offices, and the time entered therein may be used for calculating the time of transmission.

28. *Signature.*—All reports and messages will be signed by the originator with his rank and appointment and the formation or unit to which he belongs, though this signature will not, of course, be transmitted by signals.

The originator is responsible for warning the intercommunication personnel regarding the method of transmission of a signal message. This he does by signing in the appropriate space at the foot of A.F. C 2128. Each of the

* When this is not necessary the signal officer will inform the originator concerned.

spaces provided there contains printed instructions regarding the handling of the message.

The instructions applying to any particular message are those given in the space in which the originator signs his name.

It is unnecessary for the originator to delete the spaces not signed.

29. The following is a specimen message prepared for transmission by signals in front of corps headquarters:—

To
BEMOX—TELNA—KOPIT—LONGA—ROTAP—PINOT—BOXIT—Q

From
VILNA

Groups in Text

Originator's Number—O 43		Date 10	In reply to Number....	
ref	map	ALDRSHOT	command	one
inch	AAA	bridges	over	BLACK- WATER
RIVER	between	excl	BLACK- WATER	incl
EVERSLEY	will	be	prepared	demolition
forthwith	by	RE	assisted	working
party	TELNA	AAA	ACK	addsd
TELNA	ROTAP	rptd	BEMOX	KOPIT
LONGA	PINOT	BOXIT		
Time of origin 1630		T.O.R.		

Degree of Priority.

Priority

NOTE 1.—As "Q" is part of H.Q. 2 Div. there is no need to tell other recipients that a copy has been sent.

NOTE 2.—For the purpose of this specimen message code names may be considered to have been allotted as follows:—

BEMOX	4 inf bde	ROTAP	RE 2 div
TELNA	5 inf bde	PINOT	1 div
KOPIT	6 inf bde	VILNA	2 div
LONGA	RA 2 div	BOXIT	3 div

ORDERLIES

30.—I. The bearer of a verbal order or message should repeat it to the issuer and understand its purport; whilst the person to whom the order or message is delivered should commit it to writing, and request the bearer to sign it, if it is of any importance.

II. The bearer of a written order or message should know its purport, in case he loses the despatch or has to destroy it. It is sometimes advisable to give an orderly two messages—one real, the other false, the real one being concealed on his person.

iii. The bearer of a message, on approaching the addressee, will call out "message for" and the name of the addressee in a loud tone; he will then deliver his message and obtain a receipt. It is the duty of all to assist him in finding the addressee.

iv. An orderly will always be given a receipt for his message. The envelope, if there is one, will serve as such. The recipient must note the hour and date of receipt on it, sign and return it to the

bearer. The orderly is not to be detained longer than necessary.

- v. Orderlies bringing messages from advanced bodies of troops should carry them open. Commanders of troops whom such orderlies may pass on their way to the addressee are authorized to read the message, which they should initial. In carrying this out it is highly important that such orderlies are not detained a moment longer than can be avoided.
- vi. The sender will instruct the orderly as to his rate of speed, the route he is to take, and where he is to report himself on his return.
- vii. Commanders will assist in forwarding messages by all means in their power, supplying a new orderly, if necessary, or replacing tired horses by fresh ones.

PHONETIC, MORSE AND SEMAPHORE ALPHABETS

31. When it is necessary to spell out words in telephoning a message, the following phonetic alphabet will be used. This alphabet is common to the Royal Navy, Army, and R.A.F.

A.—Ac.	J.—Johnnie.	S.—Sugar.
B.—Beer.	K.—King.	T.—Toc.
C.—Charlie.	L.—London.	U.—Uncle.
D.—Don.	M.—Monkey.	V.—Vic.
E.—Edward.	N.—Nuts.	W.—William.
F.—Freddie.	O.—Orange.	X.—X-ray.
G.—George.	P.—Pip.	Y.—Yorker.
H.—Harry.	Q.—Queen.	Z.—Zebra.
I.—Ink.	R.—Robert.	

32. The Morse alphabet is shown in Fig. 7.

The Morse symbols for numerals are shown in Fig. 8.

33. The semaphore alphabet is shown in Plate V (page 40).

13. CIPHERS AND CODES

1. A cipher is a secret means of communication.

A code is a non-secret means of communication and is used for abbreviating the original text.

2. The following rules will govern the process of ciphering and deciphering messages :—

- i. The text of a cipher message will never contain words in plain language.
- ii. Ciphers or decipherers will never be written on the same sheet of paper as the original message.
- iii. Replies to cipher messages will be in cipher, except when the reply is in a stereotyped form, such as "Acknowledged", "Yes", "No", "Understood", etc., when they will be sent in clear.
- iv. Letter ciphers will be written in block letters in five-letter groups; figure ciphers will be written in five-figure groups.
- v. All papers used in the process of ciphering and deciphering will be destroyed.

3. The transposition cipher is a simple form of cipher which may be used in emergency when no other cipher is available.

In this cipher the letters of the original text are not changed, but their order is altered according to a key obtained from a keyword.

The following considerations should be borne in mind when selecting a keyword :—

- i. It should contain from 8 to 18 letters.
- ii. It may consist of one or more words.
- iii. It should be easy to remember and spell.

As the security of this cipher depends on the keyword, knowledge of the keywords used should be kept secret.

Keywords should be changed frequently if the traffic is considerable.




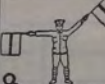
























FIG. 7

	UNITS												
	1	2	3	4	5	6	7	8	9	10	11	12	13
A													
B													
C													
D													
E													
F													
G													
H													
I													
J													
K													
L													
M													
N													
O													
P													
Q													
R													
S													
T													
U													
V													
W													
X													
Y													
Z													

FIG. 8

1. ● — — — —
2. ● ● — — —
3. ● ● ● — —
4. ● ● ● ● —
5. ● ● ● ● ●
6. — ● ● ● ●
7. — — ● ● ●
8. — — — ● ●
9. — — — — ●
0. — — — — —

PLATE V—THE SEMAPHORE ALPHABET

<p>FIRST CIRCLE</p>  <p>A</p>	 <p>1 F</p>	 <p>6 L</p>	 <p>Q</p>	 <p>Y</p>	<p>SIXTH CIRCLE</p>  <p>W</p>
 <p>B</p>	<p>END OF FIRST CIRCLE</p>  <p>2 G</p>	 <p>7 M</p>	 <p>R</p>	<p>END OF FOURTH CIRCLE</p>  <p>ERASE</p>	<p>END OF SIXTH CIRCLE</p>  <p>X</p>
 <p>C</p>	<p>SECOND CIRCLE</p>  <p>3 H</p>	<p>END OF SECOND CIRCLE</p>  <p>8 N</p>	<p>END OF THIRD CIRCLE</p>  <p>S</p>	<p>FIFTH CIRCLE</p>  <p>NUMERICAL SIGNAL</p>	<p>SEVENTH CIRCLE</p>  <p>Z</p>
 <p>D</p>	 <p>4 I</p>	<p>THIRD CIRCLE</p>  <p>9 O</p>	<p>FOURTH CIRCLE</p>  <p>T</p>	 <p>J</p> <p>ALPHABETICAL SIGNAL</p>	
 <p>E</p>	 <p>5 K</p>	 <p>OP</p>	 <p>U</p>	<p>END OF FIFTH CIRCLE</p>  <p>V</p>	

4. To illustrate the procedure of ciphering the following example is worked out with the keyword **FIRST DIVISION** :—

- i. From this keyword the transposition key is obtained as follows :—

Reading from left to right the first letter of the alphabet to occur is "D"; under this letter the figure 1 is written. The next letter of the alphabet to occur is "F"; under this the figure 2 is written. The next letter is "I"; there are four "I's"; the figure 3 is written under the first "I" to occur reading from left to right, the figure 4 under the second "I" and so on until all the letters of the keyword have been numbered according to their position in the alphabet.

The transposition key obtained from "FIRST DIVISION" would therefore be

F	I	R	S	T	D	I	V	I	S	I	O	N
2	3	9	10	12	1	4	13	5	11	6	8	7

- ii. Under this key the message must now be written, figures and punctuations being in letters. The sample message to be ciphered is "Right leading coy. is advancing on pt. 300 no opposition encountered."

This is written under the key as follows :—

2	3	9	10	12	1	4	13	5	11	6	8	7
R	I	G	H	T	L	E	A	D	I	N	G	C
O	Y	I	S	A	D	V	A	N	C	I	N	G
O	N	P	T	T	H	R	E	E	N	O	U	G
H	T	N	O	U	G	H	T	N	O	O	P	P
O	S	I	T	I	O	N	E	N	C	O	U	N
T	E	R	E	D								

The last line of letters should never be a complete line; if necessary dummy letters should be added to make the line incomplete.

- iii. The message is now transposed by reading the letters in columns, the order in which they are read being indicated by the figures of the transposition key. The cipher message will therefore begin with **LDHGO**, which are the letters under the figure 1 of the transposition key, followed by **ROOHO**, the letters under figure 2, followed by the letters under figures 3, 4, 5, etc.
- iv. The transposed message is written in groups of five letters.
- v. The total number of letters in the text will be given in figures immediately before the first cipher group.
- vi. The above message ciphered ready for despatch will therefore be :—

70 LDHGO ROOHO TIYNT SEEV R HNDNE
 NNNIO OOCGG PNGNU PUGIP NIRHS TOTEI
 CNOCT ATUID AAETE

- vii. If the last cipher group contains less than five letters, *never* complete it to a five-letter group.

5. *To decipher.*—Number off the keyword to form the key (*vide* para. 4). Divide the total number of letters of the cipher text by the number of letters in the keyword; this will give the number of complete lines of letters and the number of letters in the bottom line. In the example given above $70 \div 13 = 5$ complete lines of 13 letters and 5 letters in the 6th or bottom line.

Underneath the key construct a frame containing 5 lines of 13 spaces and a sixth line of 5 spaces.

The letters of the cipher text are then written vertically in the frame, beginning with the column under figure 1 of the key. When this column is filled in continue writing the letters in the columns under the figures 2, 3, 4, etc., of the key, until all the spaces in the frame are filled in.

The deciphered message is then read horizontally from the frame.

In the example given above the frame with the first six five-letter groups of the cipher text written into it would be :—

[illegible]

CHAPTER IV

MOVEMENTS OF TROOPS BY ROAD

14. MARCHES AND MARCH DISCIPLINE

(See F.S.R., Vol. II, 1929, Sec. 112 *et seq.*)

GENERAL RULES

1. The rate of marching throughout a column should be uniform. An irregular pace is most exhausting to the troops, especially to those in rear of the column.

No trumpet or bugle call is allowed on the march, columns being directed by signal. A system of rapid intercommunication throughout the column is essential. On service no compliments are to be paid unless special orders are issued to the contrary.

2. Space must be left on the outer flank of a column, both when marching and when halted, for the passage of officers and of orderlies and for the passing of columns in reverse direction. Unless orders to the contrary are issued, troops and transport will march on the *rule of the road* side of the road; but in dusty and hot weather, or in order to render it less conspicuous from the air a column may with advantage be opened out on each side of the road, the centre of the road being kept clear. It may even be advisable to increase the distances and intervals between men, but this will only be done by order of the commander issuing the orders for the march.

3. An average march under normal conditions for a large column of all arms is 15 miles a day, with a rest at least once a week; small commands or seasoned troops can cover longer distances under favourable conditions.

4. An officer, when available, will march in rear of each squadron, battery, company or other unit, to see that no man quits the ranks without permission, that the sections, files, vehicles and animals keep properly closed up, and that the column does not unduly open out.

5. By order of the commander of the column, distances given in Sec. 15, 3, 4 and 5, may be increased in dusty or hot weather, and reduced or omitted when marching by night and, by day, when an engagement is imminent.

When there is no possibility of meeting an enemy, the order of march of the main body will depend chiefly on the comfort of the troops. During hot weather every opportunity should be offered troops on the march to secure increased evaporation from the skin by opening or removing jackets and rolling up the sleeves. When marching in frost and snow the most efficacious measure against cold is an increased issue of rations; during halts the men should not be allowed to sit down or to fall asleep.

6. The normal march formations on a road are—

For cavalry	.. ..	Column of sections or of half-sections, <i>i.e.</i> 4 men or 2 men abreast.
For artillery	.. ..	Column of route, <i>i.e.</i> guns and vehicles in single file.
For A.F.Vs.	.. ..	Column of route, <i>i.e.</i> single file.
For infantry	.. ..	Column of route, <i>i.e.</i> fours.
For cyclists	.. ..	Half-sections, <i>i.e.</i> 2 men abreast.
For motor vehicles	.. ..	Single file.

On unenclosed ground it may sometimes be advisable to march on a broader front than in a single column in the normal march formation. It is better to march in a formation composed of several columns abreast than in a line formation, as marching in line is fatiguing for the troops, but one march formation should not be changed for another unless the latter can be maintained for a considerable distance.

7. Mounted troops.—When marching along a road not more than four horses if in sections (or groups), or not more than two horses if in half-sections (or files), should march abreast, including commanders, etc.

To avoid any increase in the length of columns, commanders, centre guides, etc., should march in the regulation distances between units, or fill up blank files.

The regulation distance between vehicles should be strictly preserved.

When a halt is ordered each vehicle must be drawn up at once by the roadside. Cross-roads should be left clear.

8. Dismounted troops.—When marching in fours not more than four men should march abreast, including commanders and supernumeraries. Bands and drums will conform.

Exact distances and covering are to be maintained at all times when marching in fours; the fact of marching at ease is not to affect the relative position of men in the ranks, or that of supernumeraries or commanders, unless orders to the contrary are issued.

9. Transport.—When a halt is ordered each vehicle should be drawn up at once on the side of the road. Cross-roads should be left clear. The regulation distance between vehicles should be strictly preserved, and no one other than the driver and one man to attend to the brake when necessary should be allowed to ride on any vehicle without written permission.

10. Starting point.—The starting point, which the head of the main body is to pass at a certain time, is fixed in operation orders. If troops are not all quartered together, it may be necessary for the commander to fix more than one starting point, so as to enable subordinate commands to take their places in the column of march punctually without unnecessary fatigue to the troops, and without crossing the line of approach of other commands. Each subordinate commander must fix his own local starting point and the time the head of his command must pass it so as to be able to pass the higher formation starting point at the hour specified.

In fixing the starting point, care must be taken that each unit reaches it by moving forward in the direction of the march. Fighting troops with their first line transport have precedence on the road over all other transport during the movement to the starting point.

Should a march begin in the dark, special arrangements for marking the starting point will have to be made and notified in operation orders. Lights may be used for this purpose, but they must be effectively screened from the enemy.

11. Halts.—On the Halt being signalled, everyone will at once halt and fall out on the same side of the road on which they are marching.

During a march halts should take place at regular intervals, and all ranks should know when to expect them and their duration. Normally these halts will be from 10 minutes before each clock hour until the clock hour, the signal for the halt and subsequent advance being given by unit commanders independently.

At the commencement of these halts dismounted troops will remove their equipment at once and mounted troops will dismount and loosen girths; riding horses' heads will be turned towards the space left clear for passing traffic.

12. Fords.—The following depths are fordable:—

	ft.	in.
Cavalry	4	0
Infantry	3	0
Tanks, medium	*4	0
" light	*3	0
Armoured cars	2	6
Tractors and horsed vehicles	2	6
Lorries and heavy ambulances	2	0
Motor cars	1	6
cyclists	1	0

* Provided the bottom of ford is sound.

Gravelly bottoms are best; sandy bottoms are bad, as the sand gets stirred up, thus increasing the depth of water.

The depth of a river is generally most uniform in straight parts; at bends the depth will generally be greater at the concave bank and less at the convex.

For this reason a river which is not anywhere fordable straight across may be found passable in a slanting direction between two bends.

All fords should be clearly marked by strong pickets driven into the river bed above and below the ford, their heads being connected by a strong rope. Marks should be made on those pickets which stand in the deepest water, at a height of 3 feet and 4 feet above the bottom, in order that any rise of water above the fordable depth may at once be evident.

13. Bearing strength of sound ice :—

Thickness	Load
2 inches	Infantry in open order
3	Infantry in fours
4	Cavalry or pack animals
6	Field artillery
8	Medium artillery
10	Heavy artillery
12	Tanks
15	Railway traffic

Route selected should be free from large cracks or of other ice and supported throughout by water. A shore bay of timber from the bank on to the ice is usually advisable to avoid breaking away the edge.

14. *Military bridges.*—Military bridges are classified according to the load they are designed to carry, as follows :—

i. *Light bridges.*—

(a) *Foot-bridges.*—For infantry in single file.

(b) *Pack-bridges.*—For infantry in file, cavalry in single file, light artillery on pack, and pack transport.

ii. *Medium bridges.*—For infantry in fours, cavalry in half-sections, and all vehicles up to a 5·7-ton axle load, and tracked vehicles up to 8 tons, with tracks not exceeding 8 ft. 8 in. in width.

iii. *Heavy bridges.*—For all vehicles up to a 16-ton axle load, and for tanks up to 18 tons.

iv. *Super heavy bridges.*—For axle loads and tanks in excess of the above.

A guard will be posted to prevent the passage on to the bridge of vehicles over the authorized weight the bridge is calculated to take, and the R.E. unit detailed for construction of the bridge is responsible for posting a maintenance party and for the provision of notice boards showing the class of traffic for which it is designed. When crossing a military bridge, infantry must break step; files or sections must not be closed up.

Horse traffic will cross at a walk, riding horses should be mounted, spare horses should be led singly by mounted men.

Mechanical transport will cross a floating bridge dead slow. If it becomes necessary to halt, heavy gun axles or tractors should rest as near as possible midway between two piers, so as to distribute the weight evenly over both piers.

15. *Loads on existing bridges.*—When it is required to know whether an existing bridge can carry a specified load, this information can be obtained :—

i. From the local civilian authority.

ii. By comparing the specified load with the civilian loads which use the bridge. Bridges unsuitable for heavy civilian loads are frequently labelled to that effect.

iii. By inspection. Except in simple cases only an expert in the particular type of bridge can form a reasonable estimate by inspection only.

- iv. By calculation, which, except in simple cases, may take much time. As a guide the following table gives the thickness of arches of brick in cement which will carry certain loads over varying spans :—

Span (in feet)	Thickness of arching at crown in inches	
	For loads up to 10-ton axles or 20 tons on tracks (2)	For loads up to 16-ton axles or 32 tons on tracks (3)
(1)		
10	12	13
15	15	17
20	17½	19
25	19	21
30	21	23
35	22	25
40	23	26
45	25	27
50	26	28
55	27	29
60	28	31
65	29	32
70	30	34

In the case of plain concrete or stone bridges these measurements will give a high margin of safety.

16. The gradients which are generally practicable are :—

- 1 in 25 for wheeled traffic when ascent is continuous for 5 miles or over
- 1 in 20 for wheeled traffic in general
- 1 in 17 for a cart road
- 1 in 10 for laden camels
- 1 in 8 for other pack animals
- 1 in 5 for foot traffic

For short distances infantry can advance over slopes of 1 in 2 and horsed artillery over slopes of 1 in 7.

GENERAL RULES FOR NIGHT MARCHES

17. For a night march the route should be previously reconnoitred both by day and by night. All points where checks are likely to occur, the position of branch roads or of places where the column might go astray and the best method of marking them must be noted. If the march is to be made across country, the route must be fixed by compass bearings. All landmarks which are visible by night should be noted, and the distance between those that lie on the line of advance should be measured in order that the progress made at night may be checked. Where the country is featureless it may be necessary to post men at certain points along the route, particularly at places where a change in the compass bearing has to be made. Men so posted must be given the compass bearing and the distance to the next post. It is often difficult for leaders to know in the dark when the destination has been reached; this should be some carefully defined landmark, or should be marked in some pre-arranged manner; its appearance by night will be noted, and a description of it inserted in operation orders, or, if it is desired to keep it secret, communicated confidentially to the commanders concerned. It may be necessary to employ local guides, but previous reconnaissance should, in most cases, do away with the necessity for these.

18. The march should generally be protected by small advanced and rear guards, usually composed of infantry only; flanks are best protected by pickets posted by the advanced guard. The distance of these bodies from the column will vary according to the darkness of the night.

- i. All ranks must know what to do in case of an alarm.
- ii. Every commander must have a fixed place in the column.
- iii. Regulation distances between units should be maintained whenever possible but on very dark nights may be reduced or omitted.
An officer should invariably march in rear of each unit.
- iv. The pace must be uniform.

When night marches are carried out without the protection of other bodies of troops, magazines should be charged but rifles should not be loaded. No one must fire without a distinct order.

Absolute silence must be maintained and no smoking or lights are to be allowed except with the permission of the commander of the force.

Hours and periods of halts should be arranged beforehand.

Units must not halt until they have regained any distance lost.

Men may lie down but must not leave the ranks during a halt.

19. To prevent troops behind it from going astray, the advanced guard, under instructions from the commander of the column, will block all branch roads which are not to be used, either by posting men at them or by placing branches of trees or lines of stones across them. Men posted for this purpose will be withdrawn by the rear guard. After crossing an obstacle or defile, where opening out is likely to occur, the column will advance about its own length, and then be halted until the rear is reported to be closed up. Staff officers will be detailed by the commander of the column to superintend this wherever necessary.

20. Protective measures must be arranged for adoption in event of a gas attack, and the procedure to be followed in event of attack by aircraft must be known by all ranks.

Noise

21. The chief causes of noise are : (a) in harness : mouthpieces of bits and links, spare and quick release ; (b) in vehicles : play of pole supporting pole bar, swingle-trees, wheels, trail-eye, and shield of gun.

No special stores are carried for the purpose of stopping the noises caused by the above. The following hints are given as a guide to the materials which may be made use of if obtainable.

To silence the noises caused by links of pole bar straps, breast collar, and quick release ends of traces they should be bound with strips of canvas and secured by stitching ; bits should be bound with cord or twine in such a way as to stop the play of the bar ; loops of bar supporting pole and swingle-trees, with cord or sacking ; pole, with sacking over the copper binding ; trail-eye, with sacking, leather or rubber ; drag washers, tied to a spoke or fitted with additional washers to a working fit. Wheels may be covered by motor tyres (eight to a gun and limber), leather belting 6 to 7 inches wide, 15 feet long laid along the tyre and tied across the felloes, or straw, hay, or rope bindings. To save the necessity of binding stirrup irons, spurs should not be worn. Accoutrements must be securely fastened to prevent them rattling. Troops should always break step when moving. Men should be warned that if they cannot refrain from coughing or sneezing they must press a handkerchief or some similar article against the mouth or nose.

MOVEMENTS OF ARMoured FIGHTING VEHICLES

22. Whenever circumstances permit, units of A.F.Vs. should march independently of columns of other arms, e.g. by parallel roads, across country, etc.

23. The capabilities of A.F.Vs. are only approximate and depend on the terrain and gradients. Tank battalions have proved themselves capable of marching 150 miles in three days, and fighting a major action during this period or of marching 60 to 70 miles prior to battle. These figures are to be regarded as the maximum endurance capacity. A normal day's march is based on the time in which the crew is in the tank rather than on the distance traversed. This time is about 7 hours and the distance traversed will then be about 50 miles.

In the case of armoured cars the maximum endurance capacity is about 10 hours' driving, giving a distance of about 250 miles. A normal day's march may be regarded as about 200 miles.

24. The circuit of action on one fill of petrol is :—

Light tanks	.. .. .	150 miles
Medium and close support tanks	.. .. .	100 "
Armoured cars (Rolls-Royce, Lanchester)	.. .. .	150 "

RULES FOR MECHANICAL TRANSPORT

25. The pace of mechanical transport vehicles will be carefully regulated and varied according to the type of vehicles comprising the convoy, and as to whether they are towing trailers or guns or running independently. Normally 10 miles an hour for solid-tyred lorries and 15 miles an hour for pneumatic-tyred vehicles will not be exceeded, and this pace will be reduced when passing through towns or villages. Loaded lorries should not move at a slower pace than 5 miles an hour, as this damages their engines.

As mechanical transport cannot, without damage to itself, move as slowly as horsed transport the M.T. portion of a "mixed" unit must either lead or remain in rear and start later.

This does not apply to first line transport vehicles, which are capable of moving, if necessary, at the same rate as dismounted troops and horsed transport.

26. When passing dismounted troops motor vehicles will move at as slow a pace as possible.

A regular distance sufficient to allow of sudden halts without a collision must be maintained between lorries moving as a column.

When moving up steep gradients columns of lorries should be allowed to open out.

27. Loaded vehicles will have the right of way over empty convoys, which will halt, if necessary, to allow them to pass.

28. The convoy commander will exercise his judgment as to the appropriate time to overtake other traffic, taking into consideration the nature and width of the road, amount of oncoming traffic, length of his column, etc. The fact that the commander of the convoy has decided to overtake traffic does not absolve each individual driver from the responsibility of deciding when he can overtake with safety.

29. On no account are any transport vehicles to "double bank" or to draw up on both sides of the same stretch of road.

Columns of lorries should not be halted at or near a corner unless sentries are placed to warn approaching traffic.

30. Mechanical transport vehicles when travelling after dusk will, unless otherwise ordered, carry lighted side and tail lamps; headlamps will not be used near the enemy. Clear instructions must be issued to drivers of vehicles working in the forward areas between dusk and dawn, and enforced by military police and traffic controllers, as to the forward limit beyond which all lights must be extinguished.

31. At every halt, when personnel fall out, drivers will look round their vehicles. Points for observation are :—

- i. Sufficiency of water, oil and petrol levels.
- ii. Signs of water, oil or petrol leakages.
- iii. Normal or excessive heat of engine, radiator, gear box, axle casing, wheel bearings, brake drums or other similarly vulnerable parts.
- iv. Loose wires. Bolts missing or obviously loose. Anything hanging down. Particular care to be paid to steering and brake joints.
- v. Tyres or tracks in good order.
- vi. Security of load.

Immediate report will be made to section or block commander, who will arrange for remedy if any defect has been discovered.

CARE OF MEN ON THE MARCH

32. Before the march unit officers should ascertain that all men are in possession of the regulation pattern footwear, that boots are serviceable, and especially that the uppers are pliable, and that socks are in good condition. Feet should be inspected to see that they are in good condition and that toenails and corns are not likely to cause injury, the services of the unit chiropodist being utilized as necessary. Only authorized equipment is to be carried, and attention should be paid to its fit and any necessary adjustment made. A clean pair of socks and a pair of light canvas shoes will be carried.

Marches should not be started on an empty stomach; for an early start a light meal to include sweet tea or coffee should be provided. Water-bottles should be filled only from an authorized source.

The care of the men's feet, etc., is the responsibility of regimental officers and not of the medical officer.

33. During the march men should postpone drinking until they have been on the road about 3 hours and should then sip from the water-bottles. Smoking increases thirst and should be confined to the early part of the march before the body has lost much water. Every effort should be made to promote passage of air within the ranks and to the individual by spacing, open coats, shirts, etc.

During short halts men should remove their equipment and rest by lying down, unless the ground is wet or frozen, and should relieve nature as necessary. The sanitary personnel will provide latrine paper and dig shallow trench latrines, urine pits and refuse pits as necessary at each halt. These will be filled in and marked before the unit moves off.

34. After the march feet should be washed and inspected, the services of the unit chiropodist being utilized where necessary. Serious cases of sore feet should be seen by the medical officer at once. After feet have been washed clean socks and the canvas shoes should be put on. The boots should be dried and dabbled. Socks should be washed, dried, stretched and holes darned.

CARE OF ANIMALS ON THE MARCH

Care of horses

35. Nothing should be carried beyond the authorized articles.

Men should rise in their stirrups and not lean on their rifles (if carried); they should see that the load is evenly distributed on both sides of the saddle. All mounted men should dismount from time to time. At halts, whenever possible, horses should be off-saddled or girth loosened and saddles eased. When saddles are removed, backs of horses should be hand-rubbed to promote circulation, and they should be allowed to roll. Loose or lost shoes will be given attention.

On a night march at the end of which hard work is expected, watering and feeding should be carried out an hour before dawn.

36. *Watering.*—Every opportunity should be taken for watering on the march. Always water before feeding, never immediately after.

Dismount, remove bits and loosen girths before watering.

Do not allow horses to go further into a pool to drink than necessary, or the water will be fouled for those coming after.

Do not move at a fast pace immediately after watering.

If possible, select watering place with sound bottom, good approach and water at least 4 inches deep. Running water with gravelly bottom is the best. Avoid dark-coloured water.

Animals do not drink well in the early morning. When an early start has been made, all animals should be watered after about 3 hours' march.

37. *Feeding.*—Give a small feed before a long march, however early the start may be.

Feed *en route* during marches over 5 hours. Remember that horses require a considerable time to consume their rations—not less than 5 hours in 24 should be allowed.

Remove nosebag when horse has done and let him graze if possible.

Opportunities to feed, water and rest men and horses should be found even during the progress of battle.

38. In hot climates horses should be protected from the sun, and in cold weather from winds and draughts.

Their protection from attack from the air must be constantly considered.

For protective and orderly duties a wise economy in horse-flesh can be made by using bicycles or other mechanical means available.

Care of transport camels and cattle

39. If possible, avoid marching in the heat of the day. Camels and cattle travel best, and with least fatigue, at night or in the cool of the morning and evening. The whole of the marching should be done between 4 p.m. and 9 a.m.

Avoid keeping camels loaded up a moment longer than is necessary. Men should be trained to load and unload as quickly as possible. Loads should not be carried more than 4 hours at a stretch.

Great care is necessary in balancing loads carefully and packing them as securely as possible to avoid unnecessary swaying and fatigue to the animal.

Cattle should never be driven beyond their natural steady walk, but they will travel much faster at night than during the day, without pushing.

Do not march more than 4 hours at a stretch.

40. Whenever possible, camels and cattle should be given 5-6 hours a day to graze and ruminate. Immediately after the morning march is the best time for this. The young shoots of the Camel Thorn are the best grazing for camels. Care should be taken to detect and avoid poisonous plants, some of which are readily eaten by camels.

Grain should be given at night mixed with some chaff or hay, and a good man will get up once or twice during the night and give his cattle a small feed. Nothing helps so much to keep them in condition.

Desert camels are the best for fast work. Camels bred in districts where water is plentiful require to be watered daily, but desert camels will usually not drink more than once in three days. Water should be given in the morning, before grazing, and with desert camels no marching should be done for several hours afterwards.

Cattle should be watered after the morning march and in the evening before starting. If possible, cattle should be grazed near water, where they can drink at will, and where grass is luxuriant.

41. The backs and feet of camels should be inspected daily after the morning march. Camelmen must do any repairs necessary to saddlery during the midday halt.

Wounds and sores on cattle are difficult to heal, and every effort should be made to prevent them by careful attention to the fitting of the yoke. The men should constantly look to this and make any small alterations which may be necessary at the midday halt.

Grooming is not usual; both camels and cattle thrive much better if they are rubbed over daily with a piece of sack or a whip.

42. Ticks should be removed daily after grazing. In a badly-infested country ticks are liable to collect in large numbers between the toes and cause sores. This may be prevented by removing the ticks and rubbing the skin with tar.

Skin disease must be constantly guarded against, and any suspicious patches, particularly between the legs, should be periodically washed with soda or wood-ashes and dressed with a mixture of sulphur and oil, or fat, 1-4. This should be issued regularly to camelmen, and a little tar may be added if available.

43. Provision must be made for the protection of animals from attack by aircraft.

15. TIME AND SPACE

1. It may be taken that all troops, mounted or dismounted, move to the starting point at the rate of 100 yards a minute.

i. The average rate of marching for a large body of troops composed of all

arms is $2\frac{1}{2}$ miles an hour, including short halts. Rates of movement for small bodies of troops in the field are approximately as follows :—

Arm (1)	Yards for each minute (2)	Minutes required to traverse 1 mile (3)	Miles an hour, including short halts (4)
INFANTRY— Usual pace	100	18	3
MOUNTED TROOPS— Walk	117	15	$3\frac{1}{2}$
Trot	235	8	7
Gallop	440	—	—
Trot and walk ..	—	—	5

The length of a pace in slow and quick time is 30 inches.

"	"	"	stepping out	"	33	"
"	"	"	double time	"	40	"
"	"	"	stepping short	"	21	"
"	"	"	side step	"	12	"

A side pace to cover off another man, as in forming fours, is 24 inches.

ii. The rates of marching of transport on a level road are :—

Horsed transport	$2\frac{1}{2}$ miles an hour.
Mule or pony cart, A.T. (2 mules or ponies)	$2\frac{1}{2}$ "
Bullock cart, A.T. (2 bullocks)	$1\frac{1}{2}$ "
Camel	2 "
Pack mule or pony	3 "
Pack bullock	2 "
Pack donkey	$1\frac{1}{2}$ "
Coolie	2 "
Motor lorries (solid-tyred)	10 "
Motor lorries (pneumatic-tyred)	15 "

These rates include short halts only

iii. The following are the approximate rates of movement of transport on a level road in single file :—

Pack mules or ponies	250 pass a given point in 10 minutes.
Camels	100 " " "
Pack bullocks	160 " " "
Army transport carts (mules or ponies)	100 " " "
Army transport carts (bul- locks)	60 " " "

On rough, uneven or hilly roads the above numbers should be halved.

iv. The following are the normal speeds for armoured fighting vehicles, including short halts :—

Type (1)	On roads (2)	Across country (3)	In the dark	
			With lights (4)	Without lights (5)
Light tanks	12 to 15 m.p.h.	7 to 8 m.p.h.	10 to 12 m.p.h.	5 m.p.h.
Medium and close support tanks	7 to 8 m.p.h.	7 to 8 m.p.h.	7 to 8 m.p.h.	5 m.p.h.
Armoured cars (Rolls-Royce and Lanchester)	25 m.p.h.	10 to 15 m.p.h.	20 m.p.h.	7 m.p.h.

In the case of an armoured force composed of light, medium and close support tanks, the normal speed of the main body, including short halts, is :—

<i>By day</i>	<i>In the dark (without lights)</i>
7 to 8 m.p.h.	5 m.p.h.

The normal hourly halt for tank units is 15 minutes.

2. Space allowed in column of route for :—

Cavalry or mounted rifles in sections	1 yard for each horse in the ranks.
Cavalry or mounted rifles in half-sections	2 yards
Infantry in fours	1 yard for 2 "men in "the ranks".
Cyclists in half-sections	1½ yards for each man.
Each pack animal (or pair)	4 yards.
" camel	5 "
" 2-mule or pony vehicle	7 "
" 1 or 2-horsed vehicle	10 "
" 4-horsed vehicle	15 "
" 6	20 "
" 8	25 "
" 2-bullock vehicle (2-wheeled)	10 "
" 4	15 "
" 4-bullock vehicle (4-wheeled)	20 "
" motor-car, van or motor ambulance	6 "
" gun and tractor (Medium Artillery)	20 "
" gun and tractor (Field Artillery)	13 "
" bus	10 "
" lorry or tractor	8 "
" tank or armoured car	6 "

Including distances.

Actual length.

3. To prevent minor checks in a column being felt throughout its length, the following distances will normally be maintained :—

In rear of infantry company	10 yards
" " squadron, horse drawn battery or equivalent unit	10 "
" " cavalry regiment, horse drawn artillery brigade or infantry battalion	20 "
" " cavalry or infantry brigade	30 "

4. For the purpose of calculating road space of mechanically-drawn artillery and A.F.Vs. the following average distances between vehicles, sub-units and units may be taken as normal, the distance being measured in each case from the tail of one vehicle to the head of the next :—

(i) *Mechanically drawn artillery :—*

	Medium	Field.
(a) Distances to be maintained <i>on the move</i> :—		
(1) Between vehicles	20 yards	20 yards
(2) Between sections (or blocks)	25 "	25 "
(3) Between batteries or brigades	50 "	50 "

(b) Distances to which vehicles should close up *at the halt* :—

(1) Between vehicles	4 "	4 "
(2) Between sections (or blocks)	25 "	25 "

(ii) *Armoured fighting vehicles :—*

In rear of light tanks	20 yards
" " medium and close support tanks	35 "
" " tank sections	50 "
" " tank companies	100 "
" " tank battalions	300 "
" " armoured cars	15 "
" " armoured car sections	60 "
" " armoured car squadrons	60 "
" " armoured car regiments	150 "

At the halt, sections will close up on the leading vehicle of the section, the distance between tanks being $1\frac{1}{2}$ lengths.

The normal distances in rear of sections and larger units will be maintained.

5. M.T. columns will be divided into blocks consisting of 5 vehicles. On good and level roads a distance of 15 yards between lorries and 60 yards between blocks may be taken as a fair guide, provided the drivers are skilled and well trained in marching discipline.

When a column is halted the 15 yards between lorries will be reduced to 2 yards, but the interval of 60 yards between blocks of 5 vehicles will be maintained, to allow of side-tracking any passing vehicles when necessary.

16. MOVEMENTS OF TROOPS BY MECHANICAL TRANSPORT

1. The movement of troops by mechanical transport will usually be confined to dismounted personnel, and the distance of the move will normally be limited to 40 miles, i.e. 2 days' march of the horse transport.

Troops so moved will be without transport on arriving at their destination, therefore machine guns, Lewis guns, ammunition, rations and all impedimenta required for immediate use will generally have to be carried by the troops moved.

2. Before ordering a bus move a commander must weigh up the following tactical considerations:—

- i. There are few things more visible or better targets to air forces than long columns of lorries, or troops engaged in embussing or debussing.
- ii. With infantry equipped with horsed transport a move by mechanical transport over any appreciable distance involves a separation of units from their first line vehicles and therefore from part of their essential fighting requirements.
- iii. The greater the pace of movement the greater will be the distances that can be covered and in consequence the greater the difficulties of communication between the various parts of the force.

3. *Essentials for the movement of troops by mechanical transport:—*

- i. Careful previous arrangements.
- ii. The move must be effected with the same detail and accuracy as a move by rail.
- iii. Close co-operation between the staff, the mechanical transport authorities and the troops.
- iv. Selection of suitable roads.
- v. Good discipline of the troops throughout the move.

4. Embussing and debussing points should be on straight lengths of broad road, with open ground on the rule of the road side and in the case of a debussing point with a suitable assembly ground to which the troops can move without crossing the road.

Whenever possible sites for these should be carefully reconnoitred in advance.

Villages, defiles and bridges must be avoided. Mechanical transport should never have to turn round on embussing or debussing points.

5. The following require special attention:—

- i. The selection and previous reconnaissance of embussing and, when possible, debussing points.
- ii. Troops to be embussed will be told off into unit groups of vehicles. The leading vehicle of each unit group will be marked by a flag, as also will be the point at which it is to draw up at the embussing point.
- iii. Unit groups will be told off into parties of 25 to a bus, 20 to a heavy lorry or medium six-wheeled lorry, 13 to a light lorry, and 8 to a van. These numbers may have to be reduced if machine guns and heavy impedimenta are also carried. Each party will be given a number corresponding to the number of the vehicle on which they are to embus. Parties will form up on the rule of the road side on the embussing point at the place at which their vehicle will halt.

iv. Prior to embussing, troops will prepare their Lewis guns for action in case of attack from the air.

6. The time taken to embus a body of troops will be affected by—

- i. The number of vehicles that can be loaded simultaneously;
- ii. Whether the operation takes place by day or by night.

Under favourable conditions it should be possible to embus a battalion, exclusive of its animals and vehicles, in 20 minutes, provided that the men have been told off beforehand into parties for each vehicle, and are suitably spaced alongside the embussing point prior to the arrival of the vehicles.

The speed of a bus column (in groups of 50 vehicles) may be taken as averaging :—

- (a) By day, 12 m.p.h.
- (b) By night, with headlights, 9 m.p.h.
- (c) By night, without headlights, 6 m.p.h.

7. In the preparation of operation orders for a march, involving the movement of troops by mechanical transport, the following points should receive attention :—

Order for the move, destination, time and date, role on arrival, composition of groups, road parties (time of start, arrival and route), advance parties and means of transport. Protection. Medical supplies, arrangements and equipment.

Air protection of embussing, debussing and halting points. Numbering of buses and parties. Allotment of embussing points to groups and arrangements for flagging them. Detail of spare vehicles and baggage lorries. March table to embussing point. Embussing table. Road picketing parties. Guides for billeting areas. Position of bus commander.

8. The following is a suitable form of embussing table :—

SECRET

EMBUSSING TABLE.

Issued with.....Operation Order No.....dated.....

Copy No.....

Serial	Date	Unit groups		Embus at		Troops arrive embussing pt. at Hrs.	Vehicles allotted		Detail of loads		Remarks
		Composition	Condr.	Place	Time		Type	Convoy serial No.	Personnel	Stores	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		1/Leicesters									

NOTES.—Col. (3). For reasons of convoy control unit groups should be in multiples of 5-vehicle loads.

Cols. (3) and (4). Names of units may be given across these columns as indicated; the detail of unit groups being given underneath.

Col. (12). E.g. halts, arrangements for night marches, air defence.

DUTIES OF OFFICERS COMMANDING BUS COLUMNS

9. An officer, known as the O.C. bus column, will be appointed to command every body of troops moving by mechanical transport :—

- i. He will notify the route to be followed to the O.C. M.T. unit, who will be responsible for the necessary instructions as to the guiding of the column.

- ii. He will ensure that all officers under his command are acquainted with the destination and route.
- iii. He will arrange with the O.C. M.T. unit for the numbering throughout from front to rear of the vehicles on the rule of the road side, and for the flagging of the leading vehicle of each unit group. If the transport unit consists of various types of vehicles, he will ascertain the number of each kind.

Buses and lorries of unit groups will be grouped separately, the buses preceding lorries. Spare vehicles will not be numbered, and will be marked "Not to be loaded."

- iv. He will give the order for the column to move when the embussing is completed; this will be notified to him by the unit group commanders by signal.
- v. He will make the necessary arrangements for the protection of the column while *en route*, especially in regard to attack from the air.
- vi. He will give the signal for halts, if any; the place, approximate time and duration should be notified in the orders for the move.
- vii. At the debussing point he will give the orders to debus, and unless time is an object, he will ensure that the mechanical transport clears the point before the troops use the road.
- viii. He can best control the column by travelling with the O.C. bus unit in the latter's motor-car, unless a car has been provided for his use during the move.

10. The O.C. M.T. unit will be responsible for march discipline and for ensuring that correct distances are kept between vehicles as laid down in Sec. 15, 5.

He will call on the office commanding bus column for personnel required for blocking roads, etc.

CHAPTER V

AIR FORCE CONTINGENT WORKING WITH A FIELD ARMY

17. ORGANIZATION, DISTRIBUTION AND COMMAND

1. *Units*.—The flying unit in the Royal Air Force is the squadron. The types of squadrons which are normally allotted to the air force contingent with an army in the field are :—

- i. Army co-operation squadrons.
- ii. Fighter squadrons.
- iii. Day bomber squadrons.

In addition night bomber squadrons may be allotted.

Bomber squadrons may be "armed" with single or twin-engined aircraft.

A squadron (with the exception of twin-engined bomber squadrons) consists of headquarters and three flights each of 4 aircraft (*i.e.* 12 aircraft for each squadron). Twin-engined bomber squadrons consist of headquarters and two flights each of 5 aircraft (*i.e.* 10 aircraft for each squadron). A flight is not a self-contained unit and should not normally be detached from its squadron.

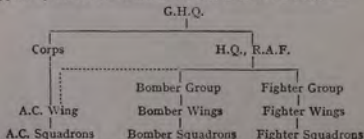
2. *Formations*.—A wing is the smallest formation and consists of two to four squadrons, but the number may be increased in special circumstances. Whenever practicable, each wing consists of squadrons carrying out similar duties. In addition to being numbered, wings are normally designated fighter, day (or night) bomber or army co-operation wings.

A group is the next higher formation. It consists of headquarters and a number of wings which is variable according to circumstances.

H.Q., R.A.F., is the headquarters of the air officer commanding the air force contingent with an army and is normally located with G.H.Q.

3. *Distribution and command*.—The responsibility of the distribution of the air forces in the field rests with the C-in-C., who will be advised by the A.O.C. It will be usual to retain air force formations, other than the A.C. formations, under the command of the G.H.Q., and to place the A.C. formations under the command of corps commanders.

A typical system of command in the field is as shown below :—



(It will be noted that in the case of an A.C. wing which is normally under corps, the A.O.C. will deal direct with the wing commander concerning such matters as personnel, technical questions, etc., with which army formations are not concerned).

4. *Staff organization*.—The air force staff in the field is organized in three branches :—

- i. The *air branch*, which deals with the employment of fighting units and the execution of operations.
- ii. The *personnel branch*, which deals with the administration, discipline, reinforcement and evacuation of personnel.
- iii. The *equipment branch*, which deals with the supply and maintenance of all war materials and includes the movement staff, which controls all movements.

It will be seen, therefore, that the air branch corresponds with the general staff, the personnel branch with the A.G.'s branch and the equipment branch with the Q.M.G.'s and M.G.O.'s branches of the army staff.

The services controlled by the various branches of the staff are similar to those which are controlled by the corresponding branches of the army staff.

In the case of the air force contingent working with an army the greater

part of the staff work in connection with supply and replenishment is carried out by the administrative staff of the army.

S. Establishments.—

Formation or unit (1)	R.A.F.					From Army (attached)			
	Personnel		Transport			Personnel		Transport	
	Officers (2)	O.R. (3)	Prime movers (f) (4)	Trailers (5)	Motor- cycles and side-cars (6)	Officers (7)	O.R. (8)	Vans or lorries (9)	Motor- cycles, bicycles (10)
H.Q., R.A.F.	32	248	15	4	3	(a)			
Fighter Group H.Q.	4	43	8	3	3				
Bomber Group H.Q.	4	43	8	3	3	(b)			
Fighter Wing H.Q.	6	44	9	3	1				
Bomber Wing H.Q.	6	44	9	3	1	(b)			
A.C. Wing H.Q.	7	46	10	3	1	(c)			
Fighter Sqn. (12 aircraft) ..	13	152	17	9	3		(e)		
Bomber Sqn. (single engine, 12 aircraft).	14	177	19	11	3				
Bomber Sqn. (twin engine, 10 air- craft).	22	273	27	10	6				
A.C. Sqn. (12 aircraft)	22	199	23	11	3	(d)			

(a) Includes 1 G.S.O. 2.

(b) Includes intelligence liaison section of one officer (I.L.O.), one clerk and one draughtsman.

(c) Includes one wing artillery officer.

(d) Includes intelligence liaison section and squadron artillery officer (total, 2 officers and 2 other ranks).

(e) The remainder of the army personnel attached include the R.A.F. signal sections provided by the R. Signals for each R.A.F. formation and unit for internal communications. Their establishments are not yet settled.

(f) Under "Prime Movers" are included all self-propelled vehicles, e.g. motor-cars, lorries, R/T tenders, Hucks starters, ambulances, etc.

18. INTELLIGENCE LIAISON SECTIONS

1. To expedite the investigation and distribution of information the following procedure is adopted :—

- i. An intelligence liaison section, consisting of an officer of the intelligence corps called the Intelligence Liaison Officer (I.L.O.) with the necessary clerical staff, is attached to each army co-operation squadron or day bomber wing headquarters. These sections form part of, but are detached from, the intelligence section of the general staff of the formation to which the air force unit is attached.
- ii. A wing artillery officer (W.A.O.) is attached to the headquarters of each army co-operation wing and acts as liaison officer between the C.C.R.A. and the wing commander, and co-ordinates the duties of squadron artillery officers within the wing.
- iii. A squadron artillery officer (S.A.O.) is attached to the headquarters of every army co-operation squadron and forms the link for intelligence purposes between the squadron and the artillery with which the squadron is co-operating.

All the above officers receive their orders and instructions direct from their respective military headquarters, but live and mess with the wing or squadron to which they are attached.

2. The task of the intelligence liaison section is to prepare and issue to observers details of the information which is required of them, to interrogate observers on their return from flights and distribute to the general staff and to artillery commanders the information thus received and any photographs which have been taken.

19. INTERCOMMUNICATION BETWEEN AIRCRAFT AND THE GROUND

1. Communication between aircraft and the ground is obtained by the following methods :—

- i. Wireless telegraphy.
- ii. Radio-telephony.
- iii. Visual signalling.
- iv. Message dropping and picking-up.

2. *Wireless telegraphy.*—Aircraft employed on artillery reconnaissance are equipped with W/T transmitters.

Artillery commanders, and horse, field and medium brigades, R.A., are supplied with receiving sets, provided and manned by the R.A.F., on a scale calculated to meet their requirements.

At present communication from the ground to artillery reconnaissance aircraft is by means of ground strips or visual signalling.

Medium reconnaissance aircraft are fitted with W/T transmitters and receivers for two-way communication with a special type of R/T tender which is normally only available at headquarters of corps.

3. *Radio-telephony.*—All A.C. aircraft carrying out close reconnaissance duties are equipped with two-way R/T. These aircraft communicate with a R/T tender manned by air force personnel.

There is a pool of these tenders with wing headquarters for allotment to army formations as required.

It is possible for one R/T tender to control two aircraft at the same time, but it is not practical for an aircraft to receive messages from more than one R/T tender. When two or more tenders are working with one aircraft, it is usual to detail one tender as the "Control" tender, whilst the second is the "Listening" tender. The latter does not normally transmit to the aircraft unless the situation demands it. R/T with close reconnaissance aircraft can be carried out up to a range of 16 miles.

The dispositions of our own troops must not be sent by R/T unless by some pre-arranged code or grid system. This information is normally dropped in message bags at the appropriate station.

4. *Visual signalling.*—Flares, ground strips, lamps, etc., may be used to indicate the position of troops to close reconnaissance aeroplanes.

Aeroplanes fire various coloured signal lights for the following purposes :—

- i. Green to call for formation ground indicators.
- ii. White to call for indication signals, viz., flares or ground strips, etc.

5. *Message picking-up.*—This is done by a hook fitted to the aeroplane. The message is slung between short poles 4 feet high.

6. The responsibilities of the army in connection with intercommunication between aircraft and the ground are as follows :—

- i. *Close reconnaissance.*—The R/T tender allotted to an army formation will come under the command of the signal officer of that formation. The orders to move and for the siting of the R/T tender when halted will be given by the signal officer concerned, as in the case of army wireless vehicles. An army orderly will be provided for the R/T tender to collect the messages received and to take them to the signal office concerned.

Three copies of messages will be made out by the R.A.F. to enable the signal office to pass one direct to the general staff, while retaining one for registration purposes in the normal way.

This ensures that messages reach the general staff with the least delay.

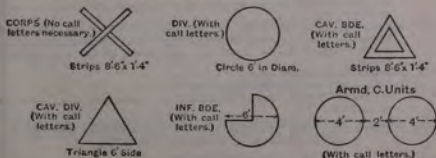
The R. Signals are responsible for the collection of messages dropped and the operation of a message picking-up station.

- ii. *Artillery reconnaissance.*—Artillery commanders are responsible that instructions are given to their W/T, R.A.F. operators as to :—

- (a) When and where to erect their masts.
- (b) The frequencies employed by the squadrons in whose area they are operating.
- (c) The area or station calls which are to be received.

As regards ground signals, the provision and laying out of the strips is the responsibility of the artillery; R.A.F. personnel is not provided for the purpose.

- iii. *Ground indicators and call letters.*—The form of ground indicators for the various headquarters is as follows :—



The identity of the formation is shown by call letters formed by ground strips placed on the left of the indicator as seen by the observer flying from the direction of the enemy. These call letters are arbitrarily fixed and constantly changed by the chief signal officer of the army formation concerned.

Care must be taken that ground indicators are not displayed or other indications given when they can be observed by enemy aircraft, as these will betray the location of the headquarters.

The army is responsible for laying out ground indicators.

20. MAINTENANCE OF AIR FORCE UNITS WITH AN ARMY

- i. The army is responsible for the provision of the following stores :—
 - i. General stores, clothing and necessaries common to both services.
 - ii. Rations and all ordinary supplies.
 - iii. Ordinary medical stores.
 - iv. Hutting and engineer stores.
 - v. Camp equipment and tentage.
 - vi. M.T. petrol and lubricants.
 - vii. S.A.A. for ground use.

2. The R.A.F. is responsible for the provision of the following stores:—

- i. Special types of ammunition and all bombs for use in aircraft.
- ii. Petrol and lubricants for aircraft.
- iii. Technical stores, such as aeroplanes, photo stores, air force special clothing and motor transport.

Categories (i) and (ii) are held in army base depots and category (iii) at air force base depots.

3. The army is responsible for the delivery of all the above stores to rail-head or to a point within 25 miles of air force units, whichever is nearer. Distribution from this point is the responsibility of the air force.

AIR FORCE MAINTENANCE UNITS

4. *Port detachment*.—This is a unit the duty of which is to arrange for and facilitate the clearance of air force material from the dock area.

5. *Aircraft depot*.—This is the air force supply and repair unit at the base. It holds a supply, appropriate to the situation in the theatre of operations, of stores and reserve aircraft and M.T. vehicles. The aircraft depot includes:—

- i. Stores section.
- ii. Aircraft repair section.
- iii. Aircraft engine repair section.
- iv. M.T. repair section.
- v. Salvage sections.

6. *Air stores park*.—An air stores park is solely a mobile distributing unit which acts as an intermediary between squadrons and the aircraft depot or other sources of supply. Stocks held are limited to items necessary at short notice for operations.

7. The army is responsible for carrying out the following services:—

- i. Medical arrangements from the time air force personnel are received in army medical units in the field to the base. The air force is responsible only for the evacuation of air force casualties to army medical units.
- ii. Works services, including the erection of permanent or semi-permanent hangars. (Portable hangars supplied by the air force are erected by army unskilled labour under the supervision of air force trained personnel.)
- iii. Provision of unskilled labour.
- iv. Provision of horsed transport, if required.
- v. Provision of shipping and of transportation vehicles in the theatre of operations.

21. NOTES ON THE SELECTION OF A LANDING GROUND AND MESSAGE PICKING-UP SITE

LANDING GROUND

1. The landing area should provide a clear run of approximately 600 yards in the principal landing direction, which will depend on the prevailing wind. It may be any shape which will allow an aircraft to land conveniently in four or five different directions, i.e. "T," "L" or "X" shaped.

2. The surface should be fairly level or of a rolling character, free from sharp changes of inclination, ridge or furrow, ditches or mounds. It should be sufficiently firm to take the weight of the aircraft for which it is required.

3. The boundaries of the area should be free from obstruction, such as high trees, telegraph wires, buildings, etc., calculated to interfere with the approach or the taking-off of aircraft. The landing ground should normally be accessible to six-wheeled vehicles.

4. If there is a possibility of the landing ground becoming a permanent one, road and rail access and communications generally, accommodation for personnel, water-supply, etc., should be taken into consideration.

MESSAGE PICKING-UP SITE

5. In choosing a site for a message picking-up station care should be taken to ensure that the line of flight of the aircraft, which will be into the wind, is clear of trees, telegraph poles, or any other obstructions for a distance of approximately 200 yards fore and aft of the station. If possible, the ground selected should be level, but when this is not possible the station should be on a mound or at the top of rising ground rather than in a hollow.

CHAPTER VI

FIELD ENGINEERING

22. FIELD WORKS

(See also Manual of Field Works (All Arms).)

1. Field works are classified as :—

- i. *Work for which formations and units of infantry or other arms are responsible.*—This will be carried out under the orders of the infantry (or other arms) commanders, with materials supplied by the engineers, but without engineer supervision or assistance other than technical advice, if required, or minor assistance in technical details, such as fixing of timbers in completed shelters.
- ii. *Work for which the engineers are responsible.*—This will be carried out solely by engineer units, or an engineer unit with the assistance of working parties from infantry or other units, or by civil labour.

ORGANIZATION OF WORK

2. In all field engineering work two principal officers are concerned :—

- A.—The officer in charge of the work.
 - B.—The officer commanding the working party.
- (In minor works one officer may act in both capacities.)

OFFICER IN CHARGE OF THE WORK

3. The officer in charge of the work is responsible for :—

- i. Making the preliminary reconnaissance.
- ii. Tracing out the work.
- iii. Demanding the working party.
- iv. Organizing the working party in reliefs to suit the work.
- v. Supplying materials and extra tools if necessary.
- vi. Supplying guides to ensure that the working party actually arrive on the site of the work.
- vii. Seeing that the work is completed as designed.
- viii. Arranging for covering party, if required, in addition to the working party.

OFFICER COMMANDING THE WORKING PARTY

4. The officer commanding the working party is responsible for :—

- i. The disposal of the men on the work.
- ii. Issuing all orders as regards smoking, lights, talking, etc.
- iii. The completion of the work to the satisfaction of the officer in charge of the work as regards both quantity and quality.
- iv. It is also his responsibility to decide whether in the event of suffering serious casualties the men should be withdrawn temporarily or an attempt made to carry out the task at all costs. If heavy casualties are anticipated, the authority which orders the work must give definite directions as to its relative urgency.

Task work should be given whenever possible.

PREPARATORY MEASURES

5. When reconnaissance is possible, before sending in demands, the officer in charge of the work will make a reconnaissance of the work, if possible by daylight.

He should take with him, whenever conditions permit, a tracing party to mark out the work and the guides who will direct the working party from the

rendezvous to the work. If possible, the officer who will command the working party and some of his N.C.Os. should take part in this reconnaissance.

Before starting, they should all be informed where the work is, what it is, and its purpose.

6. Note should be taken of the following points :—

- i. The route to the work involving the least fatigue and delay and the time required to reach the work (plenty of time must be allowed, remembering that a large party moves very slowly, especially across country or in trenches in single file). If the enemy's harassing fire is heavy, it may be necessary to tape out routes across country; these may involve special measures being taken to cross trenches.
- ii. Landmarks which assist in locating the site of the work and the route to be followed; if none exists, artificial marks should be erected.
- iii. The guides should be shown the rendezvous at which their parties will be ordered to report.

7. The work should next be marked out, and the O.C. the working party will decide, in consultation with the officer in charge of the work, how best to distribute his men. This should be done by platoons and companies.

The limits of each platoon and company should be clearly marked; each guide should be shown the points to which he must bring his party, and the extent of its task. The officer in charge of the work, having reconnoitred and laid out the work, will make a rough estimate of the amount of each sort of work, digging, carrying, etc., and an estimate of men, time, tools, and material required.

He will then :—

- i. Submit his demand for these, in quadruplicate (as shown on specimen form, para. 13 below).
- ii. Arrange for the necessary materials, tools, etc., and for their transport, ensuring delivery of these at the rendezvous before the arrival of the working party.
- iii. See that arrangements are made for the provision of a covering party if required.

8. On receipt of the working party demand, the headquarters of the formation will issue orders to the units supplying the working party. Working parties will consist of complete units, i.e. companies or platoons, with their normal proportion of officers and N.C.Os. If necessary, the minimum working strength will be specified in the orders, e.g. "two platoons, minimum working strength 50."

9. When there is not sufficient time for reconnaissance before submitting demands, the officer in charge of the work will base his demands on previous knowledge of the ground and large-scale maps.

He will also :—

- i. Detail guides (from the rendezvous to the site of the work) to meet the working party at the rendezvous.
- ii. Request that the O.C. the working party, with officers or N.C.Os. representing companies or platoons, be at the rendezvous one hour before the remainder of the working party arrive there.

The officer in charge of the work with a tracing party and guides will show the latter the rendezvous, and thence proceed to the site of the work, where a reconnaissance will be made and work marked out if conditions permit.

When the O.C. the working party arrives at the rendezvous with his advance party, the guide sent back by the officer in charge of the work leads him to the site, where the latter officer explains the work to be done, and hands over any templates that may be necessary.

The O.C. the working party then decides how to distribute his companies and platoons.

The main body of the working party, on arrival at the rendezvous at the appointed time, is taken by guides to the site of the work, where the O.C. the working party marches the men straight to their tasks.

TRACING AND SETTING OUT WORK

10. Any work that is to be executed should be marked out beforehand by tracing tapes (each tape is 50 yards long) or by Hambro' lines, pickets, spitlocking, etc.

Tracing often has to be done by night, in which case preliminary reconnaissance is important; the direction should be checked at frequent intervals by compass or by measuring the distances at right angles to a known line. The steel helmet and box respirator must be taken off before the compass is used, as both these articles affect it.

SIMPLE FIELD GEOMETRY

11. To lay out a right angle. Let X be a point in a given straight line AB (Fig. 9) from which it is required to set off a right angle.

From X measure off a distance of 4 units XC along AB. Take a piece of line or tape 8 units long, apply one end to point X, and the other to point C; find a point in the tape 3 units from X, and, seizing it at this point, draw the bight out to D, till the line is taut, then CXD is a right angle. For example, if 1 foot is the unit—XC=4 feet, XD=3 feet and CD=5 feet. The longer the sides of the triangle, the more accurate will be the right angle, and it will be found that when laying out long lines, such as a parade ground, or football ground, the sides of the triangle should not be less than 16 feet, 12 feet and 20 feet.

FIG. 9

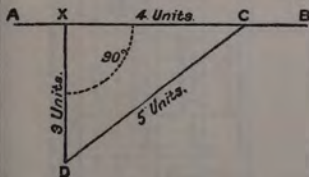
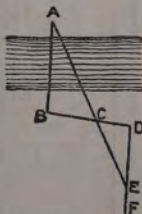


FIG. 10



12. To find the distance between any two points A and B when it cannot be measured directly. From B (Fig. 10) lay off the line BD as nearly at right angles to AB as possible, D being at any convenient distance. In BD select a point C so that BC is some multiple of CD. From D lay off the angle BDE equal to the angle ABD, and on the opposite side of the line BD. Make DE of such a length that the point E is in line with A and C.

Then $AB : BC :: DE : CD$,

$$\text{or } AB = \frac{BC \times DE}{CD}$$

13. SPECIMEN OF A WORKING PARTY DEMAND.—

WORKING PARTY DEMAND, NIGHT 22/23 MARCH 1931, "A" FIELD COMPANY, R.E.

64

Serial No.	Date	Number of working men	Unit* providing party	Rendezvous	Time Hrs.	Guides	Tools	Task †	Officer in charge of work	Remarks
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1	22nd	40		(Map ref.) Corner of Ham Wood	1800	Field coy., Sapper Pick	1 shovel per man 1 pick per two men	Digging communication trench between posts B and C, 4 hours' task work	Lt. Jones, R.E.	Serial Nos. 1 and 4. Officers and N.C.Os. not digging to bring 6-foot sticks marked in feet.
2	22nd	30		(Map ref.) R.E. dump, Guy's Farm	1800	Field coy., Sapper Screw	Nil	Carrying wiring stores to post B, 2 journeys	Lt. Jones, R.E.	
3	22nd	20		(Map ref.) Corner of Ham Wood	1900	Field coy., Sapper Spade	Nil	Wiring in front of posts B and C, 4 hours' task work	Lt. Jones, R.E.	
4	22nd	40		Do.	2359	Field coy., Sapper Wire	1 shovel each man 1 pick every two men	Digging communication trench between posts B and C, 2nd task, 4 hours' task work	Lt. Smith, R.E.	

* This column will be filled in by the General Staff.

† State whether task or time work and probable duration. If duty is carrying stores, state number of journeys between dump and site of work.

Copies—2..... Z Brigade

1..... C.R.E.

1..... O.C. Field Coy.

Sd.....

O.C. "A" Field Coy.

14. TABLES OF TOOLS CARRIED IN THE FIELD.—

Other than those allowed for machine guns or as vehicle or tank equipment

Detail	Cavalry brigade	Cavalry regiment	Horse artillery battery	18-pr. battery	4.5-in howitzer battery	Light battery	60-pr. battery	6-in howitzer battery	Heavy battery	Anti-aircraft battery	Field squadron, R.E.	Field company, R.E.	Field park com- pany, R.E.	Army troops company, R.E.	H.Q. infantry brigade	Infantry battalion	Tank battalion	Divisional reserve (a)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
Axes, felling ..	—	14	6	6	6	4	8	8	12	8	64	49	18	36	—	16	16	—
Axes, hand ..	1	7	—	—	—	4	—	—	—	—	48	40	10	36	1	8	16	—
Axes, pick ..	160	12	36	36	42	16	4	4	36	24	79	107	49	98	550	76	3	435
Crowbars ..	—	3	3	3	3	2	2	2	6	6	12	8	4	8	2	8	3	—
Hooks, bill ..	—	12	18	18	21	8	4	4	12	24	40	39	16	20	—	20	—	—
Hooks, reaping ..	4	36	12	12	12	48	—	—	12	—	16	13	10	6	—	20	—	—
Sandbags ..	—	—	—	—	—	—	—	—	—	—	200	400	400	800	—	—	—	—
Saws, cross cut ..	—	—	—	—	—	—	2	2	2	—	8	4	6	12	—	—	4	—
Saws, folding ..	—	3	6	6	6	4	4	4	6	—	12	4	4	—	—	12	—	—
Saws, hand ..	—	4	18	18	21	4	4	4	6	10	40	35	35	67	—	1	21	—
Shovels ..	200	18	36	36	42	48	16	16	48	24	96	111	60	122	840	100	3	860
Spades ..	—	—	30	30	36	—	4	4	48	24	8	10	10	16	—	10	—	—

(a) Carried by Field Park Coy., R.E.

15. TABLE OF TIME, MEN AND TOOLS REQUIRED FOR THE EXECUTION OF CERTAIN FIELD WORKS.

It is assumed that :—

- i. All tracing and marking out has been done beforehand.
- ii. Materials are on the site of the work, except when provision for carrying is made.
- iii. The labour is ordinarily trained infantry working parties.
- iv. Rain is not falling.
- v. The march to work does not exceed $1\frac{1}{2}$ hours.

Nature of work (1)	Unit or party (2)	Time (3)	Amount of work (4)	Tools for each party (5)	Remarks (6)
(1)—ENTRENCHING					
1. Excavating	1	1 hour ..	20 cubic feet	1 pick 1 shovel	Soil average easy; increase by 50 per cent. for very easy soil; decrease by 30 per cent. for very difficult soil. Decrease by 30 per cent. for very dark nights.
	1	4 hours ..	60 cubic feet	Do.	Maximum throw 12 feet and lift 4 feet, or maximum lift only 9 feet. When these maxima are exceeded, one shoveller, with one shovel, is required for every two diggers. When depth of trench exceeds 4 feet, one shoveller, with one shovel, is required for every two diggers, to clear berms and level parapet; parapets must be left heaped and uneven. In heavy clay provide sticks as scrapers. Officer in charge of work is responsible for the provision of any special tools, such as crowbars, spare pick handles, spades, axes, billhooks, required by the nature of the soil. One pick between two diggers or one pick between three diggers will suffice in certain soils.

ii. Moving earth 25 yards, depositing and return	1	2 mins.	..	1 cubic foot	2 wheelbarrows ..	Spare wheelbarrows or stretchers being filled while the others are being emptied.
	2	2 mins.	..	1 cubic foot	2 stretchers	
	1	2 mins.	..	$\frac{1}{2}$ cubic foot	1 sandbag	Sandbags ready filled—dumped, but not emptied.
iii. Filling sandbags ..	3	1 min.	..	1 bag ..	3 shovels	Sandbags to be three-quarters filled.
(2)—REVTMENTS, ETC.						
i. Sandbag revetment—						
(a) Filling sandbags				See (1) iii, above		Size of sandbag, 20 by 10 by 5 inches.
(b) Carrying sandbags to site, etc.				See (1) ii, above		Alternate courses of headers and stretchers.
(c) Building sandbags	2	2 mins.	..	1 square foot of revetment	2 filled bags 1 flat beater	Flat beater may be a billhook or a spade.
ii. Sod revetment—						
(a) Cutting sods ..	3	3 mins.	..	5 sods .. See (1), ii, above	3 sharp spades ..	Size of sod 18 by 9 by $4\frac{1}{2}$ in. 1 sod to be taken as $\frac{1}{2}$ cubic foot.
(b) Carrying sods to site, etc.						
(c) Building sods ..	2	3 mins.	..	1 square foot of revetment	1 shovel or spade ..	Allow 5 sods, each 18 by 9 by $4\frac{1}{2}$ in. per square foot of surface revetted 18 in. thick.

Nature of work (1)	Unit or party (2)	Time (3)	Amount of work (4)	Tools for each party (5)	Remarks (6)
iii. Sheeting and anchored pickets	10	30 mins. ..	10 feet run of revetment	2 mauls 1 saw 1 billhook 1 pair pliers 2 shovels 1 pick 1 crowbar	Trench cut to section. Sheeting consisting of corrugated galvanized iron sheets, planking, hurdles or expanded metal. Wire, sharpened pickets, and sheeting distributed at frequent intervals on site. 1 anchorage picket to each main picket. 8 strands of wire from each picket to anchorage. Anchorage pickets 8 feet from main pickets. With angle iron pickets use sledge hammers instead of mauls. 2 men on anchorage pickets. 2 men on main pickets. 2 men sheeting. 2 men wiring. 2 men filling and trimming.
iv. Sheeting and small "A" frames	7	30 mins. ..	10 feet run (of trench)	2 picks 2 shovels 2 mauls 2 spades 1 saw 1 hammer nails	Trench cut to section. Materials distributed at frequent intervals. Sheeting consisting of corrugated galvanized iron sheets, planking, hurdles or expanded metal. Allow 15 mins. for each corner. With rounded corners time includes bending the corrugated galvanized iron. 2 men supplying materials. 2 men trimming and packing. 3 men placing frames.

v. Fences, rough, making	3	20 mins.	1 bundle	2 billhooks .. 2 knives 1 mallet 1 pair pliers	Materials: 75 lb. brushwood and 60 ft. of wire or yarn for each hurdle, 6 ft. by 2 ft. 9 in. Weight of each complete, about 56 lb. Brushwood ready cut on site.
vi. Fascines, making ..	4	1 hour	1 fascine	3 billhooks .. 1 handsaw 1 pair pliers 2 knives 1 maul 1 choker	Materials: 200 lb. of brushwood and 60 ft. of wire or hoop-iron (40 ft.) per fascine, 18 ft. long by 9 in. diam. Weight complete about 140 lb. Cradle for making requires 10 pickets, 6 ft. 6 in. by 3 in. diam. All materials on site.
(3)—CUTTING AND FELLING					
i. Trees, felling ..	1	1 min.	1 in. in diam.	1 felling-axe or saw..	Up to 12 in. diam. If over 12 in. diam., allow time in mins. = $\frac{d^3}{144}$ where "d" = mean diam., in inches. If only hand-axes are available allow twice the time as calculated in both these rules.
ii. Woods, clearing of brushwood and small trees	10	2½ mins.	20 sq. yards (up to 12 in. diam.)	10 billhooks .. 4 felling-axes 2 saws, cross-cut 4 saws, hand 1 grindstone 2 whetstones	All hands felling at first, then a proportion detailed for collecting and removing according to purpose in view. Produce: about 5 lb. brushwood for each sq. yard.
iii. Hedges, cutting stems	2	5 mins.	1 yard run (up to 2 in. diam.)	1 billhook or hand-axe 1 saw 3 fathoms of rope	Average stiff thorn hedge. If necessary use rope to expose lower stems to the cutting tool.

Nature of work (1)	Unit or party (2)	Time (3)	Amount of work (4)	Tools for each party (5)	Remarks (6)
iv. Brick walls, cutting loopholes in	1	30 mins. ..	1 loophole ..	1 pick or 1 crowbar	Up to 18 in. thick. If possible, obtain a mason's chisel and hammer.
v. Brick walls, notches in	1	10 mins. ..	1 notch ..	1 pick or 1 crowbar	Up to 18 in. thick. If possible, obtain a mason's chisel and hammer.
(4)—WIRE ENTANGLEMENTS					
i. French wire	10	Day, 10 mins. Night, 20-30 mins.	50 yards ..	1 pair pliers 9 windlassing sticks Gloves, if desired 26 long pickets 4 anchorage pickets 6 coils French wire 24 staples 3 coils barbed wire † 2 spirals barbed wire *	Double row of French wire, coils 6 ft. apart, thickened with horizontal barbed wires and loose wire between. * Two coils barbed wire for thicken- ing entanglement, if spirals are not available.
ii. Double belt of concer- tinas	8	Day, 20 mins. Night, 30-35 mins.	50 yards ..	1 pair pliers 7 windlassing sticks Gloves, if desired 34 long pickets 4 anchorage pickets 16 concertinas 2 coils barbed wire †	2 rows of concertinas 6 ft. apart, thickened with horizontal wires.

iii. Low (or knee-high) wire entanglement	8	Day, 30 mins. Night, 1-1½ hours	50 yards ..	1 pair pliers 7 windlassing sticks Gloves, if desired 54 pickets 2 ft. 6 in.- 3 ft. 6 in. long 2 coils barbed wire † 3 coils barbed wire (50 yards) 4 spirals*	2 rows of pickets 6 ft. apart. * Four coils barbed wire for thickening entanglement, if spirals are not available.
iv. Double apron fence ..	11	Day, 30 mins. Night, 45-60 mins.	50 yards ..	1 pair pliers 10 windlassing sticks 20 long pickets 40 short pickets 7 coils barbed wire †	
v. Entangling hedges, etc., rough abatis	8	20 mins. ..	50 yards ..	2 billhooks 2 pairs pliers 5 coils barbed wire (50 yards)	

† Coils of barbed wire are 130 yards coils, unless otherwise stated.

23. EFFECT OF WEAPONS

1. The heights over which an average man can fire on level ground are:—

Lying down	..	..	..	..	1 ft.
Kneeling	..	..	..	..	3 ft.
Standing	..	..	..	..	4 ft. 6 in.

A higher parapet can be used when firing uphill, and a lower one must be used when firing downhill.

RIFLE FIRE

2. Modern military rifles are sighted to about 2,800 yards. Their maximum range may be taken as about 3,700 yards. The slope of fall of the bullet varies from about 1/120 at 600 yards and 1/30 at 1,100 yards, to 1/4 at 2,200 yards.

The following table gives the maximum penetration of a single pointed rifle bullet into various materials. It does not allow for a number of bullets hitting on or near the same spot. *To be bullet-proof under service conditions, the thickness of all material must be about 50 per cent. greater than that given in the table:—*

Material	Maximum penetration	Remarks
	inches	
Steel plate, ordinary mild or wrought iron	2	
Shingle	6	Not larger than 1-inch ring gauge.
Coal, hard	9	Between 1-inch boards.
Coal, small kitchen	15	Between 1-inch boards.
Brickwork, cement mortar	9	
Brickwork, lime mortar	14	
Chalk	15	
Sand, confined between boards, or in sandbags	18	With dry sea or desert sand this may be reduced to 12 inches.
Sand, loose	30	
Earth, free from stones (unrammed)	40	Ramming earth reduces its resisting power.
Sawn timber—		
Hardwood, e.g. oak	38	In timber the penetration is much less in round logs than in scantling, owing to the deflection of the bullet, but care must be taken to fill the interstices.
Softwood, e.g. fir	56	
Green timber—		
Logs 12 inches diameter and over	24	
Poles 4½ to 6 inches in diameter	36	
Clay	60	Varies greatly. This is maximum for greasy clay.
Dry turf or peat	80	
Snow	—	Varies greatly. 3 feet of rammed frozen snow, well consolidated with water, will stop a bullet, but the power of resistance will decrease as the temperature rises. Soft snow unrammed has little power of resistance.

MACHINE-GUN FIRE

3. At ranges beyond 300 yards the penetration of machine-gun fire may be taken to be equal to that of concentrated rifle fire. At distances under 300 yards, owing to the cumulative and shattering effect produced by a number of shots striking rapidly in succession over a small area, penetration is effected more rapidly and with a fewer number of rounds than by rifle fire.

ARTILLERY FIRE

4. Protection is given in three degrees:—

- i. *Shrapnel-proof*.—This will keep out shrapnel, indirect machine-gun fire and small splinters.
- ii. *Shell-proof*.—To keep out all shell from guns, howitzers and mortars up to 6-inch.
- iii. *Bomb-proof*.—To keep out aeroplane bombs with delay-action fuzes, and all shell from guns, howitzers and mortars.

Shrapnel-proof

5. Shrapnel-proof protection is given by 12 inches to 2 feet 6 inches of earth. Earth is not shell-proof until some 20 to 30 feet is used, and anything more than 2 feet 6 inches only increases the explosive force of the shell. A bursting course of broken bricks, stones, etc., is always a useful addition to shrapnel-proof cover, but the depth of the whole roof covering should not exceed 2 feet 6 inches.

Shell-proof

6. The cover required to give full protection from shells up to 6-inch is as follows:—

- i. *Burster*. This turns the nose of the shell and causes it to burst before it has penetrated too far.
- ii. A cushion to absorb shock.
- iii. *Distributing course*. This spreads the stresses caused by the explosion over a large area of the roof.
- iv. A second cushion. This acts as a buffer between the distributing course and the roof.
- v. A thin layer of hard material immediately above the roof, to stop splinters.

(a) A burster of non-rigid material—broken bricks, stone sets, or hard chalk—about 2 feet thick, has been found superior to slabs, rails, concrete, etc., for, although it must be thicker, it is less susceptible to permanent damage by shell, and is more easily replaced and repaired.

The burster must be carried well over the front and sides, so as to protect them as well as the roof.

(b) The cushion should be made of the spoil obtained from the excavation of the dug-out. It should be about 3 feet thick.

(c) The distributing course should consist of logs, rails, etc., tied together with stout wire, so as to form a mat. The material should be laid touching and, if possible, in two layers.

(d) The second cushion may be similar to the first.

(e) The inner layer may consist of 6 inches of bricks, stone or concrete, laid on boards or corrugated iron.

Bomb-proof (tunnelled dug-outs and cellars)

7. Complete protection against shells of large calibre (8-inch and over) can seldom be gained without descending to impracticable depths. Generally speaking all underground work should be provided with sufficient head cover to exclude 6-inch howitzer and mortar shell fitted with delay action fuze.

The thickness of cover required in these circumstances will be as follows:—

		feet				feet	
Made earth	..	..	35	Gravel	..	..	25
Clay	..	..	30	Chalk	..	..	25 to 20
			Hard rock	..	..	15 feet.	

In chalk, economy in timber may often be effected by sinking slightly deeper than necessary for cover to reach hard, sound chalk in which it is not necessary to timber galleries and chambers.

8. *Cellars.*—Full use should be made of cellars for providing protected accommodation. The roof should be shored up with stout pit-props to support debris from the upper storeys, or any protective layer that may be added.

Brick or concrete roofs will usually be shrapnel-proof, but timber roofs require the addition of a protective layer.

3 ft. 6 in. of reinforced concrete will give shell-proof protection.

In well-built houses existing walls and roofs act as bursters and as they are knocked down the covering of the cellar is automatically increased.

Cellars should be made gas-proof and be provided with two entrances.

9. *Entrances.*—It is essential to prevent cellars and dug-outs from becoming sumps for drainage. A step up of about a foot should be made at the entrance to keep out surface water.

10. *Defence against gas.*—The entrances to all dug-outs, shelters and mine shafts should be provided with gas-tight doors or curtains of anti-gas material, fitted so as to give a good joint at the sides and bottom of the doorway. If two curtains are used with a space between them, complete protection is given.

Plate VI shows constructional details of gas curtains.

The distance between the curtains should be not less than 3 feet, and must be increased for dressing stations to allow stretcher cases to be brought in.

11. *Air bombing protection.*—Splinter-proof walls of earth, shingle, etc., should be constructed round huts, tents, etc., and to increase the protection afforded by these the floors of huts should be kept as low as possible.

Stables are particularly vulnerable to this form of attack, and in the case of long stables they should be divided by splinter-proof walls into compartments for 20 horses.

24. DEFENCE OF A POSITION

1. *Priority of work in preparing a position for defence.*—

- i. Siting of weapons and O.P. (artillery, machine-gun and infantry posts) and marking their positions by pickets, tapes, or spitlocking the ground.
- ii. Constructing O.P.s. and machine-gun positions (see Plates VII and VIII).
- iii. Erecting obstacles.
- iv. Digging fire positions, 3 feet deep.
- v. Clearing and improving field of fire.
- vi. Improving and marking roads and tracks.
- vii. Completing fire positions, and connecting them by shallow communication trenches.
- viii. Cover for H.Q. and Signals.
- ix. Completing communication trenches and avenues.
- x. Dug-outs.

NOTE.—ii, iii, iv, v and vi would probably be carried out concurrently.

2. *Infantry posts.*—Trenches should be dug at first 3 feet wide and 3 feet deep; as time permits they can be connected by short communication trenches to form platoon and company posts and can be enlarged as shown in Plate IX, Fig. 1.

3. *Drainage.*—If trenches are not drained they will, in wet weather, become uninhabitable and impassable. Care should be taken in siting them to arrange for drainage into natural channels, if practicable, and special trenches to carry off water from low points should be provided. If drainage into natural channels is impracticable, sumps may, as a last resort, be provided. When trenches are to be occupied for a long time they should be floored with trench boards.

4. *Fire-trenches* should be sited in irregular lines, with fire-bays not more than 30 feet long and traverses not less than 15 feet thick. A berm, 18 inches wide, must be left clear from the top edge of the trench to the toe of the

PLATE VII—HASTY M.G. EMPLACEMENTS

Time Factors, Earthwork only, in average easy soil, no revetment, executed at night.

Fig. 1. PLAN

One man. 1 Pick. 1 Shovel
= 2 hours.
Two men. 1 Pick. 1 Shovel
= 1½ hours

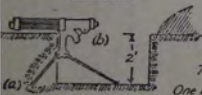
Crest line of Parados carried round end of Trench on exposed flank

Fig. 2. PLAN

One man. 1 Pick
1 Shovel
= 1 hour
Two men. 1 Pick
1 Shovel
= 40 mins

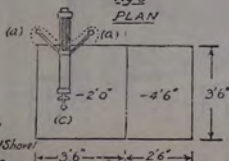
Crest line of Parapet carried round end of Trench on exposed flank.

SECTION



Without Parapet

Fig. 3. PLAN

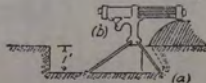


Total Time

One man. 1 Pick. 1 Shovel
= 5 hours
Two men. 1 Pick. 1 Shovel
= 3 hours

Development of Figs 1 & 2

SECTION



With Parapet

(a) Slight undercut (can be revetted with wooden slats from ammunition box) for each leg.

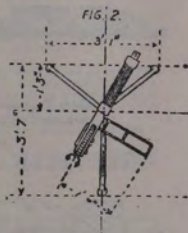
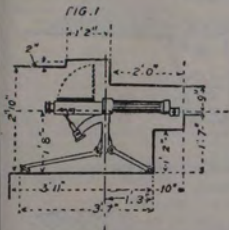
(b) Gun mounted in highest position.

(c) 2' is maximum depth to enable No. 1 to fire in sitting position.

Fig. No. 3 shows normal development of Figs. 1 and 2 when time permits.

PLATE VIII

MINIMUM DIMENSIONS OF OPEN M.G. EMPLACEMENT



TYPE OF M.G. EMPLACEMENT—IN OPEN GROUND

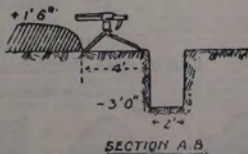
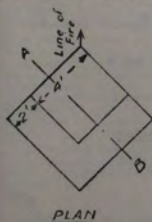


PLATE IX NORMAL SECTION OF FIRE TRENCH

FIG. 1

ORDER OF WORK.

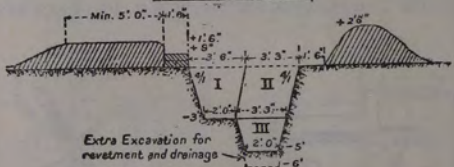


FIG. 2

SECTION OF COMMUNICATION TRENCH (Unrevetted)

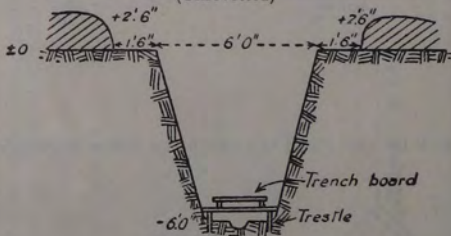
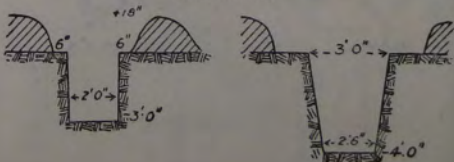


FIG. 3

SHELL SLITS

TO GIVE QUICK IMPROVISED SHELTER

UNSTRUTTED



parapet or parados, to prevent the collapse of the side of the trench from the weight of the earth.

Parapets must not be undercut to form unlined shelters.

Fire-trenches must have fire-steps at intervals at the back of the trench and must be provided with frequent exits consisting of well revetted steps both to front and rear.

Breastworks are made when it is impossible to dig trenches (Plate X).

5. *Revetments*.—The upper part of a trench is most exposed to shell fire and should not be revetted unless absolutely necessary; when necessary, sandbags are most suitable.

Fire-steps should be revetted as soon as possible. Short "A" frames (Plate X) with brushwood or expanded metal are best for this purpose.

6. *Observation posts*.—The observer requires a shelf-rest in front for his elbows, field-glasses, etc.

The post must not be too dark, otherwise the eyes of the observer are strained whenever he turns from the daylight to the darkness within.

The bottom of the slit should be 5 feet 6 inches above inside floor level and high enough above outside ground level to avoid view being obstructed by growth of weeds, etc.

The slit itself should be of irregular shape and not less than 6 inches of headroom above the top of the slit must be allowed.

The floor area should be as small as possible, with a minimum of 36 square feet, for artillery work; accommodation for 2 telephonists may conveniently be provided below the O.P.

DEFENCE OF HEDGES, WALLS, ETC.

7. *Hedges*.—To conceal the fact that the hedge is occupied, the back of the hedge should be cleared so that the upper branches form a screen against aeroplanes, etc., and the front of the hedge may need clearing so that the defender can see and fire through it without being seen (Plate XI, Figs. 1 and 2).

8. *Walls*.—It is rarely advisable to occupy walls if the enemy's artillery is efficient. Machine-gun fire would usually enforce the use of loopholes. In any case, men occupying walls or buildings should be protected against falling debris by overhead cover (Plate XI, Figs. 3 to 5).

9. *Embankments, cuttings*.—Fire positions are easily made by cutting "D" and "T" heads into the bank, making provision for protection from the back-burst of shells. A "D" head should be 30 feet long, so that both entrances cannot be destroyed by one shell.

10. *Sangars* should be built of the largest stones available and "bonded" like a revetment wall. If time is available, they should be 6 feet high, with a fire-step 18 inches high. The base must be broad enough to ensure that the top of the wall is bullet-proof (minimum 14 inches). The top of the wall should not be left level. When time is limited, large stones of irregular sizes (some being two or three times the size of a man's head), if available, should be placed on the wall at irregular intervals; if more time is available, regular embrasures of stones can be made on the top of the wall or box loopholes inserted.

11. *Sangar posts* (Plate XII) may be of any shape conforming to the tactical features of the site. They must be most carefully sited and strongly wired. Two small bastions at opposite corners are often useful for flank defence.

DEFENCE OF BUILDINGS

12. Buildings exposed to artillery fire are readily penetrated by shells of light calibre, and may be destroyed by a comparatively short bombardment. It will, therefore, seldom be worth while expending time and material on elaborate defensive measures on such buildings; it will usually be preferable to hold outlying hedges, walls, etc., and to strengthen the cellars for use as dug-outs. Buildings not exposed to artillery fire may be of great defensive value. Preparation for defence will include the following:—

- i. Clearing the field of fire; this may include demolition of walls, outlying buildings, etc., but the debris must not afford cover.

PLATE X

SECTION OF BREASTWORK IN WET SOIL.



NOTE.—Depth of bottom to vary according to ground. Set frames as low as possible to save breastwork and about 3 ft. apart. Drainage at grade of 1/100 to lower ground essential.

ADAPTATION OF HEDGES AND WALLS

FIG. 1.

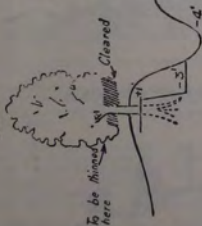


FIG. 2.

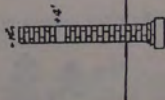


FIG. 3.



FIG. 4.

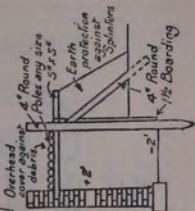
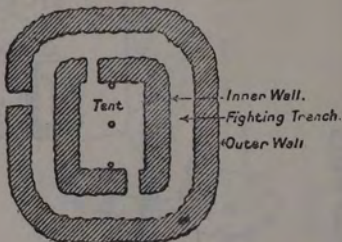
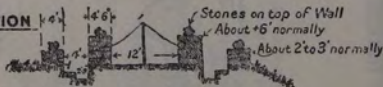


FIG. 5.

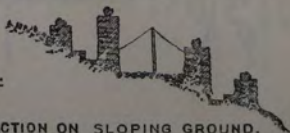
PLATE XII

SANGAR PIQUET POST.PLANFIG. 1.SECTION

Tie tent walls to stones. The wall of the tent is placed on the inside of the inner wall to catch bombs & ensure bombs not rolling into fighting trench.

FIG. 2.VIEW OF PIQUET.

Top of tent coloured to prevent silhouetting

FIG. 3.SECTION ON SLOPING GROUND.

- ii. Completion of the defensible enclosure by barricading doors and ground-floor windows. Doors required for use require special treatment.
- iii. Construction of fire positions. Loopholing of doors, windows and walls. Provision of flanking fire and bombing posts.
- iv. Construction of obstacles and strengthening of existing obstacles. Illumination to be provided at night where possible.
- v. Improvement of communications within the building.
- vi. Arrangements for storing ammunition, provisions and water.
- vii. Medical and sanitary arrangements.
- viii. Fire-fighting appliances.
- ix. Visual signalling arrangements.

In addition, if the building is large and strongly built, and if it be required to make a protracted defence, a small portion should be specially fortified as a "keep" to be held as a last resource.

25. OBSTACLES, IMPROVISED ROADS AND TRACKS

OBSTACLES

1. *Obstacles* should be laid out in irregular, bold zigzags, with their outer edge a minimum of 30 yards and a maximum of 100 yards from the trench.

They should be concealed from direct observation as far as possible, in folds of the ground, behind and in hedges, in ditches, below banks and in woods and crops. They should not afford cover to the enemy.

Gaps should be left in all lines of obstacles except those in the front line, in which only small concealed openings, for the passage of patrols, should be provided.

Gaps should also be provided for infantry every 100 yards, and for artillery every half-mile. They should be clearly marked, so as to facilitate the movement of our own troops.

Knife rests for closing gaps should be provided.

2. *The double apron fence* is the best pattern of entanglement. For very rapid work over long lengths the back apron may be omitted.

3. *Spider wire* consists of a series of four-strand fences placed so as to divide up the ground into a series of compartments; on account of the area covered it is difficult to destroy with artillery fire.

4. *Preparations for wiring*.—The rapidity of construction of an obstacle depends very largely on careful preparations. The following points are essential :—

- i. The line of entanglement must be taped; if this is not done, the party will probably lose direction, the natural tendency being to come nearer one's own trench.
- ii. Dumps of wiring material should be made in convenient positions close to the work.
- iii. Tapes should be laid from each of these dumps to the flank of the tasks for which it supplies materials.
- iv. All stores should be tied in man-loads and prepared for use. (See Sec. 49.)

5. *Wire*.—The plain wire securing a coil of barbed wire must be cut, and a piece of sandbag or white cloth tied to the end of the coil in order that there shall be no difficulty in finding it at night; any tin on the wooden drums must be broken off to prevent noise.

Any temporary lashing that may be required for the transport or carrying of materials should be of twine, so that it can be cut easily in the dark.

6. Sec. 22, 15 (4), gives a table of time and labour for various types of wiring.

Man-loads for wiring stores are as follows:—

Material	1 man-load	Weight lb.
Barbed wire, 130-yd. coil, 12½ S.W.G.	1	28
Pickets, screw, long	4	24
Pickets, screw, short	12	33
Pickets, angle, 6 ft.	2	28
" " 3 ft. 6 in.	4	36
" " 2 ft.	8	36
Pickets, brushwood, 5 ft. 4 in. diam.	4	36
" " 2 ft. 6 in.	8	24
Wire, French, coils	2	39
Concertina barbed wire	1	40

7. Anti-tank obstacles.—

- i. Any obstacle to be really effective must be kept secret from the enemy. If the position of an obstacle is known measures will be taken to find a means of crossing it, or tanks will make a detour round it.
- ii. Deep gullies, ravines, railway cuttings and embankments and thick woods provide good natural obstacles.
- iii. Generally to stop a tank an obstacle requires to have a vertical face of such a height and so arranged that the tank must force its nose against the face of the obstacle. Plate XIII shows how such an obstacle may be formed by excavation. This type is most effective in soft or clay soil, or where the vertical face is of rock or other hard material. In gravel or sandy soil the action of the tracks may cause the face to crumble and render the obstacle ineffective.

It should be borne in mind that obstacles of this nature, unless carefully sited, may provide the enemy with ready-made fire-trenches.

IMPROVISED ROADS AND TRACKS

8. These are of three kinds—for men, pack animals and horse transport.

All tracks must be reconnoitred, pegged out, roughly levelled, drained and clearly marked by posts or notice boards.

Batteries and conspicuous points which draw fire should be avoided.

9. *Trench-board tracks for men.*—These should be laid out in long curves or zigzags.

Width should be 3 feet, and "up" and "down" tracks should be provided.

Trench boards should be laid on 3-inch by 1-inch transoms bedded in the ground. Trestles raised 6 inches to 12 inches from the ground may be used instead of transoms in swampy soil.

To prevent slipping, stout wire netting (trench weaving) should be fixed to the trench boards. Failing this, No. 8 or No. 10 S.W.G. wire may be used, well stapled down in a diamond-shaped pattern, 6-inch to 8-inch mesh.

In sandy soil a quickly made and efficient track may be obtained by spreading out rolls of wire netting (½-inch to 1-inch mesh) directly on the ground and pegging firmly down.

When brushwood is available marshy ground may be crossed by means of brushwood mats made of 1-inch rods.

Permanent track wardens must be appointed to repair damage.

10. *Tracks for pack animals.*—These should be made at the same time as tracks for men, and consist of earth formation on the best ground available, going round shell holes or craters, and choosing the route which involves the least earth work.

The formation should be 4 feet to 5 feet wide for single and 8 feet to 10 feet wide for double traffic.

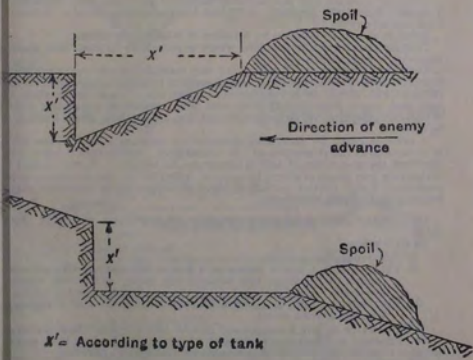
Surface drainage must be provided by means of a ditch on each side of the track.

For crossing boggy ground the following may be used:—

- i. Fascines, with a layer of earth on them to prevent shoes being pulled off.
- ii. Hurdles.
- iii. Corduroy of logs.
- iv. Timber slabs laid on longitudinal runners.

PLATE XIII

ANTI-TANK OBSTACLES



11. *Tracks for horse transport.*—These can be used in fine weather only, and are similar to tracks for pack animals, but require a formation width of 18 feet.

12. *Roads.*—The object of a road is to present a hard, even surface for traffic. This can be obtained by using hard stone or hard wood.

To present an even surface, the road must have good foundations.

The surface must be kept dry; this is done by making it higher in the centre, *i.e.* providing camber, and by providing longitudinal side drains.

Every road requires a maintenance party to keep it in repair.

13. *Corduroy roads* are constructed as shown on Plate XIV. Runners must be spiked to sleepers, and slabs to runners. Ribands must be laid with a gap of one foot at each end to allow water to run away.

On hard ground or for light traffic the sleepers may be omitted, but the runners must never be omitted. Fascines may be used instead of sleepers and a preliminary layer should be used in addition to the sleepers in swampy ground.

Corduroy runners and sleepers may all be of the same size, 3 inches by 4 inches thick, and generally in 10-foot lengths, giving either a 10-foot or 20-foot roadway.

Ribands should be 6 inches by 6 inches or 6 inches diameter.

Turning places must be provided where wagons have to turn, and passing places on a single-width roadway.

Time for construction.—In daylight with material on site 1-yard run single width (10 feet) may be constructed in from 6 to 10 man-hours; double width (20 feet) will take 10 to 14 man-hours to construct. Where beech slabs are used and auger holes largely dispensed with, construction is more rapid. Where circumstances are unfavourable and men unpractised, longer times must be allowed.

A suitable party for slab road construction requires skilled labour (R.E. or Pioneers), in the proportion of 1 to 4 unskilled. As the men become more practised the proportion of skilled labour can be reduced. Parties should be divided up into gangs of about 50 under a skilled N.C.O. for the laying of the roadway. Large parties (unskilled) may be employed in the early stage levelling and digging side drains.

14. *Craters.*—First construct a deviation around crater for traffic (Plate XIV).

To fill crater:—

- i. Remove sludge or water.
- ii. Fill to within 1 foot 6 inches or 2 feet of the surface with alternate courses of sandbags and rammed dry earth, or fill with rammed dry chalk. Hard material should be reserved for the top layers.
- iii. Lay slab roadway, or cover with expanded metal and 3 inches to 4 inches of road metal.

To fill a crater 40 feet diameter and 20 feet deep requires about 400 man tasks, organized in reliefs (say 4 reliefs of 4 hours). First reliefs have smallest number of men. Fifty barrows are required.

The time is exclusive of formation of roadway.

26. CAMOUFLAGE

1. *The principal methods of camouflage are:—*

- i. Covering over small works, dumps, etc., with semi-opaque material which tone in with surrounding ground.
 - ii. Breaking up outlines.
 - iii. Providing dummy works, tracks, etc., to mislead the enemy.
- If overhead camouflage is to be erected it is *essential* that this should be done before the soil is disturbed.

2. *The principal materials available for these purposes are:—*

- i. Wire or fish netting. This material is the foundation of all overhead covers and for spreading over dumps, spoil heaps, etc.; $1\frac{1}{2}$ to 2-inch mesh is the most suitable.

PLATE XIV

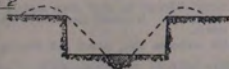
FORWARD ROADS

FIG 1 SHELL HOLES



Cut the shell-hole square ramming the bottom of the hole

FIG 2



*Then fill the shell-hole with sandbags laid properly, on the top of the sandbags the roadway is now made in the usual way
If the shell hole has water in it it must be pumped dry before it is filled*

FIG 3

ROAD REPAIR

Section of road to be repaired. Foundations completely disappeared. Mud and Sludge

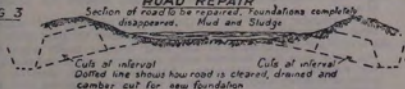
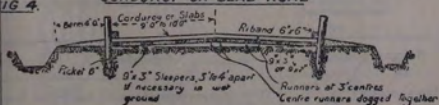


FIG 4.

CORDUROY OR SLAB ROAD



- ii. Canvas strips (12 by 2 inches), grass, etc. These are used woven into the mesh of the netting to render it semi-opaque. They should be painted in a suitable tone to harmonize with the ground surface. Lengths of canvas can also be used to imitate tracks, etc.
- iii. Expanded metal is useful for concealment of blast marks of guns. One sheet giving appearance of sparse grass and three of very thin grass.
- iv. Branches of foliage are useful in the construction of screens and cover up the litter round gun emplacements, etc.
- v. Paint is only effective to a small degree in deceiving the camera, but is useful against visual observation.

Top surfaces should be covered with rough-textured materials and painted a dark tone. Vertical surfaces may either be assimilated to their background by breaking the outline and painting in harmonizing colours, or alternatively "dazzled" by painting in bold blotches of colour designed to break the outline and neutralize shadows. These should be on a large scale, the blotches generally being sufficient. The former method is useful with small fixed objects close to a solid background, and the latter with moving objects or against a more distant background.

3. *Defensive works are usually recognizable in air photographs by the following:—*

- i. Spoil heaps.—The subsoil being different in tone from surface soil shows up light in an air photograph. It should therefore be spread and covered with turf or fabric.
- ii. Development of tracks, cable trenches, etc., round and leading to objects.
Traffic should be strictly confined to existing tracks; where this is impossible new tracks and cable trenches should lead along natural features and past the object to some definite point which would give a reason for their existence.
- iii. Regularity.—Regularity in nature invariably denotes the presence of man.
An irregular layout should therefore be adopted, and outlines should be merged in the background by gradually thinning cover.
- iv. Shadows.—Air photographs of any solid erection taken when the sun is low show long shadows which enable the height and shape of the erection to be estimated. Advantage should therefore be taken of existing shadows of trees or buildings or, if in the open, the whole shadow area should, if possible, be covered with netting.
- v. *The flat top cover*, which consists of a practically opaque centre, thinning out towards the outer edges, helps to merge any shadow created in the background.

Nature of Ground, etc.	Camouflage
Grass country	Strips of green painted canvas, knotted on foundations.
Grass and earth	Large irregular islands of scrim painted earth colour, surrounded by canvas knots.
Shelled area	Large irregular islands of scrim, mud colour, centre. Smaller patches towards edges.
Mining districts	Black and white canvas strips alternating with preponderance of black.
Ruins	Red, white and brown strips.
Gorse and heather	Darkened coir nets on irregular framework.

27. KNOTS AND CORDAGE

KNOTS

Thumb

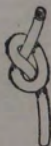


FIG. 11

Figure of 8

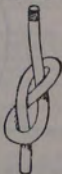


FIG. 12

1. To make a stop on a rope, or to prevent the end from unfraying, or to prevent its slipping through a block—the Thumb Knot or the Figure of 8.

Reef

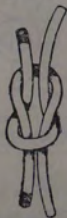


FIG. 13

Single Sheet Bend

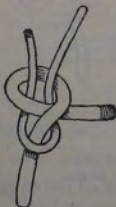


FIG. 14

Double Sheet Bend

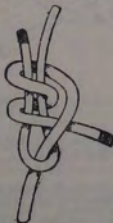


FIG. 15

2. To join two ropes together—

Same size (dry)	..	..	..	..	Reef.
Different sizes (dry)	..	..	..	..	Single Sheet Bend.
" " (wet ropes)	..	..	..	..	Double Sheet Bend.



FIG. 16

3. To form a loop or *bight* on a rope which will not slip.

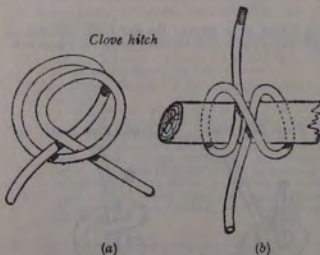


FIG. 17

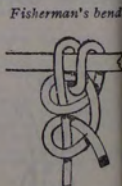


FIG. 18

4. To secure the ends of ropes to spars or to other ropes—Clove Hitch or Fisherman's Bend.

CORDAGE

5. *Hemp*.—Strongest and most reliable.

Manila.—Stands exposure best and does not kink, but is liable to cut where knotted.

Coir.—Weakest, but floats in water and does not rot. (Coir can be recognized as being the material used for coconut matting.)

For field purposes the safe working load in cwt. for different materials may be taken as under, where "c" is the circumference measured in inches:—

Steel wire rope	$9c^2$
Cordage	c^2
Cordage, new, white, selected..	$2c^2$
Coir rope	$\frac{c^2}{4}$

28. BRIDGES AND BRIDGING EXPEDIENTS

1. Tactical requirements will determine the locality for a military bridge, but the nature of the banks and approaches, the nature of the bed, width to be bridged, depth of water, strength of current, and the probability and extent of floods are important from a technical point of view. If a tidal river, the rise and fall of the tide should be ascertained.

2. The approaches at both ends of a bridge are most important. Easy access and a difficult exit are liable to cause crowding on the bridge, which may lead to an accident. Approaches should be metalled or timbered up to the beginning of the bridge.

3. *Bridging expedients.*—For tactical reasons it is often important to pass men, horses and artillery across water at the earliest possible moment, and some expedient must precede work of a more deliberate nature.

A few of these bridging expedients are given below:—

- i. In shallow water carts or wagons may be used to form the sub-structure of a bridge.
- ii. Small gaps may be filled up with bundles of brushwood, channels being left for the passage of the water.
- iii. Barrels make buoyant floating piers for bridges or rafts, but are heavy to launch.
- iv. Rafts or even piers for bridges may be made of waterproof material, such as tarpaulins, ground-sheets, stuffed with hay, straw, heather, ferns (see Plate XV).

A raft consisting of four 18-feet by 15-feet tarpaulins stuffed with hay will carry a load not exceeding 24 cwt. The best method of filling each tarpaulin is to make a light framework of poles 6 feet square by 2 feet 6 inches high on the ground (a hole of similar dimensions will do almost as well). Then place two lashings about 24 feet long across the framework each way, and over these the tarpaulin, well soaked. Fill the tarpaulin with hay and trample it well down. The ends and sides of the tarpaulin are then folded over the hay, and the whole made into a compact bundle by securing the lashings across the top.

The stores required are:—

Tarpaulins	4
Hay (tons)	1½
Planks	16
Spars (average 4-inch diameter), four 16 feet, four 14 feet and two 12 feet	10
Lashings, 1-inch, about 3 fms. long	40
.. 1½-inch, about 6 fms. long	16
Ropes, 2-inch, length according to width of river	2
Punting poles	2

Smaller rafts can similarly be made by stuffing ground-sheets with hay or straw; 24 of these made into a raft will support a load of 1,800 lb. It is essential for the sake of stability that, unless the buoyancy is much in excess of that actually required, the length of each pier of a raft should be twice the width of the platform of the raft. IF THE RAFT IS FORMED OF ONE PIER ONLY, THE PART OF THE PLATFORM LOADED SHOULD BE THE CENTRAL QUARTER ONLY.

- v. A rough boat can be made by covering the body of the Mark IX G.S. wagon with its tarpaulin cover. Any projecting points of the wagon must be covered with hay to protect the tarpaulin, and any holes in the wagon should be filled in the same way. The tarpaulin must be kept close to the wagon body by lashings. If sufficient lashings are available, one should be tied right round the wagon two-thirds of the way back from the front, while a second should be lashed round the wagon half-way up its side, passing through the eyelet holes in the cover. Four to six men may be carried sitting down in this boat.

Rough boats may be made in a similar way by fastening tarpaulins over a light framework of planks nailed together.

PLATE XV
BRIDGING EXPEDIENTS

Tarpaulin 18'x15' stuffed with straw &c

FIG. 1.



Raft of four tarpaulins as Fig 1

FIG. 2.

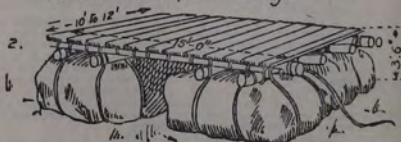


FIG. 3.

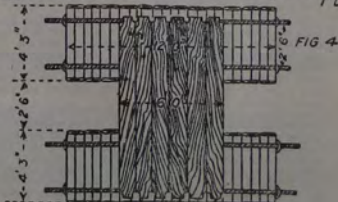
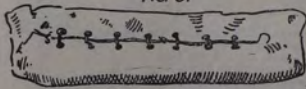


FIG 4

Raft of 24 ground sheets as Fig 3.

- vi. Plank bridges as shown on Plate XVI will take infantry in single file.
- vii. The Kapok assault bridge is shown on Plate XVII. Improvised floats may be made of petrol tins, oil drums, bales of cork, etc.
- 4.—i. The bridging equipment carried in the field constructed to form a medium bridge will carry axle loads up to $5\frac{1}{2}$ tons and tracked loads up to 18 tons. When made up for heavy bridge it will take all loads up to 18-ton tracks. The former includes all normal divisional vehicles but not medium tanks, or S.P., A.A. guns.
- ii. Sign boards will normally be fixed at the approaches, giving the loads the bridge will carry.

5. Assault bridging.

- i. Forcing the crossing of a river or canal is a tactical operation for which the commander of the infantry who are to force the crossing is responsible. It is for him to decide the sites for the bridges and where they are to be put together, having due regard to technical considerations as represented by his technical adviser, the engineer commander.
- ii. Obvious crossing places which can be easily and quickly bridged may be more difficult to cross on account of the enemy's fire than wider and less obvious ones.
The actual crossing will probably be carried out at night or under cover of smoke screens, but some light is essential. In the case of tidal rivers the time of high or low tide may be the ruling factor.
- iii. As far as time permits information must be obtained on the points mentioned in para. 1 and also on the possibility of deployment of attacking troops on the far bank, cover for bridging material on the near bank, positions for covering fire by rifles and machine guns.

This information will be obtained from large-scale maps, aero-plane photographs and ground reconnaissance.

- iv. Covering parties should be in position before the bridges are pushed across.
- v. The method of crossing depends on the width and nature of the channel. With narrow rivers and canals assault bridges can be pushed across. With wide rivers it may be advisable to send forward a covering party on rafts on a wide front just before launching the assault bridges, which can be pulled across by ropes.
- vi. The number of bridges will depend on the width of the channel, the material and labour available, and the tactical situation.
- vii. Tapes must be laid from the forming-up line to the crossings, either beforehand or as the bridging parties advance at the time of the assault. Illuminated signs should be provided on the forming-up line by night.
- viii. The leading troops detailed to cross by the assault bridges (unless they are the bridging party) should remain under cover until the assault bridge is secured on the far bank and ready for crossing; they should then cross at the walk. In no circumstances should the assaulting troops follow the bridging party so closely that they have to halt on the bank and wait for the bridge to be launched.
- ix. The importance of traffic control cannot be over-emphasized. During assault bridging operations congestion is very liable to occur, especially on the near bank. One infantry officer should be detailed for each assault bridge to ensure that troops do not bunch near the bridge before crossing.

In addition a staff officer should be detailed for each brigade series of crossings to control the advance of units towards the bridges.

- x. In order to keep bridges in action, 25 per cent. of spare material for bridges over 100 feet in length and a larger proportion for shorter bridges, together with adequate maintenance parties, must be provided. A party must be detailed to keep watch above the highest upstream bridge to bring to the bank floating objects such as mines and debris which would damage the bridges down-stream.

PLATE XVI
INFANTRY PLANK FOOTBRIDGE

Planks $12'' \times 1\frac{1}{2}'' \times 13'$

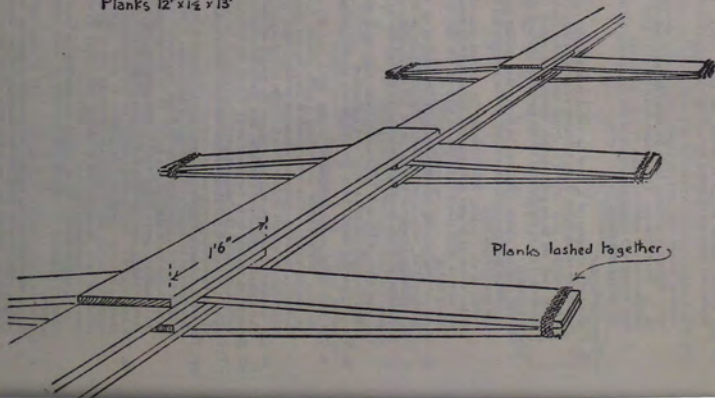
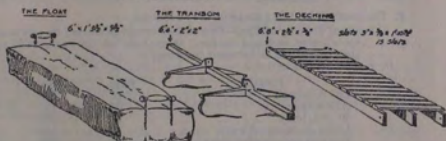
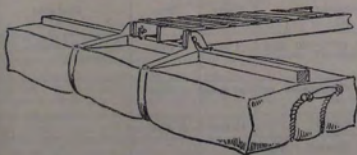


PLATE XVII KAPOK ASSAULT BRIDGE

COMPONENT PARTS



Detail of fixing



6. Bridging material carried in the field.

i. With a field park company :—

- (a) 64 bays (416 feet) of assault bridge material (Kapok float).
- (b) Trestles and superstructure capable of constructing 42 feet of heavy or 63 feet of medium bridge.

ii. With a pontoon bridge park :—

- (a) 128 bays (832 feet) of assault bridge material (Kapok float).
- (b) pontoons, trestles and superstructure capable of constructing up to 525 feet of heavy or 798 feet of medium floating bridge.

iii. In the engineer store depot at the base :—

- (a) A reserve of light floating bridges.
- (b) Steel super-heavy bridges.

iv. With a field squadron :—

- (a) 208 feet of assault bridge material (Kapok float).
- (b) Pontoon equipment (Consuta wood) and trestles to construct 105 feet of medium bridge (*i.e.* 4 piers and 5 bays of superstructure).

7. The loads of bridging material are as follows :—

- i. Medium floating bridge.—One complete bay is carried on one medium six-wheeler and one trailer. (One pontoon on each, with superstructure divided between the two.)
- ii. Kapok assault bridge.—

<i>Vehicle</i>	<i>Bays</i>	<i>Feet</i>
L.G.S. wagon	12	78
G.S. wagon	20	130
30-cwt. lorry	25	162
Light six-wheeled lorry	16	104
Medium six-wheeled lorry	20	130
3-ton lorry	36	234
Pontoon wagon	31	201

TABLE OF TIME AND MEN REQUIRED FOR THE EXECUTION OF CERTAIN BRIDGING OPERATIONS

8. It is assumed that :—

- i. The work is being carried out by day, under fair weather conditions.
- ii. The labour is trained R.E. personnel (except where otherwise stated).
- iii. Material is ready at site.
- iv. The current does not exceed 3 knots.
- v. The banks and bed present no exceptional difficulty.

Operation (1)	Party (2)	Time (3)	Remarks (4)
Construct a petrol-tin pier for an infantry assault bridge.	4 men	1 hour	R.E. or infantry pioneers.
Construct a barrel-pier of 54-gallon casks.	16 men	40 mins.	
Erect a steel trestle ..	12 men	$\frac{1}{2}$ hour	
Bridge a 50-yard river with :—			
(a) Light timber trestle bridging.	60 men	8 hours	Depth of water not exceeding 10 feet.
(b) Infantry assault bridging.	50 men	20 mins.	Includes carrying complete bridge 600 yards and launching. Bridge assumed to be assembled beforehand. 2 men for each pier. R.E. or infantry.

Operation (1)	Party (2)	Time (3)	Remarks (4)
Assembly and launching steel stock-span bridge (Martel box girder), 96 feet, 4 girders.	60 men	16 hours	Time necessary for abutment and foundations depends on local circumstances.
Assembling Kapok assault bridge.	3 men for each bay	1 minute for each bay by day, 2 minutes for each bay by night	R.E. or infantry. Not including launching or carrying.

FORMULÆ FOR CALCULATING BUOYANCY

9. In using closed vessels such as casks for floating piers, the *safe* buoyancy for bridging purposes may be taken at nine-tenths the *actual* buoyancy.

When calculating the buoyancy required for a raft or pier for a floating bridge, it is necessary to work to the actual weight of the load to be carried, *plus that of the superstructure*. The superstructure of the actual roadway of a bridge of normal width to carry infantry in fours may be taken at 120 lb. each foot run, up to 15 feet span.

10. The buoyancy of closed vessels can be determined with sufficient accuracy by the following methods:—

I. When the contents are known—

Multiply the contents, in gallons, by 9; this will give the safe buoyancy in pounds.

II. When the contents are not known, measure the capacity in cubic feet as accurately as possible and multiply by 54 to give safe buoyancy in pounds.

11. The maximum width of stream over which a Kapok bridge can be launched by pushing is about 150 feet in almost still water or 100 feet in a 2-knot current.

29. DEMOLITIONS

(See Sec. 44, 25)

1. *Wet gun cotton* is issued in tin cases containing 14 1-lb. slabs, each 6 inches by 3 inches by 1½ inches.

It must be detonated by a dry primer. Primers, weighing 1 oz., are issued in boxes of 6 tin tubes each containing 10 primers.

2. *Ammonal*.—A less rapid high explosive than gun cotton, useful for mined charges. It is a greyish powder which readily absorbs water and will not detonate when wet. Issued in 25 and 50-lb. tins.

3. *Dynamite*.—A plastic explosive, in various forms; not a service explosive, but largely used commercially and issued in 2-oz. cartridges, wrapped in parchment paper and packed in 5-lb. to 50-lb. boxes.

Dynamite, if frozen, is dangerous to use and cannot be completely detonated. It freezes at 40° F. Thawing out dynamite is a dangerous operation and should be left to experts; dynamite is also dangerous after exposure to damp.

4. *Detonators*.—No. 8 service detonator is used with safety fuze.

No. 13 electric detonator is similar to the No. 8 but provided with wires for electric ignition.

Commercial caps, similar to the No. 8 detonator, but usually weaker, and of various sizes. No. 6 commercial corresponds in size to the No. 8 service detonator, and although only half the strength it is sufficiently strong to fire a service primer.

5. Fuze.—

i. *Safety fuze* coloured black, and made to fit the No. 8 detonator. It will burn under water and burns at the rate of about 2 feet a minute. Packed in boxes containing 8 fathoms. It is difficult to light with a flame. To light: the head of a match should be inserted in the end of the fuze and lighted by another match or rubbed with the match box.

ii. *Fuze, instantaneous detonating*, consists of a tin tube filled with high explosive.

Its action is practically instantaneous if detonated. It will not detonate if lighted.

The method of detonating is shown on Plate XVIII. Two primers and a No. 8 detonator with safety fuze are required.

The explosive deteriorates on exposure to the air; before using, therefore, cut off about 6 inches of the open end. If the ends of fuze, *detonating, instantaneous*, are to be left in a charge for a long period a good method of protection is to cap them with a No. 8 detonator.

Junctions in *Fuze, instantaneous detonating*, may be made by using a junction box filled with ammonal or 3 detonators tied together at the junction.

6. *Method of connecting up charges*.—A charge of guncotton is connected up for detonation as follows:—

The fuze is cut to the required length. The end to be ignited is cut on a slant to expose as much of the composition as possible. The end to be inserted in the detonator is cut straight across. The straight cut end is then gently inserted into the open end of the No. 8 detonator. This end of the detonator is then pinched to make it grip the fuze and so prevent it from being withdrawn.

The primer, having been tested, as below, to receive the detonator, is placed in one of the holes in a guncotton slab in the charge, and, if several charges are to be fired simultaneously, the fuze, *detonating, instantaneous*, to be used is passed through a primer in each charge and connected to the safety fuze.

For a single charge the closed end of the detonator is gently inserted into the hole in the primer so as to fill the entire length of the hole. If the hole is too large, a piece of paper or grass must be wrapped round the detonator to make it fit tightly. If too small, it must be enlarged with a rectifier or piece of wood, but not with the detonator.

The charge must be in close contact with the object to be demolished, and each slab must be in contact with those next to it; timber packing and clay are often useful to ensure the former.

The charge must extend across the whole of the object to be cut.

Dynamite or ammonal charges are fired by detonating a commercial cap or detonator in the charge. A guncotton primer is not required.

7. *Times for demolitions*.—The length of time required to effect any demolition depends mainly on the time necessary to clear away any material used as filling over that part of the structure which actually bears the load. For instance, it will take much longer to prepare a masonry bridge for demolition than a railway girder bridge, since in the former there is always a quantity of hard filling over the actual arch ring which bears the load, while in the latter the girders are generally accessible.

8. i. 1 slab of guncotton will cut a steel rail.

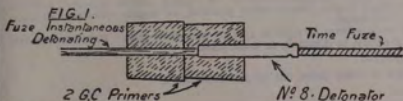
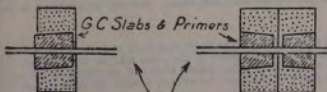
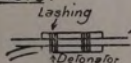
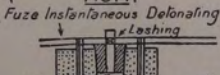
ii. Steel plate up to 1 inch thick can be cut by 1 slab of guncotton for each 6 inches width of plate. Thus a plate 1 inch thick and 2 feet 6 inches wide requires a charge of 5 slabs.

iii. A slab of guncotton will cut steel cable up to 4 inches circumference.

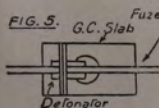
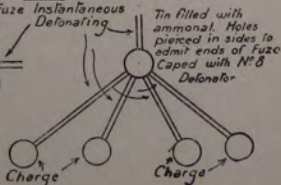
iv. Walls up to 2 feet thick can be cut by 2 slabs of guncotton each foot length, e.g. to blow a breach 20 feet wide in a wall 18 inches thick and 15 feet high requires a charge of 40 slabs. The length of the charge must be greater than the height of the wall.

v. An arch ring up to 18 inches thick can be cut by 2 slabs of guncotton each foot width of arch. The charge must be in contact with the brickwork or masonry of the arch.

PLATE XVIII

DEMOLITIONS—USE OF FUZE, INSTANTANEOUS
DETONATING**FIG. 2.****FIG. 3.****FIG. 4.**

Primer packed to make it project slightly above G.C. Slab

FIG. 5.**FIG. 6.**

9. *Demolition without explosives.*—

Railways.—Sever or block main lines of rails; remove technical tools and personnel. (This will hinder restoration.) Destroy water supplies (most effective) and points and crossings.

These measures, with the possible exception of destruction of water supplies, will probably cause only temporary delay.

Locomotives.—If it is hoped to use the locomotives again shortly, take off injectors, connecting rods or safety valves. The same part should be removed from *all* locomotives to avoid possibility of enemy making good a few locomotives by interchange of parts.

If it is not hoped that possession of the engines will be regained, fire rifle bullets through boiler (fairly easily patched) or smash cylinders, all right hand or all left hand.

Rolling stock.—Burn or remove springs and draw-gear. Break axle boxes. Leave a quantity, so disabled, on main lines.

Telegraphs :—

Cut down or break poles, cut up and twist wires.

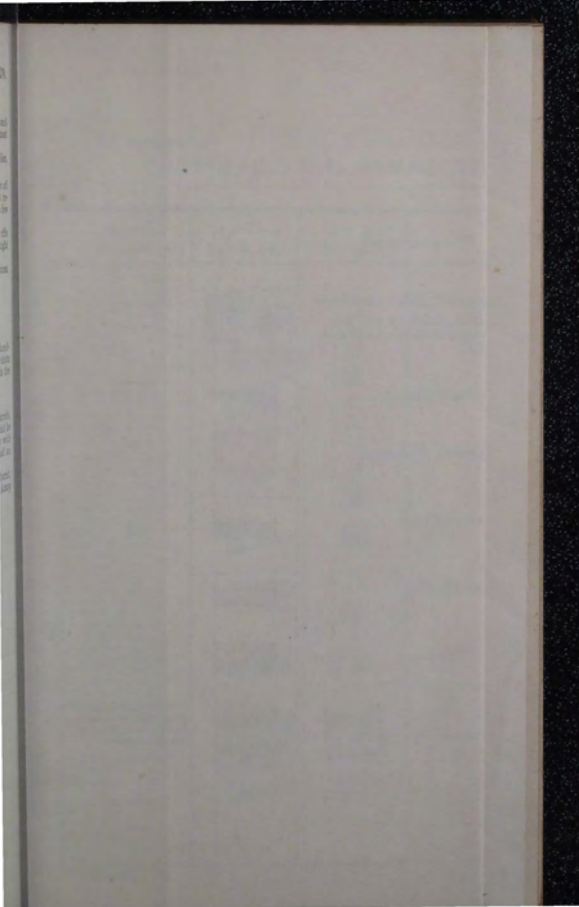
Guns :—

Close breech, then withdraw hand lever about 1 inch, and with hand-spike or pick beat down lever until hinge-joint is distorted. A few shots fired at carrier would jam mechanism still more. (*See also* instructions in the Gun Drills.)

Arms :—

The best way is first to break off the butts and then to destroy the barrels. For the latter the rifle barrels with parts of the wood still on them should be well heated over fire in a trench, after which they can be smashed up with heavy hammers. A party of 5 should be able to destroy 25 rifles in half an hour.













Ammunition to be destroyed should be placed in a deep pit and burnt. (*See also* instructions in Magazine Regulations and Regulations for Army Ordnance Services.)



DISTINGUISHING

	<i>Position of</i>	<i>Flag (by day)</i>	<i>Lamp (by night)</i>
1	G. H. Q		
2	H. Q. of an Army		
3	H. Q. of a Corps		
4	H. Q. of a Division, Number in white; C in case of Cav. Div.		
5	H. Q. of a Brigade or Administrative Area		
6	H. Q. Line of Communication		
7	H. Q. of a Post, Garrison or Base		
8	Ammunition Company		
9	Supply Depot		

FLAGS AND LAMPS.

	Position of	Flag (by day)	Lamp (by night)
10	Hospital or Field Ambulance (The Geneva flag will be accompanied by the Union Jack)		
11	Ordnance Depot		
12	Veterinary Hospital		
13	Signal Office		
14	Post Office		
15	Pay Office		
16	Latrine	<div> <div>British</div> <div>Native</div> </div> <div>   </div>	<p>Note:- In India the Flag for British Latrines has a red centre.</p>

CHAPTER VII

ACCOMMODATION

(See F.S.R., Vol. I, 1930, Chap. XVI)

30. GENERAL RULES

1. *Full consideration must always be given to the possibility of attacks from the air (including gas attack), or by armoured fighting vehicles, in the selection or siting of every type of quarters.* In the presence of an enemy, tactical considerations, e.g. favourable ground for deployment in the event of battle, concealment from ground and air observation, cover from bombardment, and economy in outposts are of primary importance. In these circumstances the time which it will take to get the troops under arms and in position to meet the enemy determines the form of quarters to be adopted.

When not in proximity to the enemy the health and comfort of the troops are the first consideration.

2. If an engagement is anticipated, the larger units should be distributed in the order from front to rear in which they will come into action, provided that when liable to attack, cavalry and other mounted troops are in the least exposed position. Artillery, tanks, armoured cars and ancillary units should be covered by other arms.

3. The following rules will be observed in distributing troops:—

- i. Personnel for store depots and workshops should be accommodated in their vicinity.
- ii. Dismounted units should be nearest the drinking-water supply, and mounted troops should be accommodated with due regard to the facilities for watering horses.
- iii. Medical units and headquarters offices have the first claim on buildings.
- iv. Hospitals should be given a quiet spot and the most sanitary position, as near good roads as is compatible with safety from the air, and away from depots of warlike stores and strategical points which the enemy would be likely to attack by air or long-range gun fire.
- v. Staff and signal offices should adjoin each other and be clearly marked. (For distinguishing flags and lamps, see Plate XIX.)
- vi. Officers should be close to their men.
- vii. Horse lines should be so situated that horses do not have to cross traffic routes to go to water.
- viii. Dismounted units carrying out continuous marches and halted for the night should be billeted as close as possible to the line of march for the next day.
- ix. Tanks, armoured cars and mechanical transport should be disposed so as to leave main roads clear.
- x. Well paved yards and large buildings with good access to main roads should be reserved for mechanical transport units.
- xi. Mobile workshops should, if possible, be located in close proximity to a lateral road.

4. Areas for accommodation will be delimited and allotted to formations by the General Staff branch. The allotment of accommodation within these limits will then be the duty of Q.M.G.'s branch.

5. Areas in rear of the zone of active operations selected for the accommodation of troops must be so arranged that, so far as tactical requirements allow, the troops are provided with the maximum comfort possible. Since these areas will probably be made use of by successive bodies of troops, either during a concentration or in the course of a move by stages from one area to another, or for periods of rest and training, they will usually be divided into sub-areas. The accommodation available in each sub-area will be definitely allotted for

a complete formation, special sub-areas being allotted for artillery and other units with horses, and special buildings or localities being reserved for headquarters. This procedure simplifies billeting arrangements, since each formation is detailed to an area organized to suit its requirements. Signal communications are also facilitated, since lines once constructed can be used for subsequent formations.

31. BILLETS

1. Whenever possible billets will be allotted in advance. Billeting areas may be allotted to armies, corps or divisions, in the first instance on a basis of population, but the capacity of areas varies greatly with their character, e.g. whether urban or rural, agricultural or industrial, rich or poor, and with the season of the year. Data as to the capacity of an area should therefore be collected beforehand, if circumstances permit.

2. In allotting areas, units should be kept together under their own commanders as far as possible. To make full use of stabling it may be necessary to mix the arms.

3. In the absence of data as to the capacity of an area, ordinary billets with subsistence should be possible for a force about twice the population for one week. Billets without subsistence can be provided at the rate of about 10 men for each inhabitant in rich agricultural districts, and at the rate of about 5 to 6 men for each inhabitant in town or industrial district.

4. When time permits, billeting demands are issued to representatives of units by brigade area commanders. The former, accompanied by a billeting party, consisting of an officer or N.C.O. and one rank and file for each company, etc., proceeds to the mayor, or equivalent official in the area, presents the billeting demand and obtains a billeting order for each inhabitant on whom men and horses are to be quartered. He will also make inquiry regarding the health conditions amongst the civil population.

5. The men of the billeting party proceed to the houses allotted to them, inspect them and mark with chalk on the door the names of officers and the number of men and horses the building is to hold. *The marks must be removed before marching off.* The officer selects regimental headquarters, guard room, alarm post, medical aid post, gun and transport parks, ascertains the best roads in and out of the area and the local sources of water-supply, and informs the billeting party when reassembled. He will despatch guides to meet the units well clear of the billeting area and lead them to their billets. A rough sketch of the area should be made if possible.

6. The following points should be observed in addition to those given in Sec. 30, 3:—

- i. Headquarter offices should be selected with due regard to signal communications and be easily found. Within danger areas cross-roads should be avoided. In areas occupied successively by different formations the same buildings should be occupied as headquarter offices.
- ii. Mounted men must be near their horses, guns and wagons, and staff officers near their offices.
- iii. Both sides of a street should be allotted to the same unit to prevent confusion in case of alarm.
- iv. Roads and communications must never be blocked. Guns and vehicles will, if necessary, be parked outside towns and villages, and should be concealed from aircraft. If parked on the sides of roads, the first and last guns or vehicles should be marked with a shaded light during darkness.

GENERAL RULES IN BILLETS

7. From the moment the advanced troops enter a village or farm, precautions must be taken to prevent the inhabitants conveying information to the enemy. The local telephone system or any wireless installations must be controlled, search made for pigeon lofts and all confined pigeons confiscated.

8. *All ranks should be warned against talking on military matters in the presence of inhabitants, against leaving letters or papers about, and of the importance of taking precautions against any leakage of information.*

9. Officers will visit the billets of their men and their horses' stables at irregular intervals, at least once by day and once by night.

10. If necessary, the inhabitants should be disarmed and forbidden to leave their houses after a certain hour; the streets should be patrolled to see that this order is obeyed. It may be necessary to take hostages for the good behaviour of the inhabitants.

11. Military tribunals should be established to deal with any infractions by the inhabitants of the orders issued and with offences committed against the troops.

All houses where liquor is obtainable must be placed under control.

12. In every house occupied by the troops at least one man must be detailed to guard the arms. Arms are not to be piled or left outside.

13. As a precaution against fire and against air observation, and also to prevent signalling to the enemy by means of lights, directions should be issued controlling the use of fires and lights by the troops and inhabitants. It may sometimes be necessary to establish special fire piquets.

14. Close billets are adopted when a greater state of readiness is required than is possible in ordinary billets. Tactical considerations have precedence over considerations of comfort. As many men and animals as possible are billeted, the remainder bivouac.

Billets may be of three descriptions, viz :—

- i. Billets with full subsistence.
- ii. Billets with partial subsistence.
- iii. Billets without subsistence.

When billets with subsistence are provided, officers and others must be satisfied with the usual fare of the householder on whom they are billeted. Neither bedding nor furniture in billets can be demanded as a right. All billets will include attendance, and—when required—the use of ordinary cooking utensils belonging to the inhabitants.

15. When in proximity to the enemy, every unit must be given an assembly post in the vicinity of its quarters, at which it will assemble in case of attack and from which its battle position can be quickly reached. If units are scattered in billets it may be advisable to have squadron, battery and company assembly posts.

Routes from billets to assembly posts and from assembly posts to battle positions must be reconnoitred, and care should be taken that main communications are not blocked by troops proceeding to their assembly posts, and that troops from different areas will not cross each other in proceeding to ground which they may have to defend in case of attack.

16. Special arrangements must be made for the protection of troops in quarters against observation and bombardment by aircraft, and for defensive measures against gas, bombardments by high-velocity guns or attack by armoured fighting vehicles, where such attack is possible.

Civilians are entitled to protection from these special forms of attack, and the arrangements made will include provision for them.

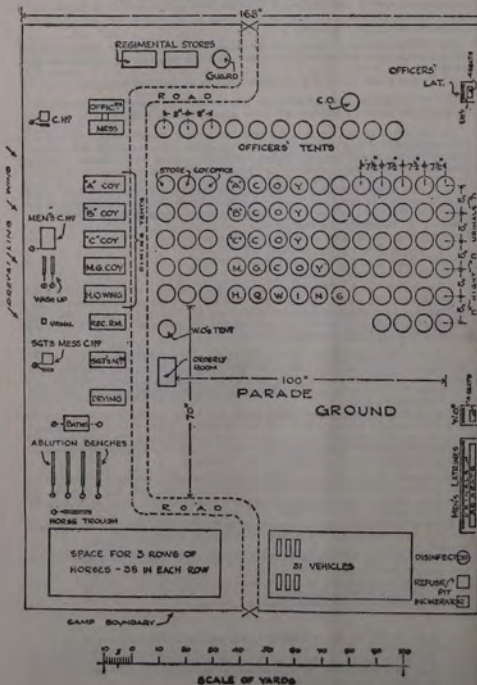
17. The defensive arrangements will include distinctive alarm signals for :—

- i. Gas attack.
- ii. Attack by air.
- iii. Artillery bombardment.
- iv. Attack by other means from the ground.

32. CAMPS AND BIVOUACS

1. Bivouacs admit of concentration and readiness, but are trying to the health of men and horses in cold or wet weather, and should be resorted to only in cases of tactical necessity.

PLATE XX
SPECIMEN LAYOUT OF A CAMP SITE FOR
A BATTALION
(GENERAL SANITARY PRINCIPLES)



2. Camps admit of concentration and are healthy, but can be used only in exceptional circumstances by troops engaged in field operations. Tents quickly become unserviceable and their carriage imposes a great strain on the transport. For standing camps huts are healthier and more comfortable than tents. In hot climates huts or tents with thick or double roofs should be used.

3. The site should be dry and on grass if possible. Avoid steep slopes. Large woods with undergrowth, low meadows, the bottoms of narrow valleys and newly turned soil are apt to be unhealthy. Ravines and watercourses are dangerous sites.

4. Good water-supply is essential, but considerations of safety may necessitate a camp or bivouac being placed at some distance from it. Other points to be considered are the facilities offered for obtaining shelter, fuel, forage and straw.

5. On arriving within 2 or 3 miles of the site, staff officers of brigades ride ahead with representatives of units, receive instructions concerning arrangements for the night, lead their units to the ground allotted them, and explain arrangements.

6. Each commander must be informed of any localities or depots outside his own area on which he may draw for water, fuel, forage, etc.; also which roads he may use and any special defensive, sanitary or other measures he is to take.

7. If grazing is necessary, arrangements must be made for the allotment and protection of grazing areas. The position to which dead animals are to be taken and method of disposal must be settled. The general position of latrines and kitchens in each area must be fixed.

8. Special care is necessary to prevent troops from the various areas crossing one another in proceeding to ground which they may have to occupy in case of attack.

9. Plate XX shows a specimen lay-out for a battalion camp. In laying out camp sites for other units the same general principles should be observed.

Where camps are to be in use for more than 24 hours a system of surface drainage must be considered.

Other points requiring attention are cookhouses, ablution points, latrines, horse-lines and incinerators. Plate XX shows their position with regard to the general lay-out and the prevailing wind.

Latrines and urine pits must be dug immediately on the arrival of the troops in camp. Care should be taken to prevent the pollution by latrines, urinals, etc., of the water-supply or the ground within 100 yards of the encampment.

10. When British and Indian troops camp together avoid putting slaughter places near Hindu troops. The slaughter places should be screened from view. British troops must not be allowed near Indian cooking places or watering places, nor must they touch the cooking utensils of Indian troops.

11. A light should never be left burning in an unoccupied tent and candles should only be used in lanterns or candlesticks. Grass near forage dumps and stores should be kept short and loose straw should not be left lying about. Cookhouses and fires must be kept well clear of tentage. Should a tent catch fire it should be struck as quickly as possible and the flames beaten out with anything available. Any tents down wind in danger of becoming involved should be struck.

TRENCH SHELTERS AND DUGOUTS

12. Trench shelters and dugouts are used in protracted defence and their construction is described in the Manual of Field Works (All Arms). Prolonged occupation of dugouts is trying to the health and detrimental to discipline and morale.

In the forward area dugouts and bomb-proof shelters will be required, the locations of which will be determined by tactical requirements.

In areas immediately in rear of the above, dugouts and bomb-proof shelters require amplification by camps so erected as to be obscured from air observation. In the rear area hutted camps and billets will be utilized for the troops and every endeavour will be made to make the troops thoroughly comfortable.

CAMPS IN MOUNTAIN WARFARE

13. When selecting the site, the necessity for occupying and denying to the enemy the chief points from which snipers can fire into the camp and for forming a defensible perimeter round it should be borne in mind.

To adapt the site to the force, lay out the longest diameter, then the cross diameter, and allot space to units along these cross roads (which should be 15 yards wide, if possible). The perimeter should be allotted to fighting troops, preferably to infantry only. See Plate XXI for type of perimeter camp.

The following points should be attended to :—

- i. All troops should fall in on their alarm posts as soon as possible after camp is laid out, and every evening at sundown.
- ii. A perimeter should be prepared, 5 yards clear of all shelters, with breastwork and entanglement. The defence should be based on a framework of machine guns.
- iii. Arrangements should be made to search ground which is not piqueted by the fire of guns and machine guns.
- iv. No cooking places or latrines (except those for use at night) should be inside camp.
- v. Camels should be in a zareba outside the camp.
- vi. All exits to the perimeter camp must be traversed and blocked with obstacles by night.

STANDING CAMPS AND REST CAMPS

14. When conditions in the air permit, standing camps may be required.

When laying out a standing camp, a sketch plan should be prepared and a copy given to the officer responsible for pitching the camp; tents, at the required intervals and distances, should be dressed both from the front and flank; main and cross streets should be maintained for the purposes of communication.

15. A system of surface drainage should be constructed.

16. Care should be taken to prevent the pollution by latrines, urinals or refuse pits of ground within 100 yards of the encampment or any possible extension of it. An improvised pail system of removal should be established if possible, otherwise latrine trenches at least six feet deep must be dug. Pails and trenches should be flyproof.

17. Incinerators for burning dead animals and refuse should be constructed. Horse and cattle lines should be cleaned regularly, dung removed and special precautions taken to prevent ground in the neighbourhood of kitchens and washing places becoming fouled. Flies are a source of disease and care is necessary to prevent them from breeding in dirt, horse dung and refuse and from coming in contact with the food. If they cannot be burned, dead animals should be buried as far away as possible and the spots marked.

18. Notice boards should be erected showing the position of offices, depots, hospitals, veterinary hospitals, watering places, latrines, urinals, refuse pits, etc.

Camping grounds should be definitely allocated for mounted troops, dismounted troops and convoys respectively.

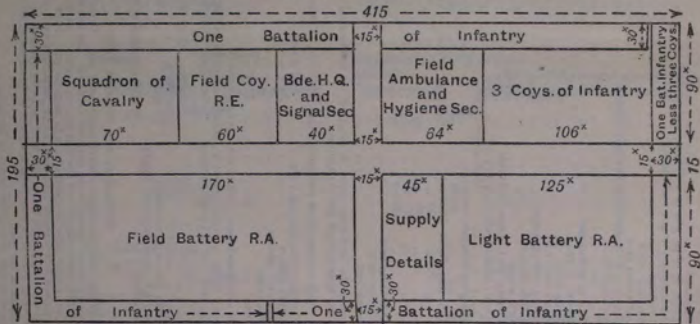
19. Cavalry and infantry require an alarm post of 60 yards depth in front of the camp or bivouac, in addition to the depth shown below. Other arms fall in on the ground where they camp or bivouac.

The following distances should be kept clear in front of guns or vehicles :—

Mechanically drawn guns	..	..	..	..	..	12 yards
6-horsed gun or wagon	..	..	..	..	..	12 "
4-horsed vehicle	..	..	..	..	..	8 "
1 or 2-horsed vehicle	..	..	..	..	..	5 "

All resources available must be made use of to conceal guns and vehicles from aircraft.

PLATE XXI
TYPE OF PERIMETER CAMP FOR A MIXED FORCE
(LESS R.A.S.C. TRANSPORT)



20. The following spaces are required for animals, vehicles and tents :—

Horse, mule, pony or bullock	.. .. .	8' x 15'
Camel	.. .. .	9' x 15'
Elephant	.. .. .	9' x 21'
13-pr. or 18-pr. gun or 4.5" how. and limber	.. .. .	7' x 28'
Ammunition wagon and limber	.. .. .	7' x 23'
Dragons	.. .. .	10' x 18'
Medium tanks	.. .. .	11' x 23'
Armoured cars	.. .. .	9' x 22'
2-man A.F.Vs. and light artillery tractors	.. .. .	8' x 14'
Motor-cycle	.. .. .	4' x 9'
" car	.. .. .	9' x 18'
Van or ambulance	.. .. .	9' x 20'
30-cwt. lorry	.. .. .	9' x 21'
3-ton lorry	.. .. .	11' x 24'
Store cart, I.P.	.. .. .	7' x 14'
Army transport cart	.. .. .	5½' x 14'
L.G.S. wagon	.. .. .	6½' x 22½'
G.S. wagon	.. .. .	6½' x 22½'
Circular tent, single or double	.. .. .	10' radius
Tents, Indian pattern, privates'	.. .. .	40' x 36'
" " staff-serjeants'	.. .. .	28' x 28'
Hospital marquee, large	.. .. .	81' x 45'
" " small	.. .. .	45' x 40'
G.S. tent, India (160 lb.)	.. .. .	22' x 16'
" " (80 " )	.. .. .	16' x 10'
" " (40 " )	.. .. .	12' x 10'
" " (21 " )	.. .. .	9½' x 7'
" " (officers')	.. .. .	14' x 9'
Operating tent	.. .. .	45' x 35'
Shelter tent	.. .. .	12' x 7'
Store tent	.. .. .	76' x 60'

Double the standing space is required for mechanical vehicles to allow room for maintenance and manœuvre.

21. With circular tents accommodation is allowed as follows :

Generals, colonels and C.Os.	.. .. .	1 to a tent.
Other officers	.. .. .	3 "
Warrant officers	.. .. .	5 "
Serjeants	.. .. .	7 "
Men	.. .. .	15 "

The accommodation in other tents is as follows :—

Tents, Indian pattern, privates',	accommodate 16 British.
G.S. tents (160 lb.)	accommodate 16 British or 20 native soldiers.
" " (80 ")	8 " 10 "
" " (40 ")	1 warrant officer or N.C.O.
" " (officers')	2 officers.
Shelter tent	accommodates 2 men.
Tent, I.P., staff serjeants' accom-	modates 2 staff serjeants or 6 privates.

DIRECTIONS FOR PITCHING TENTS

22. *Tents, circular, single.*—Mark centre with peg. Describe a circle, with radius of 4 paces, on which the pegs will be fixed. On this circle drive in the two pegs opposite the door of the tent one pace apart. At 3 paces from these pegs, on either side of them, drive in pegs for guy ropes. The other guy rope pegs will be 5 paces from these and 6 paces from each other.

Put up tent, pole to be set and kept perfectly upright.

Drive in the other pegs, which should be one pace apart and in line with the seams of the tent.

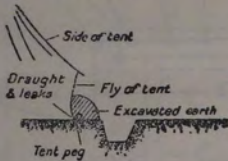
Doors should, if possible, point to leeward.

7½ yards should be allowed from centre to centre of tents.

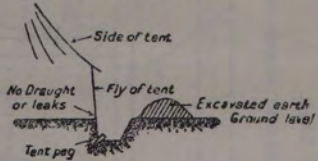
Cut drains round bottom of tent walls and heap earth inside flap. (See Plate XXII.)

DISPOSAL OF RAINWATER.

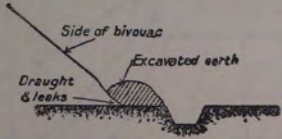
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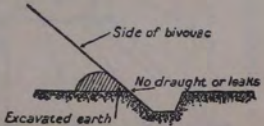
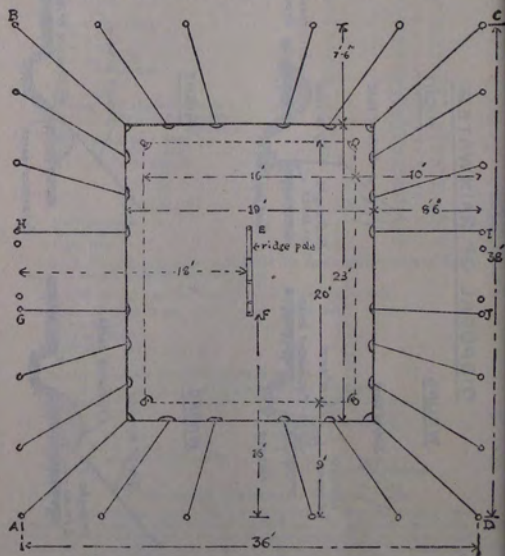


PLATE XXIII

TENT, I.P., PRIVATES'—PITCHING PLAN



Dig a hole 6 inches deep close to tent pole, then if heavy rain comes on suddenly, the tent pole can be pushed into the hole and much strain is taken off the canvas, ropes and pegs.

Allow 1 yard between pegs of adjacent tents.
 " 1 " " tents of adjacent squadrons.
 " 3 yards " " companies.
 " 10 " " " units.

23. *Tents, I.P., Privates', Mark II.*—The tent is packed in 6 bundles, No. 1 containing 2 flies and 4 purdahs, Nos. 2 and 3 each containing 2 walls, Nos. 4 and 5 each containing 50 pins and 1 mallet, and No. 6 all poles, tied together.

8 men are required to pitch the tent, overall area, 38'×36', area inside tent, 20'×16'.

Stake out pitching space (A, B, C, D) by means of 8 pins, 2 at each corner, in the form of a rectangle, 13 paces by 12 paces (see Plate XXIII).

Lay ridge pole in centre of pitching space, drive pins E and F in the ground at each hole in the ridge pole.

Drive in four pins (G, H, I and J) for main side ropes, two on each long side of rectangle in line with the ends of the ridge pole.

Arrange outer fly (white outside and blue inside) to lie on the site, so that the ridge lies between the two pins G and H. The outer edge of the fly should be in the centre of the pitching space. Open the fly until the insides of the caps are exposed.

Make fast the underside corner and side ropes to the pins A, B, G and H, allowing about 13 feet of the rope from the tabs of the corner ropes A and B and about 10 feet from the tabs of the side ropes G and H. These ropes prevent the tent falling over when raised.

Place inner fly (blue outside, buff inside) on the lower side of the outer fly, allowing space for the bag to lie flat. Take ridge pole and pass it through the centre of bag on inner fly. Pass spiked ends of the two standing poles as far as the "Turk's heads" upwards through the holes in the inner fly caps and the spikes through holes in caps of outer fly.

Pull over upper side of outer fly. Place bottom of the poles against the pins E and F. The tent is now ready for raising.

Pull on the two corner and two side ropes of the outer fly C, D, I, J and raise the tent, leaving the inner fly hanging. Make fast all 8 ropes.

Make fast the four corner ropes and the four main side ropes of the inner fly on to the same pins.

Insert remaining pins and make fast the ropes.

Fix the walls and the door curtains, pegging down the footloops of the walls and propping up the door curtains with the foot poles supplied.

24. *Tents, I.P., staff-serjeants'.*—The tent is packed in 3 bundles, No. 1 containing two flies with saiban, 2 chicks, 1 disc in salitab, No. 2 all poles tied together, No. 3 containing 60 pins and mallet in pin bag.

6 men are required to pitch the tent; overall area, 28'×28'; area inside tent, 12'×12'.

Stake out the pitching space (A, B, C, D) by means of four corner pins in the form of a square 28'×28' (see Plate XXIV).

Drive in pin E at the centre of the square to mark position of pole.

Spread out the outer fly double on its side on one side of the pitching space, so that the top cap of the fly lies half-way between the pins A and B and the bottom edge of the folded fly down the centre of the site.

Adjust the tension ropes at the four corners of the fly. (Tension ropes are the two short ends of rope at each corner of the outer and inner flies. Take the two ends, push back the tab and fabric along them for a distance of about 18 inches, tie the two ropes together, having passed them outwards and over the two corner ropes, then under and up between the corner and tension ropes, crossed on top and tied by reef knot underneath.)

Make fast the two underside corner ropes to pins A and B, allowing 11 feet of rope from tab to pin. This prevents the tent from falling over when raised.

Draw back upper portion of fly and place inner fly (with tension ropes adjusted) folded double on the lower portion of outer fly, care being taken that the doors in the walls are on the sides required and the cap of inner fly coincides with that of the outer fly.

Pass the top of the standing pole as far as the "Turk's head" through the cap of inner fly; pass the iron spike through the wooden disc and through the hole in cap of the outer fly. Place the base of the pole against the pin E. The tent is now ready to raise.

Raise the tent and fasten up the corner ropes. Peg out the corner ropes of the inner fly.

Prop up door curtains with poles provided, peg down the walls, attach saiban to whichever side it is required, and fix chicks over the door.

TYPES OF BIVOUAC SHELTERS

25. The tent shelter for two men consists of two sheets of dyed khaki duck, 5 feet 3 inches square, fitted with buttons, button-holes, guy and looping lines, eyelets, two poles 3 feet long. Approximate weight, 9½ lb. One shelter can be joined on to the next.

The following are suggested methods of forming shelters for men :—

- i. Two forked sticks driven into the ground with a pole resting on them; branches are then laid resting on the pole, thick end uppermost, at an angle of about 45 degrees, and the screen made good with smaller branches, ferns, etc.
- ii. A hurdle may be supported and treated in a similar way.
- iii. A water-proof sheet, blanket or piece of canvas secured by poles and string.
- iv. A *tent d'abri* for two men, formed with two blankets or waterproof sheets laced together at the ridge, the remaining two blankets being available for cover inside.
- v. When materials are available extemporized huts can be made by erecting a rough lean-to of light poles and brushwood rods, roughly thatched with branches, brushwood, pine brush, or covered with a tarpaulin.

Plate XXII (p. 109) shows a method for disposal of rainwater from the roof of a shelter.

When no other materials than earth and brushwood are available, a comfortable bivouac for 12 men can be formed by excavating a circle with a diameter of 18 feet, or thereabouts, and piling up the earth to form a wall 2 feet or 3 feet high. The men lie down, like the spokes of a wheel, with their feet towards the centre. Branches of trees, or brushwood stuck into the wall, improve the shelter.

HUTTING

26. Huts can be made by thatching with stalks of any grain. In the absence of ropes, creepers can be used if available.

If huts are constructed of material drawn from the engineer parks, the most convenient form is rectangular in plan, 17 or 18 feet wide, to allow of bunks on either side. When attack by aeroplanes is expected only one tier of bunks can be provided, and that must be as close to the ground as possible. The floor should be of hard material or wood, the sides and roof of corrugated iron or of wood covered with tarred paper or felt, and the windows of oiled canvas or glass.

Comfortable huts can also be made of materials obtained locally secured to a framework of rough timber; such materials include matting, brushwood, reed, etc.

A useful type of hut consists of a thatched roof supported by uprights and walls of "Malay Mat" made with brushwood and well plastered with mud.

For warm climates ample space for ventilation should be left at the top of the walls.

Splinter-proof walls of earth, shingle, etc., must be constructed round each hut, as a protection against splinters from shells or bombs from aeroplanes. To economize material and labour and to increase the protection afforded, the floors of all huts should be close to ground level, or in dug sites below; on sloping ground the site of each hut should be levelled by cutting into the slope of the hill.

If stoves are provided, the floors, walls and roofs of huts and billets must be specially protected with sheet iron or tin where the stoves stand or the stove piping passes through.

CARE OF HORSES IN CAMP OR BIVOUAC

27. If possible choose ground flat enough to give a level standing to the horses, but with sufficient natural fall to carry away storm water; sheltered by higher ground from the wind; within easy reach of the water-supply, but not draining into it. Move standings after a wet night.

In very cold weather do not groom, but wisp and rub mud off legs. Put more covering on back. Do not let a horse stand in a hot sun with his back wet.

28. A horse when picketed requires 3 to 5 yards between picket line and heel pegs; 5 feet between head ropes. The head rope should only be long enough to permit the horse to carry his head naturally when standing; too long a rope permits him to get his leg over the rope and leads to heel galls.

In the case of a horse given to reining back, pass his head rope through a shackle on the forefoot. This soon tires him of reining back. Picket kickers separately. A gangway of 5 yards should be maintained between two horses' lines.

29. Horses require hay, grass or some substitute in addition to grain. Give a hungry horse some hay first, then his oats.

30. Scrub nose-bags frequently; turn and dry them in sun. They should not be interchanged owing to the risk of spreading infection. Avoid waste by keeping nose-bags in repair and by using hay nets when available.

31. Do not herd horses in mobs when grazing, but have guards out, who should only mount when rounding up. Keep kickers apart, or hobble their hind pasterns.

32. Measures for the protection of animals from attack by aircraft must be considered beforehand when this form of attack may be expected.

METHODS OF SECURING HORSES

33. *Tying up a horse.*—The following is a useful method for securing a horse to a bush or small tree.

Take a suitable branch or bunch of branches, place the loop of the reins under and round it, then double back the end of the branch, breaking it if

FIG. 19

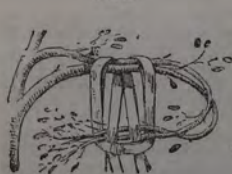
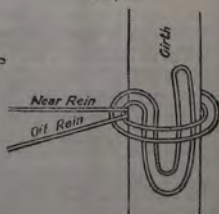


FIG. 20



necessary, and pass it through the reins as shown in Fig. 19 and tighten up. A piece of stick will answer for the same purpose.

Horses should not be tied to valuable trees, such as those in an orchard, as damage may be caused thereby.

34. Single horses can also be kept from straying as follows :—

- i. By knee-haltering.—The correct knot for knee-haltering is a clove hitch, fairly tight, above the knee, with a keeper knot (half-hitch) round the rope to prevent it from becoming loose. The other end is then tied to the lower ring of the back-strap of the head-collar and so secured that the horse cannot tread on it. The rope should be from 1 foot to 1 foot 6 inches from knee to the head-collar.
- ii. By securing the bit to the stirrup iron by means of the rein or strap.
- iii. By securing the bridle rein to the girth on the near side, as shown in Fig. 20. It should be drawn sufficiently tight to bend the horse's head to the left. When mounting in haste the rider can easily loosen the slip knot after mounting, and then pull the reins clear and pass them over the horse's head.
- iv. By being hobbled above the knees by a rope or leather thong tied round in such a way as to prevent the horse moving one foot in advance of the other.

35. *Coupling horses.*—Horses can be securely coupled by turning them head to tail and tying each with the bridle rein to the off back-strap or arch of the saddle of the other, taking care that the reins when tied are not more than 6 to 8 inches long. (See Fig. 21).

With a slip knot a horse can be tied to the head-collars of either or both of the two horses so coupled. The length of reins should not exceed one foot.

FIG. 21



36. *Linking horses.*—The head-ropes are brought over the horses' heads clear of the reins, without unfastening the coil or knot. Each man, facing his horse, hands his rope to the man on his right, who passes it through the upper ring of his own horse's head-collar and ties it with two half-hitches.

37. *Ringing horses.*—The reins are taken over the horses' heads and the flanks of the troop are brought forward until the horses are in a ring. The surcingle or stirrup leather of the right-hand man is then passed through all the reins and fastened.

CARE OF HARNESS AND SADDLERY

- 38.—i. The leather work of all saddlery should be kept soft and supple. Leather girths, girth attachments, sweat flaps and breechings should be greased regularly. Steel work should be oiled.
- ii. Stirrup leathers should occasionally be shortened about an inch at the buckle ends to bring the wear on fresh holes.
- iii. Leather must not be washed with soda or hot water. Lukewarm water may be used, but leather should never be allowed to soak in any water.
- iv. Saddlery should, if possible, always be hung up or raised off the ground.

33. CAMP COOKING

1. Various types of field kitchens are shown on Plates XXV to XXIX.

Camp kettles will cook for 15 men, and when cooking potatoes only will cook for 30 men. Plate XXVII, Fig. 1, shows how camp kettles can be arranged for cooking when time does not permit of a kettle trench being made.

2. Cooking can also be done in mess tins. No trench is necessary. The mess tins are arranged in the same way as camp kettles shown on Plate XXVII, Fig. 1, with the opening facing the direction of the wind.

Another method of cooking in mess tins is as shown on Plate XXVII, Fig. 2, by puncturing a bucket, tea tin or drum all over. Light a coke or charcoal fire inside, place mess tins one on top of the other in rows on each side and on top. Individual soldiers can cook in mess tins separately by standing the mess tin on two stones, leaving an open fire-place underneath for fuel. The mess tin lid should cover the tin loosely, otherwise the expansion of metal by extreme heat will prevent its removal.

BOILING, STEWING AND FRYING

3. To boil a joint of meat place it in boiling water and allow it to boil quickly for ten minutes, then simmer by removing the vessel to a cooler position or reducing the fire. The average loss by boiling is 15 to 20 per cent. The time required to cook is about 15 minutes for each pound of meat.

Vegetables should be placed in boiling water with a little salt and boiled quickly until tender. Potatoes take from 20 to 30 minutes, carrots and parsnips 20 to 45 minutes. Dried vegetables should be soaked for about 4 hours and then boiled slowly.

Stewing is not boiling. All that is required for a stew is a gradual simmering. This will make the toughest parts of meat tender.

Frying is cooking with the aid of fats. When possible cover the article to be cooked with fat.

The lid of a camp kettle can be used as a frying-pan.

HAY BOX COOKERY

4. When fuel is scarce, the hay box method of cooking will be found most useful.

The hay box is constructed to store heat. The contents of a cooking pot, which have been brought to boiling point on an ordinary fire, should be placed in the hay box long enough to finish cooking them. In order to do this the vessel must be enclosed in some form of packing which will store heat, for which purpose waste hay has been found most suitable.

Place hay in bottom of the box and press it firmly to a depth of 6 inches, then place the empty kettle in the centre on the top of the hay and proceed to press hay all round it level with the top of the kettle. Take out the kettle, leaving the mould perfectly made (see Plate XXVII, Fig. 6).

Prepare food in the kettle and bring it to the boil on an ordinary fire. After it has boiled the necessary time, see that the lid is tightly fixed on and without delay place the kettle into the mould already prepared. Fill the top portion of the box with hay tightly pressed in and put on the lid of the box, which should be tightly closed with suitable fastenings. The vessel now being encased in 6 inches of compressed hay, the contents will continue to cook and keep hot for hours.

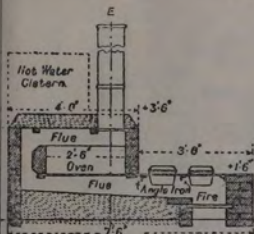
RECIPES

5. *Stewed beef or mutton*.—Cut up the meat into thin slices or small pieces, the smaller the better, put a little fat into the bottom of the cooking pot and when hot put in the meat, stir till brown, add a sliced onion, carrot or turnip, season with pepper and salt, add a little flour and some hot water, stir well and allow to simmer slowly till done. Rice and powdered biscuits in lieu of flour may be added.

6. *Irish stew*.—Ingredients: meat, potatoes, onions, pepper, salt. Peel, wash and slice the potatoes; peel, clean and cut up the onions, cut up the meat into small pieces, place a little water in the kettle and a layer of potatoes at the bottom, then a layer of meat and onions. Season with pepper and salt, then add another layer of potatoes and so on to the top, potatoes forming the top layer. Barely cover the whole with water and stew gently for about 2 hours.

7. *Sea pie*.—Ingredients as for Irish stew, with 5 lb. of flour and 1½ lb. of dripping or suet added for every 20 men. Prepare ingredients as in the

PLATE XXV

COOKER FOR CAMPS AND BILLETTS.LONGITUDINAL SECTION.

F

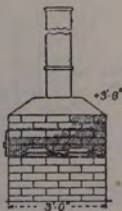
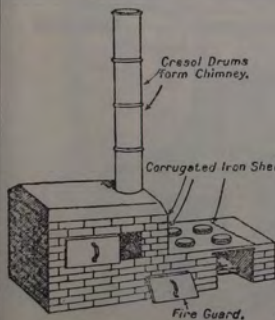
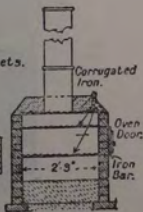
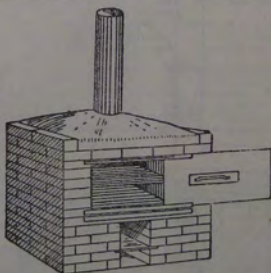
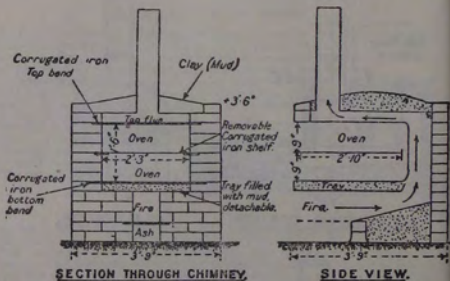
END ELEVATION.PERSPECTIVE VIEW.SECTION E.F.

PLATE XXVI
CHAMBER OVEN.



PERSPECTIVE VIEW.

PLATE XXVII

FIG. 1.—COOKING IN THE FIELD



FIG. 2.—BRAZIER FOR MESS TINS



FIG. 3.—KITCHENS

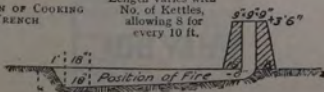
SECTION OF COOKING
TRENCHLength varies with
No. of Kettles,
allowing 8 for
every 10 ft.

PLATE XXVII—continued

FIG. 4.—PLAN OF KETTLE TRENCH

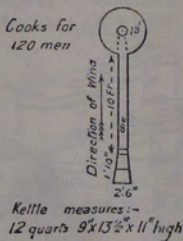


FIG. 5.—RAISED TRENCH (WET WEATHER)



FIG. 6.—HAY BOX



PLATE XXVIII

RAISED DOUBLE CAMP KETTLE TRENCH

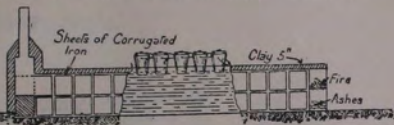
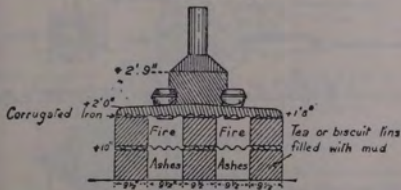
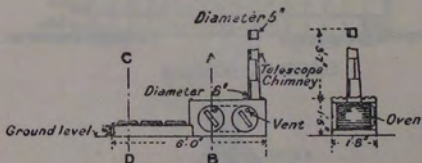
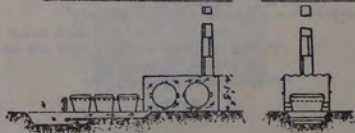
SECTIONAL ELEVATIONELEVATIONPERSPECTIVE VIEW

PLATE
PORTABLE



SIDE ELEVATION. SECTION A.B.



LONGITUDINAL SECTION. SECTION C.D.

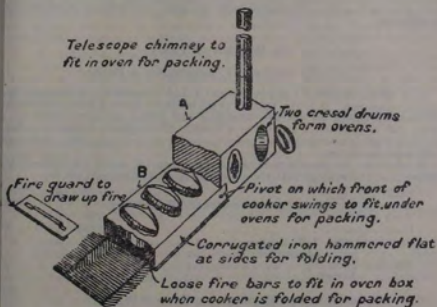
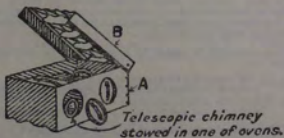


PLAN.

Cooker folded complete

XXIX

FIELD KITCHEN

PERSPECTIVE VIEW.*Method of folding and packing.*

case of stew, cutting the potatoes in slices lengthwise, and cover with paste, making a hole in the centre. To make the paste, mix flour and water, roll or beat it out with the hands on a flat surface, adding a small teaspoonful of baking powder for each pound of flour. The paste should be about $\frac{1}{2}$ inch thick. Time required to cook, about 2 hours.

8. *Beef tea*.—Cut up about 1 lb. of lean beef into small pieces, put in a kettle, add 2 pints of cold water, boil slowly, removing the scum as it rises, cook for about 2 hours or longer if time admits; strain and serve.

9. *Stew* (made of preserved meat and vegetables).—Cut up the meat, removing all fat and jelly, render the vegetables to powder and put them in a kettle or mess tin with a moderate supply of water, cook until done, add meat and jelly, season with pepper, salt and a teaspoonful of brown sugar, if available; put on the lid and allow to heat through, then serve. If desired, a little flour or pea flour thickening may be added and allowed to simmer for 15 minutes.

34. WATER-SUPPLY

(See also Sec. 51, Maintenance of Health.)

1. A daily average of 1 gallon of water a man is sufficient for drinking and cooking purposes. A horse, bullock or mule drinks about 3 gallons at a time. In standing camps an average allowance of 5 gallons should be given for a man, and 10 gallons for a horse or a camel. An elephant drinks 25 gallons a day, a mule or ox drinks 6 to 8 gallons, a sheep or pig 6 to 8 pints. These are minimum quantities.

It may also be necessary to make allowance for water for replenishing radiators. The average radiator capacities of certain vehicles are:—

2-seater cars	..	..	..	..	..	2 gallons
Motor-cars, vans, motor-ambulances and light lorries	..	..	..	..	..	6 "
3-ton lorries	..	..	..	..	..	10 "
Light tanks	..	..	..	..	..	3½ "
Armoured cars, Rolls-Royce	..	..	..	..	..	9 "
" Lanchester	..	..	..	..	..	15 "
Tractors, 3-ton	..	..	..	..	..	14 "
" 30-cwt.	..	..	..	..	..	8 "

One cubic foot of water = $6\frac{1}{4}$ gallons (a gallon = 10 lb.).

2. The rough average yield of a stream may be measured as follows:—Select some 15 yards of the stream where the channel is fairly uniform and there are no eddies. Take the breadth and average depth in feet in three or four places. Drop in a chip of wood and find the time it takes to travel, say, 30 feet. Several observations should be made. The average surface velocity in feet a second will thus be obtained. Four-fifths of this will give the mean velocity, and this multiplied by the sectional area will give the yield a second in cubic feet of water.

3. The quantity of water in a well may be estimated by the following formulae:—

i. In the case of a rectangular well:—

Length (in feet) \times breadth \times depth $\times 6\frac{1}{4}$ = gallons.

ii. Where the well is circular:—

Diameter (in feet)² $\times \frac{1}{4} \times \frac{22}{7} \times$ depth of water in feet $\times 6\frac{1}{4}$ = gallons.

4. The yield of a well may be estimated as follows:—

i. Note the level of the water in the well.

ii. Pump out enough water to lower the level, say, 3 feet.

iii. Note the time taken to fill up to the former level.

Then cross-sectional area of well, multiplied by difference between the two levels in feet, multiplied by $6\frac{1}{4}$ and divided by the time taken to regain former level in hours gives the yield in gallons an hour.

PURITY OF WATER

5. The ample supply of pure drinking-water is so important that everything possible must be done to ensure its provision and its protection from

subsequent contamination. By drinking contaminated water enteric, dysentery, cholera and other diseases may be contracted and spread. The water-supply must be selected in conjunction with a medical officer, who will satisfy himself as to its fitness. All water on active service must be considered as polluted and its purification will invariably be carried out unless orders to the contrary are issued on the advice of the medical authorities. Men must be prevented from drinking water from unauthorized sources.

The possibility of water having been intentionally poisoned should be kept in mind and, where necessary, it should be examined by a medical officer using the case, water-testing, poison.

6. Where possible, water should be purified in unit water-carts. The process involves preliminary clarification (assisted by the use of alum) and subsequent sterilization by water-sterilizing powder (chlorine). In the absence of a water-cart clarification by sedimentation (using alum, 5 to 15 grains to a gallon) followed by chlorination by water-sterilizing powder may be carried out in storage receptacles such as metal or canvas tanks or pakhals.

7. The quantity of water-sterilizing powder required to effect sterilization of water is calculated by means of the case, water-testing (Horrock's box), sterilization. After adding the required amount of water-sterilizing powder and thoroughly mixing with the water, at least half an hour must be allowed before the water is taken for drinking.

As water-sterilizing powder loses chlorine on exposure to air, light or heat, tins should be kept well sealed and cool.

8. For small detachments of troops water may be sterilized by adding to a full water-bottle the amount of water-sterilizing powder (chlorine) shown by test to be necessary for the water-cart (i.e. for 110 gallons). One scoopful, or half a teaspoonful, of this strong solution should be added to each water-bottle. If sterilizing powder (chlorine) is not available, two of the service tablets of acid sodium sulphate may be added to each water-bottle.

Boiling sterilizes water, so tea is a safe drink provided the water has boiled for at least 5 minutes.

9. Storage tanks used for drinking-water should be raised off the ground, kept covered and, when possible, provided with pipes and taps. These tanks, as also water-carts, water-bottles and other receptacles, require periodical cleansing with a strong solution of water-sterilizing powder, followed by free flushing.

10. Posts on the L. of C. should arrange to have enough sterilized water on hand to supply the wants of detachments passing through, particularly at entraining, halting and detraining stations on a railway route.

WATERING ARRANGEMENTS

11. As a rule the military police, or otherwise the first troops to arrive at a halting ground, will mount sentries on all water likely to be required for use, with such orders as will prevent any form of pollution. These sentries will not be withdrawn until permanent water guards are detailed. The water-supply will be selected in consultation with a medical officer or the O.C. a hygiene section.

12. The water-supply should usually be marked with flags, as follows, by the advanced party of engineers :—

White for drinking-water.

Blue for watering places for animals.

Red for washing or bathing places.

13. If water is obtained from a stream, horses will be watered below the place where troops obtain their drinking-water, but above bathing and washing places. Patrolling by mounted men will often be necessary for some distance above the spot where the drinking-water is drawn.

14. If running water is not available, the supply must be very strictly protected, a rough wire fence, if procurable, being run round it to keep animals out. Animals should, in this case, be watered by bucket or nosebag; and washing should be allowed only at some distance from the water-supply, and, if possible, at a lower level, empty biscuit tins or other receptacles being used to draw off water for this purpose.

Similar precautions are often necessary with running water if other bodies of troops are halted lower down the stream.

15. If many animals have to be watered and the frontage is small, times should be laid down for each corps to water. Five minutes may be taken as the average time for watering an animal.

There should be sufficient troughing to enable all animals to be watered in 1 hour. Allow 1 foot run of double-sided trough for every 6 horses.

An officer will invariably accompany watering parties of more than 20 animals.

16. The following table shows pumps, waterproof tanks and waterproof troughs carried by various units (exclusive of power pumps carried by divisional engineers) :—

Carried by (1)	Troughs, water- proof (2)	Troughs, water (3)	Pumps, lift and force (Mark V) (4)
	(a)	(b)	(c)
H.Q. Cav. Division	1	—	1
H.Q. Brigade, R.H.A.	2	—	1
Battery, R.H.A.	—	—	1
Field Squadron, R.E.	4	—	4
Cavalry Regiment	3	—	3
Cav. Mobile Vet. Section	2	2	—
H.Q. Infantry Brigade	1	—	1
H.Q. Field Brigade, R.A. (horsed)	2	—	2
Field Company, R.E.	1	—	4
Field Park Company, R.E.	6	—	6
Mobile Vet. Section	2	2	—
Army Troops Company, R.E.	6	—	6
Boring Section, R.E.	—	—	5
Remount Squadron	3	—	3
Veterinary Evacuating Station	2	—	2
Veterinary Hospital	8	—	4

(a) Listed as troughs, waterproof, 600 gallons.

(b) Capacity, 48 gallons.

(c) Weight, 84 lb. complete. Normal lift, 15 to 18 feet. Maximum lift, 20 to 28 feet. As an absolute limit the pump can supply 500 gallons an hour against a total lift and force of 60 feet, with four men working the pump. For heads of 40 feet and less the pump can be worked efficiently by two men.

17. *Horse watering points.*—The following should be remembered :—

- i. The water should be fenced off at its source.
- ii. Trough guards should be 1 foot higher than and 1 foot clear of the troughs.
- iii. Horse water points should never be placed at the side of a traffic route.
- iv. Horses should not have to cross or use a traffic route in order to reach the water point.
- v. Narrow openings, marked "IN" and "OUT" should be provided for regulating traffic.
- vi. Standings 10 feet wide should be provided on each side of the trough.
- vii. Specially marked troughs should be railed off for the use of horses with infectious disease.
- viii. Side drains round the outside of the watering point should be provided.

A unit consisting of one trough, waterproof, 600 gallons, and one lift and force pump will provide for 140 to 200 horses an hour.

CHAPTER VIII

MOVEMENTS BY SEA, AIR AND RAIL

35. CONTROL OF MOVEMENT

1. Movement includes sea, air, rail, inland water and road transport, *i.e.* transport of every nature from the home country to the front line.

All arrangements for movements are co-ordinated by the Q.M.G.'s branch, through the heads of the services concerned.

2. The duties of the movement section of the staff are:—

- i. To ensure that the best possible use is made of the resources of the transport system in the theatre of operations.
- ii. To carry out local administrative movement to the fullest possible extent short of interference with general administrative movement.
- iii. To deal with demands for conveyance and questions of priority in despatches.
- iv. To control embarkations and landings, when not the responsibility of the general staff as a matter of actual military operations.
- v. To make arrangements to ensure the best possible conditions for the health and comfort of personnel and animals during long-distance movements.
- vi. To control the military forwarding organization.

3. The organization of the services concerned in movement will be found in F.S.R., Vol. I, 1930, Chap. XII. (See also F.S.R., Vol. II, 1929, Chap. XI, and the Manual of Movement.)

36. MOVEMENTS BY SEA

GENERAL

1. The control, provision and despatch of transport necessary for the movement of military forces by sea is the responsibility of the Board of Trade, but the Admiralty is responsible for matters relating to the routes to be followed, the protection of the transports while at sea and for any communication with them during that period.

2. Movements of large numbers of troops and animals or quantities of vehicles and stores are carried out by transports or freightships.

A *transport* is a merchant ship engaged exclusively for Government service under time charter.

A *freightship* is a merchant ship in which accommodation or space is engaged by Government under the Regulations for H.M. Sea Transport Service, for the conveyance of troops, animals, stores, etc., but which is not exclusively at the disposal of the Government.

3. The military requirements are notified to the Board of Trade (or their representative officer abroad) by the Q.M.G.'s branch of the staff.

The general division of duties between the sea transport authorities and the Army is dealt with in the Manual of Movement.

4. A "*long sea*" voyage is generally regarded as one for which ships, when taken up by the Board of Trade, require extensive alterations in accordance with a special specification in order to render them serviceable, from a military point of view, for the conveyance of troops and animals overseas.

For voyages such as from port to port abroad which do not exceed 6 days the specifications for fitting may be modified at the discretion of the superintending sea transport officer.

A "*short sea*" voyage is one of the coastwise or cross-channel type, of such duration as would allow of the use of ordinary vessels without extensive refitting or alteration; where it would be possible to relax certain Board of Trade regulations without unduly restricting freedom of movement on the part of the troops whilst on board; where special sleeping accommodation

would not be necessary; or where men could remain in possession of such kit and arms as they ordinarily carry. The duration of such a voyage, however, should not normally exceed 48 hours.

5. Information as to the draught, length and breadth of vessels in relation to tonnage is given in the following table:—

Draught (1)	Length (2)	Breadth (3)	Gross tonnage (4)	Net tonnage (5)
Feet	Feet	Feet	Tons	Average 60 per cent. of the gross tonnage.
15	230	33	1,000	
19	280	39	2,000	
21	330	44	3,000	
23	360	48	4,000	
25	390	51	5,000	
26	420	53	6,000	
27	440	55	7,000	
28	450	57	8,000	
28	460	58	9,000	
29	470	59	10,000	

The trooping draught will probably be about 15 per cent. less than the figures given above.

TONNAGE DEFINITIONS

6. *Gross tonnage* is the figure obtained when the capacity in cubic feet of all closed spaces in the ship above the inner bottom is divided by 100.

Net tonnage is the gross tonnage less the closed-in spaces necessary for the navigation of the ship, such as crew accommodation, water-ballast spaces above the inner bottom, and boatswain's stores, and less an allowance for the space occupied by the machinery and bunkers. Net tonnage is, therefore, a measure of earning capacity.

Measurement (or shipping) *tonnage* is a measure of cubic capacity.

Dead-weight tonnage is the total weight of cargo, bunkers and stores a ship can carry.

Commercially freight is paid for by the freight-ton of 40 cubic feet of cargo space or 20 cwt. avoirdupois, whichever is to the ship's advantage. Requisitions for freight in ships taken up for Government service should, however, be made out in measurement tons (i.e. 40 cubic feet to the ton), with, where possible, equivalent dead-weight tonnage.

TONNAGE CALCULATIONS

7. The measurement tonnage allowance for troops will vary according to the length of the voyage, route taken and season of the year. The following data will, however, be useful as a guide to the scale of gross register tonnage required. In each case a margin is allowed for a certain amount of stores, coal, ammunition and vehicles.

			Long sea voyages	Short sea voyages
For each man ..	..	..	5	3.5
For each horse ..	..	..	10	9

8. As regards the tonnage required for guns, vehicles, etc., the stowage of such articles depends mainly upon clear floor space. In some ships the holds may be only just deep enough to take the highest vehicles, while in others there may be 9 or 10 feet to spare, yet only the same number of vehicles can be stowed in each.

A cargo ship of about 5,000 tons gross will usually take about 80 M.T. vehicles of varying sizes. No ship can be economically loaded with vehicles of one size.

The space required for the various vehicles in common use can be obtained from the tables given in Secs. 41 and 42, whilst the table in paragraph 9

gives the approximate equivalents in shipping (or measurement) tonnage per ton dead-weight of various stores, supplies, etc.

9. In the following table the figures shown in column 2 represent the approximate measurement tonnage (40 cubic feet to the ton) each ton dead-weight of the article shown in column 1.

Article (1)	Equivalent measurement tonnage each ton dead-weight (2)	
	Tons	Cubic feet
Aeroplane engines	4	—
Ammunition (filled shell)	—	27
Ammunition (S.A.A.)	1	—
Building material and other stores	1	14
Barrows, stable	13	20
Cheese *	1	30
Clothing	3	—
Coal	1	5
Coke	2	—
Flour	1	10
Furniture	17	—
Hay (steam-pressed)	4	5
Hay (hydraulically pressed)	2	10
Mails	5	—
Meat :—		
Beef	2	10
Mutton	3	—
Miscellaneous M.T. stores	4	—
Miscellaneous other stores	2	—
Oats	2	—
Other rations	2	—
Ordnance stores	2	—
Petrol and lubricating oil	1	20
Potatoes	2	—
Rails	—	13
Sugar	1	20
Timber	3	—
Tyres (pneumatic)	5	—
Tyres (solid)	2	—
Wagons (in components)	2	—

The above figures are explained by the following example :—

* 1 ton avoirdupois of cheese measures 70 cubic feet, so that its shipping, measurement, or freight tonnage would be 1 ton (of 40 cubic feet) and 30 cubic feet, or 1 30/40 tons shipping.

10. The general information given in paragraphs 11 to 17, below, is included in this book for the guidance of officers called upon at short notice to undertake duties in connection with the shipment of personnel, animals, vehicles, etc. It should be borne in mind, however, that full details concerning embarkations, etc., are to be found in the Manual of Movement and reference should always be made to this publication where copies are available.

EMBARKING

11.—i. Embark complete units on one ship, if possible.

ii. Remember to embark last what is wanted first on disembarking.

iii. Baggage party stow rifles (without slings) properly labelled in the armoury, if there is one, ammunition in the magazine, and accoutrements in the equipment room.

- iv. Men must be told off to their messes and marched to mess tables (led by a guide) carrying sea-kit clothes bags. (Better if done in consultation with first officer of the ship).
- v. Stow sea-kit clothes bags over mess tables.
- vi. Take over the bedding and utensils.
- vii. Instruct men how to roll bedding and sling hammocks.
- viii. Put ship's halters on horses and unsaddle and unharness.
- ix. See to stowing of saddlery and harness. (Put together in sets and label.)
- x. See to safe stowing of vehicles.
- xi. Leave 5 per cent. spare animal accommodation, half on each side.
- xii. Detail officers for duty during the voyage—adjutant, quarter-master, baggage master and messing officer.
- xiii. Troops are generally told off into guard (detailed daily), swabbers, etc. Tell off a boat party and the necessary parties; also deck sergeants, sanitary serjeant, police, stable guard, etc.
- xiv. Tell off troops to emergency stations, in consultation with ship's authorities.
- xv. Acquaint troops with ship's orders, alarm signals, etc.

SLINGING HORSES ON TO A SHIP

12. Horses should be unsaddled and unharnessed; ship's halter under head-collar, bridoon reins loose but knotted.

Do not let the horse's head loose; fasten with double guy, one end being held on shore or in the boat and one on the ship. Horses may fall backwards out of slings, but will never fall forward.

Five men required, one at head, one at each side, one at the breast and one behind.

Pass one end of sling under belly, both ends being brought up to meet over back; one man passes his loop through the other loop, and it is received by the man on the other side, who hauls it through, hooking the tackle to it, both men holding the ends of the sling till taut. Men at the breast and behind then bring their ropes round and make them fast to grummetts, and the man who holds the horse's head makes fast the guys to the head-collar.

Fasten the breech band and the breast girth securely.

Blindfold timid and restive horses.

Two or three men must be at the hatchway and between the decks to guide the horse when being lowered.

Provide a mat or straw for the horse to alight on, and select a reliable man to hold the head firmly to prevent struggling.

If a ship is alongside a quay, horses should always be embarked by walking them on board by means of brows.

HORSES ON BOARD SHIP—POINTS FOR ATTENTION

- 13.—i. Feeding. Average ration, half and half; at first few oats and much bran, gradually increase oats. Full ration of hay all through.
- ii. Clean ship frequently. Exercise on deck in fine weather. Cinders spread will give horses foothold.
- iii. Weather permitting, move horses daily to spare stalls or into gangways and have platforms on which they have been standing raised and the pens thoroughly cleaned.
- iv. Put horses next to each other who are accustomed to each other.
- v. Hand rub horses' legs regularly.
- vi. In rough weather sacks filled with anything soft will often preserve horses from injury.
- vii. Horses should be shod up to date before embarkation.

SLINGING CAMELS ON TO A SHIP

14. Camels about to be slung should be provided with a head-collar with rope attached (a rope fastened round the neck so as not to form a slip-knot and then a loop taken round the jaw will answer equally well). This prevents the men from hanging on to the nose-rope to steady the animal when first taken off its feet—a practice which is likely to tear out the nose-rope and cause great suffering to the animal.

Camels should be made to kneel under the crane. The man holding the

nose-rope then blindfolds the animal; two other men stand one on each forearm to prevent its rising; others slip the sling under the belly. Vicious animals require to have their mouths secured and forelegs tied with a rope passing over the neck from one leg to the other. If necessary two men can stand one on each hock to render the animal powerless.

CAMELS ON BOARD SHIP—POINTS FOR ATTENTION

- 15.—i. Large-sized camels should be accommodated in the lower hold, medium-sized camels on the upper deck and small camels between decks provided the head-room is sufficient; those on the upper decks heads outwards, those between decks heads inwards; 8 feet 6 inches between decks is sufficient to enable camels to stand up. No animals should be stowed amidships.
- ii. On board camels should be ranged side by side round the sides of the ship and made to sit, with their forelegs tied.
- iii. The decks should be covered with at least 6 inches of sand, and there should be $\frac{1}{2}$ ton sand for each camel, in addition, for a voyage not exceeding 15 days.
- iv. Every camel should be fitted with harness, secured to rings or spars lashed on to the deck, to prevent the animals from shifting their positions.
- v. In fine weather the leg ropes of a few at a time may be cast off and the animals allowed to rise; and if space allows they should be exercised.
- vi. During the voyage great care should be paid to the bend of the knees and hocks. The sand the animals lie upon works into these parts and if they are kept sitting for long periods it causes irritation and the formation of ulcers.

SLINGING GUNS AND HORSE-DRAWN VEHICLES

16. For slinging guns and limbers the following method has been found to work well.

Two slings are used, one round each axle-tree, and a hook-rope hooked into the trail-eye. The bights of the sling are placed on the tackle hook, to which the end of the hook-rope is also made fast.

Limbers have their poles removed and are slung in the same way as guns, the hook-rope in this case being made fast to the tackle hook from the trail hook.

G.S. wagons and pontoon wagons can be slung by four chain slings connected to a common link at one end and provided with hooks at the other; these four hooks are then secured to all four wheels of the vehicle.

Horse-drawn vehicles will as a rule be embarked loaded on their wheels, all loose articles being stowed within the wagons, the poles and shafts being removed before slinging. If the wheels are removed, special care must be taken that the linch-pins are put safely away. Those vehicles first required on disembarkation should be stowed away last.

SHIPMENT OF M.T. VEHICLES

- 17.—i. *General*.—The embarkation, stowage, etc., of M.T. vehicles will usually be carried out under the supervision or direction of a representative of the Board of Trade. The following points are, however, given for guidance and apply generally to all types, including tanks and armoured cars.
- ii. *Preparation for shipment*.—Before motor vehicles are embarked, all petrol must be emptied from the tanks and spare cans, and any subsequent movement in the ship's hold must be done by man-handling. All lamps, horns, mirrors and any projecting fitment should be either removed from the vehicle or their brackets reversed or otherwise protected, as any projections are liable to become damaged.
- iii. *Embarkation*.—Where embarkation is at a fully equipped and organized port no difficulties are likely to arise. Vehicles will be brought alongside, slings fitted and the vehicles lifted by cranes into the vessel. Slings will usually be provided by the ship or at the ship's side. Where the slings pass over rough edges or surfaces or pro-

jections liable to chafe, they should be protected by some soft material, e.g. sacking.

- iv. *Stowage*.—Motor vehicles with pneumatic tyres should not be stowed or moved about in the ship's hold with tyres deflated. Vehicles loaded in the ship's hold and not lashed down should be put into low gear (low gear low ratio where applicable) and the hand brake applied to prevent them moving when the ship rolls.
- v. *Disembarkation*.—Vehicles will usually be landed at a fully equipped and organized port where no difficulties are likely to arise as regards unloading. In this case the necessary organization will be in existence to enable the vehicles to be moved away from the ship's side under their own power.

37. MOVEMENTS BY AIR

1. At present transportation aeroplanes can carry 12 to 24 men with light automatics to a point 150 miles away and return without refuelling.
2. When a move is ordered, the numbers to be carried will be reported to the air force, who will notify the identification numbers and capacity, in pounds avoirdupois, of each aeroplane and the time each party is required.
3. Orders to embark will be given by the responsible air force officer.
4. The commander of the troops will be responsible for providing protection of troops and aeroplanes during embarkation and disembarkation.

38. MOVEMENTS BY TRANSPORTATION SERVICES

1. Docks, railways and inland water transport, the subordinate services constituting the transportation services, will have their own directors responsible to the D.Q.M.G., through the D.G.Tn. for the administration and operation of their services.

MOVEMENTS BY RAIL

(See F.S.R., Vol. I, 1930, Sec. 78; F.S.R., Vol. II, 1929, Secs. 121 to 123, and Manual of Movement)

GENERAL

- 2.—i. Railway transport officers are the local representatives of the movement section of the staff.
These officers are the intermediaries between the troops and the technical railway authorities.
- ii. The following are some of the points which have to be observed by the troops :—
 - (a) Railway arrangements must not be interfered with except for essential tactical reasons.
 - (b) All rolling stock must be unloaded with as little delay as possible.
 - (c) Troops must not occupy railway buildings or use the railway water-supply without the authority of a movement staff officer.
 - (d) Troops must not take tarpaulins, coal, wood or other railway property.
 - (e) Staff officers and advance parties should be sent ahead of formations to make arrangements for the troops in the area to which they are moving.

MOVEMENT OF TROOPS

3. There are four kinds of trains for carrying units and personnel :—
 1. *Strategical*.—Carrying a unit or sub-unit, complete with weapons, animals, horse transport and tracked vehicles. (M.T. vehicles will almost invariably go by road.)

- i. *Tactical*.—Carrying the dismounted personnel of a unit with a minimum of its transport only, the remainder going by route march. Their use is limited to a distance that can be covered by the remainder of the unit in a two days' march.
- iii. *Hospital*.
- iv. *Miscellaneous*.—Carrying reinforcements, leave personnel, prisoners of war, etc.

ROLLING STOCK

4. In Great Britain coaches are normally used for personnel, cattle trucks for animals, and carriages or flat wagons, or goods wagons with drop sides or ends, for guns and vehicles.

In a theatre of operations where climatic conditions are not extreme, as on the Continent, covered vans are normally used for the conveyance of men or animals alternatively.

5. The average dimensions and capacity of rolling stock on British railways are as follows:—

- i. *Bogie coaches*.—Average dimensions: length 60 feet, width 9 feet. There are usually six or seven 1st or eight or nine 3rd class compartments to each coach.
Officers.—6 to a compartment, 4 if corridor stock; 4 to a compartment if to be used for sleeping.
Men.—8 to a compartment, 6 if corridor stock; 4 to a compartment if to be used for sleeping.
- ii. *Cattle trucks*.—Average inside dimensions: length, 18 feet, width, 7 feet 6 inches.
 8 horses or mules or 6 heavy draught horses.
- iii. *Horse-boxes*.—3 officers' chargers.
- iv. *Flat trucks, or goods wagons with drop sides or ends*.—Average inside dimensions: length, 16 feet to 24 feet, width, 7 feet 6 inches.
 1 four-wheeled vehicle; 1 gun and limber; 3 two-wheeled vehicles; 1 60-pr. gun and limber requires 2 trucks; 2 pontoons require 3 trucks.
- v. *Special flat trucks*.—These include rectanks, well wagons and large bogie machinery trucks and are necessary for the carrying of tanks, dragons and armoured cars.
- vi. *Covered vans*.—Average inside dimensions: length, 16 feet to 20 feet, width, 7 feet 6 inches.

If used for personnel for short journeys allow 5½ square feet of floor for each man; for journeys over 8 hours allow 7 square feet of floor for each man. If used for animals allow 7 feet 2 inches length; width: saddled, 2 feet 6 inches, unsaddled or unharnessed, 2 feet 3 inches.

Note.—For journeys of over 8 hours' duration, or when rolling stock is not scarce, only 75 per cent. of the personnel given above should be allotted to each compartment or van.

MAKE-UP OF TRAINS

6. In Great Britain trains will normally be made up to suit the individual requirements of one or more complete units or their sub-divisions. The usual practice is to give the railway authorities the actual composition of the units in officers, other ranks, light and heavy draught horses, four-wheeled and two-wheeled vehicles, and particulars of guns, tracked vehicles, etc. Trains are made up accordingly. The average size of such trains is limited to about 75 axles behind the engine and tender.

In theatres of operations where conditions allow the use of covered wagons for troops, it may be possible to use one or two standard types of trains for strategic moves of all units, without undue waste of accommodation. This method, where possible, enables moves to be carried out at much shorter notice, as type trains can be kept in readiness.

GENERAL RULES FOR ENTRAINING

- 7.—i. Send an officer ahead to ascertain facilities for entraining.
- ii. Tell off parties to entrain horses, guns and wagons.

- iii. Entrain baggage, horses, guns and wagons simultaneously, before troops arrive, if possible.
- iv. Detail men in charge of trucks containing horses or vehicles.
 - v. Pack guns and wagons, fully equipped, and fasten securely to trucks. Occupy spare space with gear, kits, etc. Pontoon wagons may require an empty truck between pairs of trucks.
 - vi. Guns or vehicles should be in the same trains as their teams, and horses in the same train as the men who ride or drive them.
 - vii. Inflammable stores should be at the rear of a train, and risk of fire should be guarded against if in open trucks.
 - viii. Water-carts should be filled before entraining.

ENTRAINMENT OF HORSES OR MULES

8. Under active service conditions horses will be entrained saddled or harnessed, pack saddles only being removed, unless orders to the contrary are issued.

- i. On long journeys under peace conditions saddlery and harness may be removed at the discretion of the officer under whose authority the orders for the movement are issued. The risk of animals being separated from their equipment or of causing delay in the service of trains must be taken into account.
- ii. The closer horses are packed the quieter they travel. If there are not sufficient horses to fill a truck they should be closed up to one end and a sliding bar used to secure them.
- iii. Horses' heads should all face in the same direction and be fastened by head-ropes to the rings or bars, leaving about 9 inches of slack, whether the horses are harnessed or not. If watering or feeding is to be carried out on the journey, the animals should be entrained so as to face the platform at which they are to be watered or fed. It is immaterial whether the horses' heads face the second line of rail.
- iv. To prevent delay at places where horses are to be fed, nosebags should be filled before starting. Hay or straw should be loaded up separately and covered for fear of fire.

ENTRAINMENT OF VEHICLES

9. Vehicles can be either side-loaded or end-loaded. The method used will depend on the facilities which exist or can be provided at an entraining station.

10. *Side-loading.*—This method is suitable and is the quickest for all vehicles that can be man-handled, e.g. field guns, limbers, G.S. wagons, pontoon wagons and all two-wheeled vehicles.

Requirements.—A platform, the level of which is approximately that of the floor of the rolling stock (about 4 feet on an average) and a minimum width of 30 feet and if possible 60 feet. Trucks must be either flat or low-sided with drop sides. Guns and vehicles are man-handled singly on to each truck. The drop side may be used to form a ramp from the platform to the truck floor, using sleeper packing as required if the platform is low. When loading guns by this method, load the gun first and push the wheels up against the front end of the truck with the muzzle pointing to the front. There is then room to bring the limber, with its pole fixed, on to the truck, and by working the pole about to get the off wheel round the trail of the gun. A drag-rope should be made fast to the tip of the pole whilst manœuvring the limber to prevent its going over backwards. The trail should then be drawn back under the limber and the pole lashed to the gun.

Where platforms are short, and if all the trucks are flat or have drop ends, vehicles may be side loaded on to one truck and then man-handled along the train, the gaps between the ends of trucks being bridged either by the loading plates with which some trucks are provided or by means of wooden sleepers laid across the buffers. Vehicles with large wheels will cross a considerable gap on emergency.

11. *End-loading*.—This method must be used for medium and heavy guns and for all large-tracked and M.T. vehicles.

Requirements.—An end-loading dock of the requisite height or a ramp. These are generally provided with loading plates. Trucks used must be flat or low-sided with drop ends. For loading, place truck hard up against the end of the dock or ramp. Apply the brakes and place wood chocks or wooden sleepers lashed to the rails against the wheels.

Drive the vehicle on to the truck slowly in low gear, as central as possible, so that it rests equidistant from either end. Scotch the wheels or tracks, leave in gear and with brakes hard on. Chain or lash the vehicle securely to the truck.

Where the type of rolling stock permits, vehicles will move along the train, as previously detailed, under their own power. This saves shunting of individual trucks as they are loaded, but is not permissible for all types of rolling stock.

TIMES FOR ENTRAINMENT OF UNITS

12. Under favourable conditions, i.e. high-level platforms and other facilities, the time required to entrain $\frac{1}{2}$ battalion infantry with regimental transport, or a squadron cavalry, or $\frac{1}{2}$ battery artillery, is about 45 minutes.

In the absence of high-level platforms, portable or improvised ramps will have to be used for the entrainment of animals and vehicles, and the above times will have to be at least doubled in the case of portable ramps and trebled for improvised ramps.

If trains have to be broken up for loading and then reformed before despatch, at least half an hour must be allowed between time of completion of entrainment and time of despatch.

As a general rule, if a number of units is to be entrained successively from the same entraining point, allow 2 to 3 hours minimum between the departure times of successive trains.

RULES FOR DETRAINING

- 13.—i. Ascertain arrangements for detraining and clearing the railway station before troops leave carriages.
- ii. Detail unloading parties for animals, vehicles and baggage.
- iii. Detrain animals, guns, vehicles and stores simultaneously when possible.
- iv. All personnel, animals and vehicles to be moved clear of the station and immediate approaches as soon as possible to the place of assembly outside.

MOVEMENT OF STORES BY RAIL

14. There are two kinds of trains for movement of stores:—

- i. *Bulk trains*.—These contain one or more commodities in bulk, e.g. ammunition, engineer or transportation stores, road stone, mechanized vehicles, etc. They run from base depots either to regulating stations or through to special railheads.
- ii. *Pack trains*.—These contain a mixed consignment of supplies, ordnance stores, etc., to meet the demand, normally its daily requirements, from a particular formation. They are made up at depots and regulating stations, their destination depending on the movements of the formation to which they are consigned.

CAPACITY OF ROLLING STOCK

15. Tare weight is the weight of a wagon empty. Capacity, or load, weight is the weight that a wagon may carry. Gross weight is the tare plus load.

The loading of wagons to maximum capacity is rarely attained, owing to the bulk of many commodities.

The following table gives the details of the average loading capacity, inclusive of containers, of various military commodities :—

<i>Commodity</i>	<i>Average load in 10-ton wagon Tons</i>
Ammunition, coal, road stone, ballast, sand, cement, scrap iron, lead	10
Railway material (excluding ballast)	9
Ordnance stores (general)	5
Engineer stores (general)	7
Clothing	5
Medical stores	8
Supplies :—	
Sugar, beans, etc.	9
Case goods, potatoes, etc.	8
Frozen meat, flour	7
Biscuits, bread	6
Forage :—	
Oats	8
Compressed hay	5
Hay (steam-pressed)	3
Petrol in tins or cases	7
Timber (scantling), hut sections	6
Coke	6
Mails, M.F.O. stores, canteen stores, etc.	5

CAPACITY OF TRAINS

16. Limiting factor is either of the following :—

- i. Total weight (*i.e.* tare plus load). This is governed by engine capacity and the ruling grade of line.
- ii. Length, governed by length of sidings, and on single lines length of crossing loops. For various technical reasons very long trains (much over 1,200 feet) are impracticable. As a general rule military trains will not exceed 50 four-wheeled wagons or their equivalent in bogie stock.

MOVEMENT THROUGH DOCKS

17. *Dock capacity.*—The principal considerations governing the capacity of a dock are :—

- i. Quay frontage. (It will generally be necessary to allot permanently one berth for hospital ships and one or more berths temporarily for the disembarkation of troops.)
- ii. Existing equipment, *e.g.* for coal importation, cranes for heavy loads, etc.
- iii. Liability to interruption by weather or tides.
- iv. Rail connections, as affecting the rapid transit of material through the dock area.
- v. The possibility of increasing the existing capacity, firstly by the addition of extra equipment and to existing quays, and secondly by the construction and equipment of new quays if required.

18. *Dock working.*—

- i. A minimum of 75 feet, but if possible 150 feet, between ships alongside quays must be allowed for mooring cables.
- ii. For the most rapid work, provision of one crane for each 90 feet run of quay is sufficient and allows at least one crane to each ship's hold. Cranes mounted on rails are preferable, as they give more latitude than fixed cranes.
- iii. The rate of discharge from ships should average 10 tons for each crane an hour for all classes of cargo, but may reach 25 tons for some cargo, such as grain in sacks.
- iv. Appliances should only be worked two shifts daily, each of 8 hours, with an interval between each to facilitate the clearance of wagons; where clearance facilities are strained it may sometimes prove economical to work only one shift daily of 8 to 10 hours.

- v. Over a long period the capacity for unloading general stores required by an army may be taken as $\frac{1}{2}$ ton a foot of quay for each shift for small ports with little equipment beyond the ship's winches, and 1 ton a foot of quay for each shift for large ports comparatively well equipped.
- vi. To avoid congestion and double handling, stores will, if possible, be transferred direct from the ship's hold to railway wagons.

19. *Discharge of British Army traffic at French ports in 1917 and 1918 :—*

		1917		1918	
		Tons an hour		Tons an hour	
		20		30	
i.	Each vessel an hour in port	..	..	..	..
ii.	Each vessel a working hour.	Average for			
	all traffic	..	..	36-45	47-62
	Ammunition	..	..	60-76	60-76
	Bulk oats	..	..	42-59	65-119 (by pneumatic elevator)
	Coal	..	..	27-61	40-80
	Engineer stores	..	..	18-28	30-45
	Food supplies	..	..	42-57	48-60
	Hay	..	..	40-51	46-74
	Ordnance stores	..	..	23-41	27-42
iii.	For each stevedore an hour discharging.				
	All traffic	..	..	1-05-1-25	1-10-1-60
iv.	For each shore labourer an hour.	All			
	traffic	..	..	0-48-0-57	0-59-0-68
v.	1 to 1-2 tons discharge for every lineal foot of quay for each shift represented the average of a good working day for all ports used for the British Army.				

CHAPTER IX

WEAPONS AND EQUIPMENT

39. SMALL ARMS

1. *Rifles, No. 1, Mark III (with cut-off) and Mark III* (without cut-off):—*

Weight without bayonet	..	8 lb. 10½ oz. (Mk. III*—9 lb. 0 oz.)
" with "	..	9 lb. 11½ oz. (Mk. III*—10 lb. 1 oz.)
Length without "	..	3 feet 8½ inches.
" with "	..	5 feet 1 7/10 inches.

No. 4, MARK I

Weight without bayonet	..	8 lb. 13 oz. (approx.).
" with "	..	9 lb. 4 oz. "
Length without "	..	3 feet 8½ inches.
" with bayonet	..	4 feet 5 inches.

No. 3, MARK I* (T).

Weight without bayonet	..	9 lb. 9½ oz.
" with "	..	10 lb. 11½ oz.
Length without "	..	3 feet 10½ inches.
" with "	..	5 feet 3½ inches.

SIGHT, TELESCOPIC, FOR RIFLES, No. 3 (T)

Weight without case	..	15 oz.
" with "	..	1 lb. 11½ oz.

2. *Pistols, Revolvers, No. 1, Mark VI (.455-inch):—*

Weight	..	2 lb. 6½ oz.
Length	..	11½ inches
" diagonally	..	12½ "
Depth	..	5½ "

PISTOLS, REVOLVERS, No. 2, MARK I (.38-INCH)

Weight	..	1 lb. 11½ oz. (approx.).
Length	..	10½ inches
" diagonally	..	11½ "
Depth	..	5 "

3. *Light automatics:—*

.303-INCH LEWIS MACHINE GUN, MARK I

Weight of gun, about 27 lb.; length, 50½ inches; barrel=26½ inches; rifling, right-handed; number of grooves=4. Gas-operated and air-cooled. Weight of gun and mounting:—

Mount, field, Lewis, .303-inch M.G., Mark. III=29½ lb.

Mounting, tripod, A.A., Lewis or Hotchkiss, .303-inch M.G. and holder=44½ lb.

Weight of magazine empty=1½ lb.; full (47 rounds)=4½ lb.

Weight of set of carrier, pouches, magazine and braces=3 lb. 14 oz.

4. *Machine guns:—*

.303-INCH VICKERS MACHINE GUN, MARK I

Weight, about 32 lb. (including muzzle attachment, 1 lb.) and 41 lb. with water in casing. Rate of fire, normal, 500 rounds a minute. Weight of gun and mounting (less water, 10 lb.)=84½ lb.

Mounting.—Tripod, .303-inch M.G., Mark. IV—constructed for 13 degrees elevation and 25 degrees depression, or 43 degrees elevation and 55 degrees depression, according to the position of the legs and the height of the axis of the gun from the ground.

Range, 2,900 yards at 11 degrees 15 minutes elevation.

5. Small Arms Ammunition :—

MARK VII .303-INCH AMMUNITION

Cartridge.—Weight, 381.5 grains (20 rounds in chargers, about 20 oz.) ; length, 3.037 inches.

Bullet.—Length, 1.28 inches ; weight, 174 grains.

Charge.—Cordite M.D.T., about 37.5 grains.

Muzzle velocity.—2,440 feet a second.

MARK VIIz .303-INCH AMMUNITION

Cartridge.—Weight, 385 grains (20 rounds in chargers, about 20 oz.) length, 3.037 inches.

Bullet.—Length, 1.28 inches ; weight, 174 grains.

Charge.—N.C.(Z.), about 41 grains.

Muzzle velocity.—2,440 feet a second.

MARK II .455-INCH AMMUNITION

Cartridge.—Weight, 337.5 grains (12 rounds in carton, about 10 oz.).

Bullet.—Length, .875 inch ; weight, 265 grains.

Charge.—Cordite, about 6.0 grains.

Muzzle velocity.—610 f/s.

MARK I .38-INCH REVOLVER AMMUNITION

Cartridge.—Weight, 252 grains.

Bullet.—Length, .813 inch ; weight, 200 grains.

Charge.—Neonite, about 2.8 grains.

Muzzle velocity.—610 f/s.

GRENADES

6.—i. Grenades in use (for 2½-inch discharger) :—

No. 36 (or 36M), Mark I—Weight, filled, about 1½ lb.

Grenades, percussion, 2-inch :—

No. 54, Marks I and II Weight, filled, without safety cap, about 17½ oz.

No. 55 Weight, filled, without safety cap, about 1 lb.

INSPECTION, PRIMING AND STORAGE OF GRENADES

Inspection

ii. No. 36 (or 36M), MARK I :—

- (a) Necessary to guard against "failures" and "prematures."
- (b) Examine Pin—Wax—Spring—striker way. All tested by striker test.
- (c) Examine outside of body.
- (d) Examine filling screw.
- (e) Inside (i) Striker with 2 nipples and gas slot clear.
(ii) Obstructions in sleeves.
(iii) Crack in wall between sleeves.

iii. No. 54, MARKS I AND II :—

- (a) Remove safety caps ; see that the tape is present and that its weighted end is free to unwind.
The tape must not be unwound.
- (b) See that the mechanism holder is screwed up tightly.
- (c) Re-fix the cap and see that it is correctly seated.

Detonator or Burster

(d) See that the filling appears to be undisturbed (*visually only*).

iv. IGNITER SETS :—

- (a) Necessary to guard against "failures" and "prematures."
- (b) Examine cap and gas escape.
- (c) See that fuse is secure in chamber.
- (d) Examine fuse and crimping.
- (e) Examine luting.

Priming

v. No. 36 (or 36M), MARK I :—

- (a) Remove base plug.
- (b) Take detonator set, press cap chamber and fuse together with finger and thumb.
- (c) Insert detonator in small sleeve, cap chamber in large sleeve, press home with thumb.
- (d) Screw on base plug and tighten with key.
- (e) Screw on gas check.

vi. No. 54, MARKS I AND II :—

- (a) Remove the base plug and see that the rubber pad on the inner face is present.
- (b) Insert the detonator or burster in the tube until its flange reaches the end of the tube.
- (c) Screw in the base plug and tighten hard up, using the slot in the socket of the bayonet as a wrench.

STORAGE

vii. The following details will be observed :—

- (a) Stacked in small groups not exceeding 5 feet in height—Should have air space between groups and be raised from ground on battens.
- (b) Store should be at least 50 yards from roads or houses.
- (c) Smoke grenades to be stored away from other material.
- (d) Detonators, detonator sets, burster sets to be stored in a separate compartment.
- (e) Signal grenades, cartridges, illuminating, 1-inch (Very lights), and rockets to be stored in a separate compartment.
- (f) Care to be taken that all stores are kept dry and well ventilated.
- (g) No *smoking or striking of matches* near a store containing explosives.

viii. DISCHARGER, GRENADE, RIFLE, 2½-INCH, NO. 1, MARK I (weight 2½ lb. :—

Gas Port—						Yards range
Full open gives	..	..	..	..	..	80
Three-quarters open gives	..	..	..	..	..	110
Half open gives	..	..	..	..	..	140
Quarter open gives	..	..	..	..	..	170
Closed gives	..	..	..	..	..	200

N.B.—Adjusting screw must be thoroughly cleaned after firing to prevent seizing.

ix. Discharger, grenade, rifle, 2-inch, No. 1, Mark I (weight, 2 lb. 5 oz.) :—

Gas Port—					
Upper range scale, for "H.E."	grenades calibrated from 100 to 325 yds.				
Lower	..	..	"S."	..	100 to 250 yds'

7. Range cards :—

- i. All ranges, however obtained, should be at once recorded on a range card. The range card is an article of store and will be carried in the field. (Plate XXX, Fig. 1.)

PLATE XXX RANGE CARDS

Fig 1. Specimen

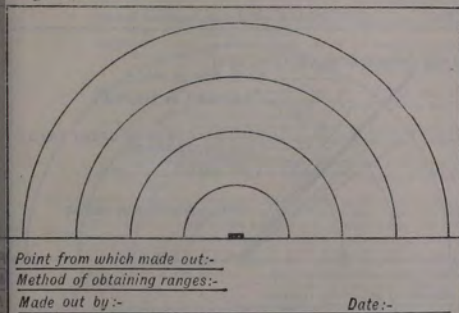


Fig.2. Ranges suitable for a rifle or light automatic section

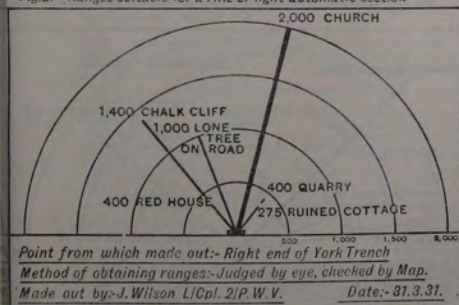


PLATE XXXI RANGE CARDS

Fig. 1. TRUE ANGLES - Too close together for use

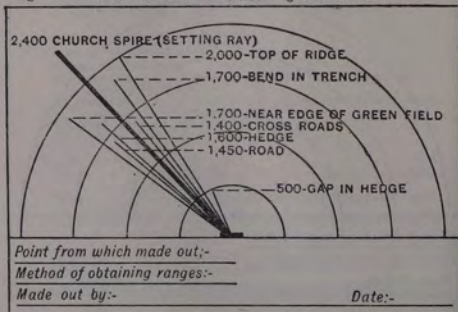
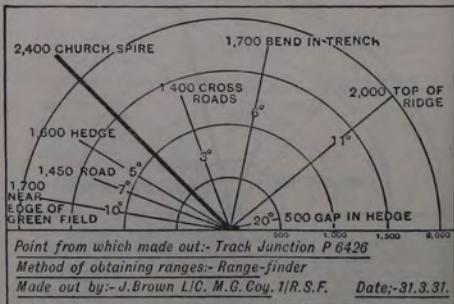


Fig. 2.—ANGLES OPENED OUT—Ranges suitable for a machine gun section.



Range card as issued.—It should be noted that the card is marked with four equidistant semicircles which can be used to represent any series of ranges up to 2,000 yards, according to whether they are for use by a rifle, light automatic or machine-gun fire unit.

ii. The successive steps in filling in a range card are as follows :—

- (a) Mark off on the card the position from which the ranges are taken. Describe this position accurately.
- (b) Select an unmistakable object in the arc or sector allotted, and draw a thick *setting ray* to it.
- (c) Select objects to which ranges are to be recorded; these should include positions which the enemy may have to occupy or near which he is likely to pass, obstacles, a gap in a hedge, etc.
- (d) Keeping the card on the setting ray, draw rays to show the direction of the objects selected. The rays to be in lengths corresponding to the distances.
- (e) Write short descriptions of each object as it appears to the naked eye. These should be written in block letters. (Plate XXX, Fig. 2.)
- (f) Write the distance to each object against the description.
- (g) Sign and date the card, and state how the ranges given were obtained.

- iii. In use the range card is set by raising the card to the level of the eye and directing the setting ray on the object named. Once the card is set, objects ranged on can be identified at once by any observer.
- iv. When lines drawn at correct angles would be so close to one another that the range card could not be easily read, the card should be prepared with the angles opened out, and the number of degrees right or left of the setting ray written against each ray. (Plate XXXI.)

8. Notes for guidance in inspecting small arms :—

i. Rifles.—

Barrel.—Chamber and bore should be clean and bright. Look for bulges, deep scratches and rust pits.

Sights.—Leaf firm and not bent. Slide working freely. Fore-sight not loose or burred.

Action.—Bolt and body numbers should agree. Bolt working surfaces clean and movement free in body. Cocking piece secured by keep screw. Striker working freely in bolt. Test feel of spring and see that striker point is undamaged. Safety catch, half-cock and pull-off function correctly.

Magazine.—Undamaged and properly secured by catch, and platform moves freely.

Stocking.—Fore end free from fracture. Nose cap and band firmly attached and swivels secure. Butt firm in the socket.

Bayonet.—Must fit and unfix correctly. Blade to be straight and point sharp. The blade will not be polished, but will be kept oiled.

Oiling.—Normally all exposed working parts of the rifle will be kept oiled, but in dry and sandy countries it may be necessary to keep the action free from oil. The bore will be kept oiled whenever possible. Internal working parts will always be oiled.

ii. Light automatics (Lewis).—

Barrel.—As for rifle.

Sights.—As for rifle.

Breech mechanism.—Should be clean and work smoothly and freely. Look for signs of burring or other damage. Examine extractors and point of striker. Test working of trigger.

Gas cylinder, regulator, piston.—Gas passages clear, no excessive hard fouling.

Feed mechanism.—Examine feed and stop pawls, cartridge guide spring and ejector for damage and correct assembly. Test with magazine on gun.

Mounting.—Gun firmly supported in the firing position and securely clamped to the gun. Examine leg joints.

Bolt.—Firm and catch secure.

Spares.—All spares in every respect undamaged, clean and oiled.

Magazine.—Look for dented or distorted rims and bent separating pegs. Test catches; segregate any defective.

Oiling.—All working parts of breech and feed mechanism lightly oiled. Bore kept oiled whenever possible. Gas cylinder, regulator and piston wiped with slightly oily flannelette or with the mop. Too much oil in these parts may disclose the position of the gun owing to smoke when firing and create excessive deposit. When exposed to sand or dust keep the mechanism covered as far as possible.

iii. Machine guns.—

Barrel.—As for rifle.

Sights.—As for rifle.

Lock.—Mechanism clean and working smoothly. Look for burring or other damage. Examine point of striker. Test working of sear and trigger.

Feed block.—Pawls and springs in order and the whole working freely.

Mounting.—Gun joints clean and not distorted or burred. Direction dial and pointer undamaged and secure. Joint pins clean, securely attached and leg clamping screws working properly. All parts of elevating gear clean and working freely over the whole range of movement.

Condenser tubes.—Examine tubes and their attachments for damage or perishing.

Belts (other than "strip-ess").—Examine for damage, rotting or mould growth. See that cartridges are not loose in the pockets.

Oiling.—All working parts of lock and feed block oiled. The bore to be kept oiled whenever possible.

Muzzle attachment.—Clean and not distorted. Properly secured to the gun by the split pin complete with chain.

Water-jacket.—Examine for signs of damage likely to cause leakage and see that plugs are in order and secured by their chains.

iv. General.—

In cold weather.—At low temperatures lubricating oil congeals and may cause stoppages. In water-cooled guns the water may freeze.

Precautions.—Apply oil sparingly, wipe off excess when gun is warm. In extreme cases oil may be diluted with not more than 1 part paraffin to 2 of oil, M.80.

Protect water-jacket with wrappings of cord, felt, blanket or other non-conducting material available.

Use one of the following anti-freezing solutions, whichever is available: (a) glycerine 1 part to 4 parts water, or (b) glycerine residue 2 parts to 3 parts water.

Do not have more than 5 pints of water in barrel casing.

Beware of harmful fumes in closed emplacements when solution (a) boils.

40. DEFENCE AGAINST GAS

(Further details are given in Defence Against Gas.)

CARE OF THE RESPIRATOR

1. The respirator gives complete protection for the eyes and lungs if the facepiece is properly fitted. Facepieces should not be changed from one man to another without disinfecting and refitting.

The respirator has been designed to stand reasonable wear and tear during

use in the field. If properly cared for, it will last a long time. The most serious causes of damage are :—

- i. Water entering the container and affecting the efficiency of the chemical filling ; therefore the container should be protected from wet as much as possible.
- ii. Injury to the fabric of the facepiece or the elastic head harness through the presence of foreign articles in the haversack. Nothing must be carried in the haversack except the respirator and anti-dimming outfit.
- iii. Prolonged storage of the facepiece in the haversack without use.
- iv. Injury to the outlet valve in the case of the facepiece, Mark III.
- v. Dents in the container seriously increase resistance to breathing. Avoid rough usage as far as possible.

PROTECTION OF WEAPONS AND AMMUNITION

2. Certain gases, more likely to be encountered in stabilized operations than in mobile warfare, have a corrosive action on metal. In the event of a gas attack, ammunition and belt boxes should be kept closed and weapons covered. If this cannot be done, keep the working parts moving or fire occasional rounds or short bursts.

As soon as possible after the attack clean and oil weapons thoroughly and when opportunity offers give a second cleaning with boiling water containing a little soda. Oiling alone will be effective against corrosion for about 12 hours. Ammunition must be cleaned with oily rag and then dried.

In the case of weapons and material splashed with liquid mustard gas, the contaminated parts should be rubbed for five minutes with bleach paste made up preferably with petroleum jelly, if available. The paste is then wiped off and rags used for the purpose burned or buried.

If bleach paste is not available use water, preferably hot, or paraffin or petrol.

Wooden cases heavily contaminated should be burned. It is important to remember that the handling of materials splashed with liquid mustard gas or contaminated with earth from mustard gas shell bursts will result in casualties unless gloves or improvised protection are used before decontamination is carried out.

PRECAUTIONS WITH REFERENCE TO FOOD AND WATER

3. Normally all food and water should be kept covered. Any food which possesses a peculiar taste or odour after a gas attack should be destroyed.

Water from gas-shell craters should not be used for any purpose whatever.

DUGOUTS AND SHELTERS

4. The entrances to all dugouts, shelters and mine shafts should be provided with gas-tight doors or curtains of anti-gas material, fitted to give a good joint at the sides and bottom of the doorway. If two curtains are used with a space between them, complete protection is given. The distance between the curtains should not be less than 3 feet and must be increased for dressing stations to allow stretcher cases to enter. (See Plate VI, p. 75.)

CHARACTERISTICS OF MUSTARD GAS

5.—i. Mustard gas is a heavy liquid which evaporates slowly at ordinary temperatures and very slowly in cold weather. For this reason it is termed a persistent gas. The enemy can distribute it by shell, hand bombs, hand or air spraying and air bombing.

ii. *Powers of penetration.*—The liquid penetrates like oil, but more readily. The vapour penetrates ordinary clothing.

The sole of the service boot, when in good repair, is not easily penetrated by liquid mustard. The uppers are more liable to penetration.

iii. *Casualties.*—These are caused by contact with :—

- (a) Free liquid.
- (b) Ground and articles contaminated by the liquid.
- (c) Vapour.

Both the liquid and the vapour will injure the body. The eyes are the most easily damaged part of the body, the lungs next and lastly the skin.

- iv. *Odour*.—The odour is characteristic—like mustard or garlic; each individual must learn to recognize it.
- v. *Detection in the field*.—The gas when breathed causes no immediate irritation and the only practicable means of detection is by the sense of smell. If you smell it, report it. Mustard gas as used in the Great War may be recognized by its brownish stain; therefore efforts should be made to confirm it by visual means.
- vi. *Burning properties*.—Mustard is harmful in any detectable amount. Contact with the liquid will cause burns, whereas exposure to the vapour for a short period only is not dangerous provided the respirator is worn.
Long exposures, for instance, two hours in concentration likely to be encountered in the field, or repeated exposures to the vapour will cause injury. In warm weather an exposure for half an hour is dangerous.
- vii. *Delayed signs of burns*.—A lapse of some hours (usually four to six) occurs before obvious signs of injury develop. The most common skin injury is a redness and inflammation followed by a blister.

HINTS FOR PROTECTION AGAINST MUSTARD GAS

- 6.—i. *Eyes and lungs*.—Complete protection is given by the respirator. Therefore wear the respirator whenever gas is smelt.
- ii. *The skin*.—Protection of the skin is difficult, but the following hints are useful:—
Do not remain in an atmosphere of mustard gas for any length of time.
Do not lie down on contaminated ground. If you must lie down use a ground-sheet or substitute to protect from contact with the ground.
Do not touch with the bare hands anything contaminated with mustard gas.
Do not walk through long grass, brushwood, or undergrowth which has been shelled with mustard gas.
Keep to roads or short grass. Do not touch your face with the hands. Do not place your rifle or equipment on contaminated ground. This is particularly important in the case of a stretcher.
- iii. *Food and water*.—Do not drink or wash in water suspected of contamination with mustard gas.
Boil all suspected water.
Do not eat food which smells of mustard gas.
- iv. *Dugouts, billets, etc.*—Do not enter a dugout or billet after walking over a mustard gas area without first cleaning your boots, preferably with bleach.
Place bleach trays outside all billets, etc., wherever possible.
Never carry any contaminated article of equipment into a dug-out or billet.

FIRST-AID TREATMENT

7. Time is of the utmost importance; never delay in carrying out first-aid measures.

Unless the clothes are changed promptly there is a chance of becoming a casualty. If no change of clothing is available this chance must be faced. If fresh clothing is available remove the contaminated clothing at once and dump it away from a place of habitation.

Wash and scrub the skin with soap and water or apply bleach in the form of a paste made with water, or an ointment made up with petroleum jelly. Leave bleach on for two or three minutes and then wipe off. Fresh clothing can then be put on.

Bathe the eyes with clean water and insert medicinal paraffin, if available, to prevent eyelids sticking.

All contaminated clothing must be cleansed by an approved method before re-issue.

DECONTAMINATION OF AREAS

8. The decontamination of large areas is not feasible. Only areas in the vicinity of places necessary for occupation can be treated. Evacuation will frequently be necessary to prevent casualties, and in an advance gas reconnaissance must be employed to determine safe areas.

An area or building may be so grossly contaminated that it is practically impossible to render it safe. Alternative sites, therefore, should always be reconnoitred.

Units are responsible for rendering safe all areas, etc., they intend to occupy.

Shell or bomb craters can be rendered safe as regards emanation of dangerous vapours by covering them and their surroundings with a mixture of bleaching powder and earth (1 to 3) to a depth of two to three inches. If bleaching powder is not available cover with three inches of fresh earth and mark the area so that it can be recognized.

Avoid spreading contamination.

Decontamination of buildings, billets, etc., must be carried out according to the instructions given in Defence Against Gas.

After work of decontamination has been completed in such places, make sure there is no smell from mustard which has penetrated wood and brickwork; otherwise such places will be unsafe for occupation. Remember that prolonged exposure to detectable concentrations of mustard gas will cause casualties.

41. FIELD GUNS AND HOWITZERS

1. *Particulars of artillery weapons.*

Particulars (1)	Q.F. 13-pr. (2)	Q.F. 18-pr. Marks I to II* (3)	Q.F. 18-pr. Marks IV and V (4)	Q.F. 3·7-inch Howitzer (5)	Q.F. 4·5-inch Howitzer (6)	Q.F. 3-inch (20-cwt.) A.A. Gun, Mark I (7)
Muzzle velocity (range-table) f.s.	1,700	1,615	1,615	973	1,000	2,000
Calibre inches	3	3·3	3·3	3·7	4·5	3
Weight of projectile, fuzed lb.	12½	18½	18½	20	35	16
.. .. complete round, approximate ..	16½	23½	23½	23	39	24½
No. of rounds in limber	24	24	20	—	12	—
.. .. wagon	38	38	38	—	32	—
.. .. wagon, limbered	38	38	38	—	16	—
No. of rounds on gun lorry	—	—	—	—	—	24
.. .. 3-ton lorry	—	—	—	—	—	212
.. .. light lorry	—	—	—	—	—	104
Maximum elevation (mounting)	16°	16°	37° 30'	40°	45°	90°
.. .. range, H.E. yards	8,700	9,400	9,400	6,000	6,800	18,000 (b)
.. .. range, Time Shrapnel	6,500	6,600	6,600	—	—	7,000 (c)

Particulars of artillery weapons—continued.

Particulars (1)	B.L. 60-pr. Marks I to I** (2)	B.L. 60-pr. Marks II and II* (3)	B.L. 6-inch. 26-cwt. Howitzer (4)	B.L. 6-inch Mark XIX Gun (5)	B.L. 8-inch Howitzer (6)	B.L. 9-2-inch Howitzer (7)
Muzzle velocity (range-table) f.s.	{ 2,080 (f) 2,125 (g) }	{ 2,130 (f) 2,175 (g) }	1,400 (k)	2,350	1,500	{ 1,187 (h) 1,600 (i) (k) }
Calibre inches	5	5	6	6	8	9-2
Weight of projectile, fuze lb.	60	60 (d)	86 (a)	100	200	290
Weight of complete round, approximate ..	70	70	91½	124	218½	315 (e)
No. of rounds in limber	—	—	—	—	—	—
" " wagon	24	24	—	—	—	—
" " wagon, limbered	16	16	—	—	—	—
No. of rounds on gun lorry	—	—	—	—	—	—
" " 3-ton lorry	—	—	—	—	28	20
" " light lorry	—	—	—	—	14	10
Maximum elevation (mounting)	21° 30'	35°	45°	38°	45°	50°
" range, H.E. yards	16,000	16,000	11,400 (k)	19,200	12,400	13,935 (k)
" range, Time Shrapnel	15,100	15,100	—	15,900	—	—

(a) 100-lb. projectiles are also used.

(b) Height in feet.

(c) Horizontal—yards.

(d) Also 56-lb. projectiles.

(e) With super-charge, 321½ lb.

(f) With 60-lb. projectiles.

(g) With 56-lb. projectiles.

(h) Mk. I howitzer.

(i) Mk. II howitzer.

(k) Super-charge.

2. Details of artillery equipment.—

Particulars (1)	Q.F. 13-pr. (2)	Q.F. 18-pr.		Q.F. 3-7-in. Howitzer (5)	Q.F. 4-5-in. Howitzer (6)	B.L. 6-in. (26-cwt.) How. (i) (7)	B.L. 60-pr. Mk. IV. Carriage (i) (8)
		Mks. III to IV Carriage (3)	Mk. V Carriage (4)				
<i>Weights with loads</i>	cwt. qrs.	cwt. qrs.	cwt. qrs.	cwt. qrs.	cwt. qrs.	cwt. qrs.	cwt. qrs.
Gun and carriage	20 0	28 3 (a) 29 3 (b)	31 1 (a)	14 4	28 3 (a) 27 4 (b)	88 0	112 0
Gun, carriage and limber ..	33 1	43 0	45 2	— —	43 3	98 2	129 0
Wagon, amn., without limber	16 2	20 0	20 0	— —	24 2 (a) 11 2 (b)	— —	— —
Wagon, amn., with limber ..	31 3	39 0	39 0	— —	39 1	— —	— —
<i>Widths</i>	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
Gun, carriage and limber ..	6 3½	6 9	6 9	6 6 (c) 4 8½	6 3½	8 0	8 0
Wagon, amn., and limber ..	6 3½	6 3½	6 3½	— —	6 3½	— —	— —
Wheel track	5 3	5 9	5 9	4 0	5 3	6 7	6 7
<i>Lengths</i>							
Gun and carriage	12 2	15 2	16 7	10 10	12 3	17 6	18 4
Gun, carriage and limber (with- out pole)	17 2	20 2	21 7	— —	16 8	24 6 (j) 8 0 (j)	27 0 (j) 7 1 (k)
Limber, carriage, without pole	5 3	5 7	5 7	— —	5 7	— —	— —
Wagon, amn., without limber and pole	8 4	8 5	8 5	— —	9 10	— —	— —
Wagon, amn., with limber (without pole)	13 5	13 6	13 6	— —	15 3	— —	— —
Wagon, amn., with limber and pole	21 4	21 5½	21 5½	— —	23 3	— —	— —
<i>Heights</i>							
Gun, carriage and limber ..	4 9	5 0	5 5½	4 5½	4 11½	5 7½	5 2½ (l)
Wagon, amn., and limber ..	4 8	4 8	4 8	— —	4 11½	— —	— —

(a) With steel-tired wheels.

(b) With rubber-tired wheels.

(c) With shield.

Details of artillery equipment—continued.

Particulars (1)	Q.F. 3-in. (20-cwt.) (2)	B.L. 6-in. Gun, Mk. XIX (3)	B.L. 8-in. Howitzer (4)	B.L. 9-2-in. Howitzer (5)
<i>Weights with loads</i>	cwt. qrs.	cwt. qrs.	cwt. qrs.	cwt. qrs.
Gun and carriage ..	56 2	203 2	179 0	— —
Gun, carriage and limber	— —	229 2	200 1	— —
Gun and mounting on motor lorry (c) ..	183 0	— —	— —	— —
Gun and mounting on travelling platform ..	115 2 (f)	— —	— —	— —
Carriage and limber, transporting—				
Bed	— —	— —	— —	112 1
Body and cradle ..	— —	— —	— —	132 0
Wagon, transporting howitzer	— —	— —	— —	131 1
Carrier, transporting firing platform (d) ..	— —	77 1	77 1	— —
<i>Widths</i>	ft. ins.	ft. ins.	ft. ins.	ft. ins.
Gun, carriage and limber	— —	8 1½	8 1½	— —
Gun and mounting on motor lorry	7 6	— —	— —	— —
Gun and mounting on travelling platform ..	8 0 (g)	— —	— —	— —
Carriage and limber, transporting, and wagon, transporting	— —	— —	— —	9 1
Carrier, transporting firing platform ..	— —	8 9	8 9	— —
Wheel track	6 0½ (h) 7 5 (g)	7 4 (m) 7 8 (n)	7 4 (m) 7 8 (n)	7 8
<i>Lengths</i>				
Gun and carriage ..	— —	27 10½	23 7	— —
Gun, carriage and limber (without pole) ..	— —	36 0 (j)	29 0	— —
Limber, carriage, without pole	— —	6 7½ (k)	6 7½ (k)	— —
Gun and mounting on motor lorry	18 11½	— —	— —	— —
Gun and mounting on travelling platform ..	19 8½ (g)	— —	— —	— —
Carriage and limber, transporting—				
Bed	— —	— —	— —	20 9
Body and cradle ..	— —	— —	— —	19 8
Wagon, transporting howitzer	— —	— —	— —	16 6
Carrier, transporting firing platform ..	— —	21 4½	21 4½	— —

(f) 2-wheeled platform, without stores or ammunition.

(g) 2-wheeled platform.

(h) On motor lorry mounting.

(j) With engine draught connector.

(k) Without engine draught connector.

(m) Carriage.

(n) Carrier.

Details of artillery equipment—continued.

Particulars (1)	Q.F. 3-in. (20-cwt.) (2)		B.L. 6-in. Gun Mk. XIX. (3)		B.L. 8-in. Howitzer (4)		B.L. 9-2-in. Howitzer (5)	
	ft.	in.	ft.	in.	ft.	in.	ft.	in.
<i>Heights</i>								
Gun, carriage and limber	—	—	6	3	6	2	—	—
Gun and mounting on motor lorry	9	11	—	—	—	—	—	—
Gun and mounting on travelling platform	11	7	—	—	—	—	—	—
Carriage and limber, transporting—								
Bed	—	—	—	—	—	—	5	0
Body and cradle ..	—	—	—	—	—	—	9	3
Wagon, transporting howitzer	—	—	—	—	—	—	7	2
Carrier, transporting firing platform ..	—	—	5	6	5	6	—	—

1. Particulars of armoured fighting vehicles and mechanical transport "A" vehicles.—

Name (1)	Weight with equipment and fully loaded (2)		Dimensions				Maximum speed (road) (6)	Circuit of action (approx.) (7)	Capacity of petrol tanks (8)	Shipping tonnage			
			Length (3)		Width (4)					Height (5)		tons	cubic ft.
(1)	tons	cwt.	ft.	in.	ft.	in.	ft.	in.	m.p.h.	miles	gallons	tons	ft.
Tank, medium, Mk. II* ..	14	10	17	6	9	1½	8	10½	15-6	100	95	—	—
					standing	9	0						
					cut down								
Dragon, Mk. IIIA and IIIB ..	10	10	15	9	7	9	6	2	9-6	90	40	18	31
Armoured car (Lanchester) ..	7	6	19	8	6	11	9	1	40	165	24	30	35
Armoured car (Rolls-Royce, 1924)	4	14	16	2	6	4	8	4	55	195	23	21	13
Tractor, C.L., 2-ton	3	4	11	6	6	2	3	8	15 (a)	100	19	—	—
Tractor, F.A., 3-ton, Burford- Kegresse	6	14½	17	4	6	8	8	0	25 (b)	95	24	23	3
	(with 2-ton load)												
Tractor, F.A., 30-cwt., Burford- Kegresse No. 1	5	2	15	9	6	2	7	5	13 (c)	105	21	18	0
.. .. No. 2	5	2	16	9	6	2	7	5				19	7
.. .. No. 3	5	2	15	9	6	2	7	10½				19	5
							5	11				14	24
Carrier, M.G., armd., Burford- Kegresse, 30-cwt.	5	—	15	9	6	3	8	0	15	105	21	19	30
Carrier, 303-in. or 5-in. M.G., C.L., Mk. VI	1	18	8	1	5	7	3	4	25	50	9½	3	30
							6	0				14	30
Car, battery staff, 15-cwt., Crossley-Kegresse	2	14	15	2	6	6	6	9	20	200	22	16	23

(a) Towing gun and limber.

(b) Spec. w/o tow load.

(c) Towing gun.

2. *Weights, dimensions and shipping tonnage of mechanical transport vehicles.—*

Description (1)	Weight with vehicle equipment but no load (2)		Dimensions								Shipping tonnage			
			Length (3)	Width (4)		Height				Standing (7) (8)		Cut down (9) (10)		
						Standing (5)		Cut down (6)						
	cwt.	qrs.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	tons	cubic feet	tons	cubic feet
Lorries, 3-ton, 4-wheeled—														
A.E.C. (type 506)	93	0	23	6	7	4	10	4	6	6	45	14	28	0
Albion (type A.10)	72	3	21	0	7	2	10	6	7	0	39	20	26	13
Thornycroft ("J" 1926) ..	89	0	22	6	7	2½	10	6	6	0	42	23	24	18
Lorries, medium, 6-wheeled—														
Karrier	89	0	20	4	6	7	8	8	—	—	29	0	—	—
Guy	110	1	20	5	7	2	8	10	—	—	32	12	—	—
Leyland	106	0	20	10	7	2	10	1½	6	0	37	31	22	15
Thornycroft (A.5)	98	0	21	6	7	4	10	3	—	—	40	16	—	—
Lorries, light 30-cwt., 4-wheeled—														
Guy (W.D.)	44	2	17	8	6	9	9	6	8	3	28	13	24	24
Thornycroft (A.1)	47	0	17	11	6	5	9	7	6	6	27	22	18	27
Albion (R.24)	44	3	17	7	6	5	9	4	6	0	26	13	16	37
Lorries, light 30-cwt., 6-wheeled—														
Morris	54	0	16	8	6	0	8	3	—	—	20	25	—	—
Crossley	61	2	17	8	6	4	8	6	6	1	23	20	15	36
Vulcan (V.S.W.)	62	0	16	5	6	5	8	3	—	—	21	30	—	—
Motor-cars, 6-wheeled—														
Morris (closed)	55	2	16	8	6	1	7	1	—	—	17	30	—	—
Morris (open)	55	0	16	4	6	4½	6	8	5	3	17	4	13	26
Motor-cars, 4-wheeled—														
Closed	37	2	16	0	6	0	7	0	—	—	16	16	—	—
Motor-cars, light (3 passengers)—														
Garner	69	0	15	9	6	6	8	7	6	3	21	38	16	—
Riley, 9 h.p. (open)	19	3	12	3	4	9	5	6	4	4	8	0	6	12
Austin, 12 h.p. (closed) ..	22	4	13	6	5	7	6	1	—	—	11	18	—	—

Motor-cars, 2-seater—														
Austin	9	1	9	0	4	0	4	9	3	10	4	11	3	18
Motor-vans—														
Morris (type R.S.)	35	0	13	8	5	11	7	9	5	6	15	26	11	4
Motor-ambulances, 6-wheeled—														
Morris	55	1	16	4	6	6	8	9	—	—	22	9	—	—
Tractors, I.C.—														
F.W.D.	171	3	19	0	7	6	7	9	6	9	27	24	24	1
Motor-cycles, solo—														
Douglas (L. 29)	2	2	7	2½	2	8	3	3	—	—	1	16	—	—
Triumph (N.)	2	2	7	2	3	0	3	3	—	—	1	16	—	—
Triumph (N.) (in crate)	3	2	7	4	2	2	3	6	—	—	1	16	—	—
Side-car (in crate)	2	0	5	6	3	6	3	6	—	—	1	28	—	—
Silver Arrow	3	2	7	0	2	5½	3	2½	—	—	1	15	—	—
Technical vehicles—														
Dennis, portable electric lighting (less electrical equipment)	84	1	20	9	7	0	10	7	—	—	38	17	—	—
Laboratories—														
Bacteriological														
Lorries, workshop														
" store	97	0	21	0	7	0	10	6			40	0		
" breakdown		to		to		to		to	—	—		to		
" horse ambulance	145	0	23	0	7	6	11	6			51	34		
" sterilizer														
Fire-engines—														
Merryweather (Thornycroft) 6-wheeled	93	0	20	0	6	9	8	10	—	—	29	33	—	—
Trailers—														
G.S. 2-wheeled (15-cwt.)	17	0	10	10	6	10	5	5	—	—	10	1	—	—
Petrol tank (150 galls.)	17	1	11	0	6	10	5	8	—	—	10	26	—	—
Water tank (150 galls.)	21	4	10	0	6	10	5	6	—	—	10	14	—	—
G.S. 4-wheeled (3 tons)	55	0	14	2	6	10	6	5	—	—	15	21	—	—

* May be mounted on any of the makes shown under Lorries, 3-ton and 6-wheeled, medium.

8. *Weights, dimensions and shipping tonnage of horse-drawn vehicles.—*

Description	Weights				Dimensions						Shipping tonnage		
	With vehicle equipment		With equipment and maximum load		Length without pole		Width		Height		Shipping tonnage		
	(1)	(2)	(3)		(4)	(5)	(6)	(7)	(8)				
		cwt.	qrs.	cwt.	qrs.	ft.	in.	ft.	in.	ft.	in.	tons	cubic feet.
Carts—													
Ambulance, horse, Mk. II		—	—	—	—	8	8	6	10	8	0	11	34
Maltese, Mk. VI		7	2	22	2	6	4	6	3	4	8	4	25
Officers' mess, Mk. II		10	0	25	0	12	10 (a)	6	2	5	8 (b)	11	8
Tip, G.S., Mk. III		—	—	29	1	7	3	6	3	5	3	5	38
Tool, R.E., Mk. II		11	—	—	—	6	9	6	4	4	11	5	10
Water, tank, Mk. VII		25	1	35	1	8	8	6	4	4	11	6	29½
Kitchen, travelling—													
Body, Mk. II		15	3	—	—	5	6	6	4	5	6 (c)	4	32
Limber, Mk. II		15	0	—	—	5	3	6	4	4	8	3	35
Wagons—													
Ambulance, Mk. VI		24	3	—	—	13	9	7	3	9	5 (d)	19	13
										7	9 (e)		
Ambulance, light		16	2	—	—	12	3	6	4	7	2 (f)	13	36

NOTES ON THE MAINTENANCE OF MECHANICAL TRANSPORT VEHICLES

3. Provision must be made for adequate time to be allotted to the daily maintenance of mechanically propelled vehicles and their trailers, which is vital for their efficient running.

Vehicles must be replenished with fuel, engine oil and water at the end of each day's work. Gear box and back axle oil levels should be checked weekly and replenished as required.

The remainder of the vehicle must be lubricated as necessary, all parts examined for defects, loose bolts, etc., and minor adjustments must be made on the spot.

Vehicles must be kept as clean as possible and all dust and dirt removed from moving parts.

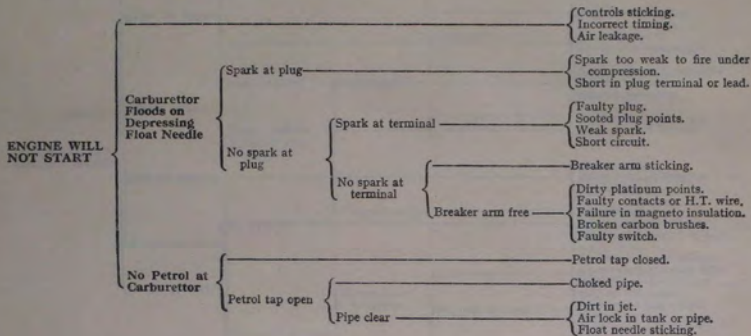
4. Full details for maintenance are contained in the Maintenance Handbook for Mechanical Vehicles. The following parts in particular must receive attention: steering gear control systems; brakes and brake gear; springs; fuel and lubricating systems; lighting systems and accumulators; fire extinguishers; tyres for pressures, wedged stones and cuts.

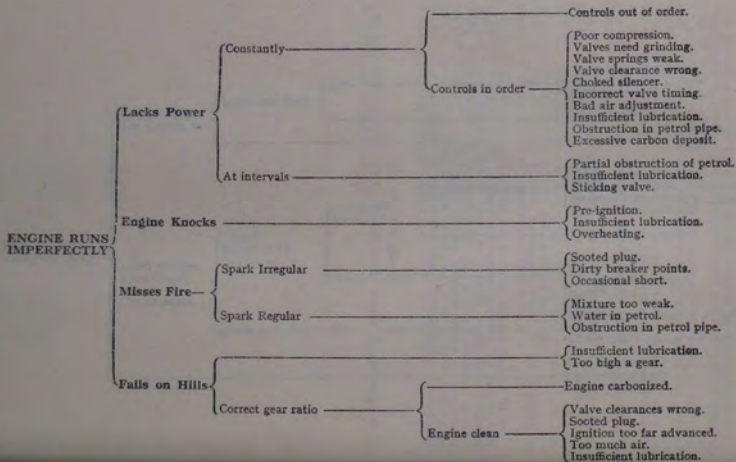
In the case of tracked vehicles precautions should be taken as far as possible to free tracks and suspensions of mud after running.

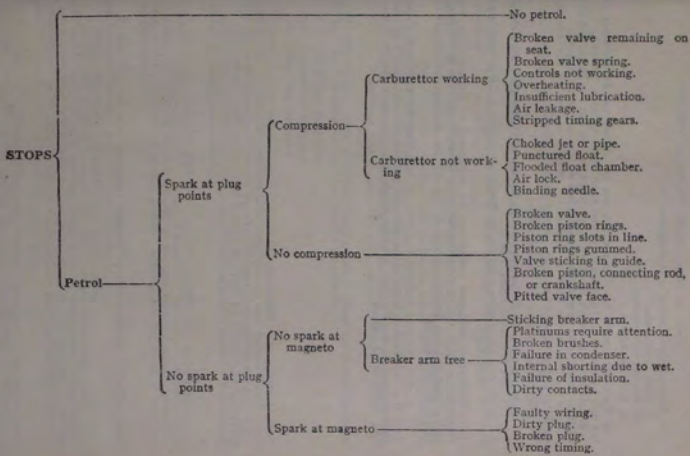
5. In severe weather precautions will be taken against damage by frost. If tracked vehicles are left to stand in exposed positions for long periods, suitable precautions should be taken to prevent tracks from becoming frozen to the ground, *e.g.* by running the vehicle on to brushwood or other suitable standings. If this is impossible vehicles should be periodically moved about. Tracks which have become frozen to the ground should be slacked off to the fullest extent and the vehicle moved slowly and carefully backwards and forwards until free.

LOCATION OF FAULTS

6. The following fault-locating chart should enable engine faults to be quickly diagnosed and remedied:—







REPAIR OF MECHANICAL TRANSPORT VEHICLES

7. Repairs are classified in three grades :—

- i. First line repairs.
- ii. Second line repairs.
- iii. L. of C. repairs.

8. First line repairs are those which can be carried out by artificers of the unit by means of the spare parts and hand tools carried in the unit.

Second line repairs are those which are more serious but can be carried out by light power tools provided by the services within easy reach of units.

L. of C. repairs are such as cannot be effected except by the heavier machinery of workshops and repair depots on the L. of C.

9. Second line repairs are carried out :—

- i. In the case of vehicles supplied by the R.A.S.C., by repair sections in the M.T. companies, R.A.S.C.
- ii. In the case of other vehicles, by divisional, corps or G.H.Q. ordnance workshops.

10. Formation ordnance workshops are organized to provide light aid detachments which can be detached to units, to render first aid to vehicles, and supplement the fitter personnel of the unit for dealing with repairs to non-R.A.S.C. vehicles.

11. L. of C. recovery sections, R.A.O.C., operate from railhead or advanced base (if established) to assist in the recovery and evacuation to base ordnance workshops of all non-R.A.S.C. vehicles which cannot be dealt with in formation ordnance workshops.

CHAPTER X

SUPPLY AND REPLENISHMENT OF MATERIAL

43. SYSTEM OF SUPPLY IN FRONT OF RAILHEAD

1. The forward supply of material in advance of railhead is normally effected by means of road transport.

2. Road transport is of three categories :—

- i. Field transport, for carriage to and with units or formations of their requirements of stores and materials either as first issues or as replenishment.
- ii. Technical transport, *i.e.* specially equipped vehicles.
- iii. Reserve transport, for allotment as additional field transport in front of railhead or as transport on the L. of C.

3. The normal system of forward supply from railhead entails the organization of the field transport in three links of a chain :—

- i. Third line transport.
- ii. Second line transport.
- iii. First line transport.

When units to be supplied are not normally required by the nature of their tasks to be far removed from railhead, two (or even one) links will suffice and the war establishment of their transport units have been organized accordingly. In the case of ammunition which may be required in varying quantities according to operations in progress, three links of road transport are provided, except for super-heavy artillery.

4. Each link normally delivers to the link in front of it at selected points termed "refilling points" or "delivery points." Third line transport, which is loaded at railhead or alternatively at an area park or dump, delivers to second line transport at refilling points; second line transport to first line at delivery points.

5. Refilling points are normally selected by the divisional H.Q., but cases may arise where they must be fixed by corps H.Q.

Delivery points are selected by unit commanders.

Intermediate between railhead and refilling points may be the rendezvous selected by corps H.Q., if refilling points have not been fixed. Intermediate between refilling point and delivery point is the "meeting point" fixed by commanders of brigades and areas where guides meet second line transport and conduct it to delivery points.

6. When the shortness of journeys makes it possible to economize road transport by omitting one link in the chain, commanders are responsible that this is done. Any one link may be utilized to carry out the duties normally allotted to two links, or even, in special circumstances, to three links.

The omission of a link will normally require the adjustment of personnel, other than transport personnel, to ensure that the duties carried out by the link omitted are satisfactorily performed by the remaining links, *e.g.* it may be necessary to transfer the supply or other personnel attached to the link omitted temporarily to the supply or ammunition links remaining.

FIRST LINE TRANSPORT

7. First line transport is an integral part of the war organization of all units, and is shown in their war establishments.

The control of first line transport is the duty of unit commanders, subject to such instructions in regard to temporary grouping or movement for tactical purposes as may be issued by superior commanders.

In normal circumstances it is advisable to divide the first line transport into two portions (referred to as "A" and "B" echelons), one of which accompanies the unit closely, whilst the other moves brigaded in rear of the formation. The composition of these echelons will vary according to local circumstances.

The responsibility for the care and efficiency of all personnel, animals, vehicles and equipment of first line transport rests with unit commanders. The C.R.A.S.C. of the division is the senior officer of and the representative of the D.S.T. in the division. He will render such assistance in the technical supervision of all first line transport in the division for which the D.S.T. is responsible as the divisional commander may direct.

The C.R.A.S.C. corps troops will exercise similar functions in regard to corps troops.

The D.A.D.O.S. of the formation is the officer responsible for supervising the maintenance of vehicles supplied by the ordnance service.

SECOND AND THIRD LINE TRANSPORT

8. Second and third line transport is composed of R.A.S.C., M.T. units. The general control is the duty of formation and area commanders and is exercised directly by orders issued by him direct to commanders of transport units or groups of such units.

9. The organization of second and third line transport units and their normal allotment and duties are as follows :—

2 and 3	G.H.Q. Troops Maintenance Company, R.A.S.C.	Transport of supplies, mails, stores, baggage, and carriage and custody of ammunition for units allotted as G.H.Q. troops.	One company to G.H.Q.
3	Corps Troops Maintenance Company, R.A.S.C.	Transport of supplies, mails, stores, and carriage and custody of ammunition for non-divisional units from railhead to S.R.P. and A.R.P.	One company to each corps.
2	Corps Troops Ammunition Company, R.A.S.C.	Carriage, custody, and issue to the 1st line transport of non-divisional units of ammunition of all natures, handed over from the corps troops maintenance company at A.R.P.	Do.
2	Corps Troops Baggage Company, R.A.S.C.	Transport of baggage, blankets, and greatcoats of non-divisional units.	Do.
2	Corps Troops Supply Company, R.A.S.C.	Transport and distribution to non-divisional units of supplies, mails, and other stores, handed over from the corps troops maintenance company at S.R.P.	Do.
3	Cavalry Maintenance Company, R.A.S.C.	Transport of supplies, mails, stores, and carriage and custody of ammunition for a cavalry division, from railhead to S.R.P. and A.R.P.	On the scale of one company to each cavalry division.
2	Cavalry Divisional Ammunition Company, R.A.S.C.	Carriage, custody, and issue to the 1st line transport of units of a cavalry division of all natures of ammunition, handed over from the cavalry maintenance company at A.R.P.	Do.
2	Cavalry Divisional Baggage Company, R.A.S.C.	Transport of baggage, blankets, and greatcoats (where applicable) for units of a cavalry division.	Do.
2	Cavalry Divisional Supply Company, R.A.S.C.	Transport and distribution of supplies, mails, and other stores for a cavalry division, handed over from the cavalry maintenance company at S.R.P.	Do.
3	Divisional Maintenance Company, R.A.S.C., for a division	Transport of supplies, mails, stores, and carriage and custody of ammunition for units of a division, from railhead to S.R.P. and A.R.P.	On the scale of one company to each division.
2	Divisional Ammunition Company, R.A.S.C.	Carriage, custody, and issue to the 1st line transport of units of a division of all natures of ammunition, handed over from the maintenance company at A.R.P.	Do.
2	Divisional Baggage Company, R.A.S.C.	Transport of baggage, blankets, and greatcoats for units of a division.	Do.
2	Divisional Supply Company, R.A.S.C.	Transport and distribution of supplies, mails, and other stores for a division, handed over from the maintenance company at S.R.P.	Do.

10. Second line transport of divisional and corps troops is organized into groups termed respectively the Divisional R.A.S.C. or Corps Troops R.A.S.C. These groups are under the direct control of formation commanders, to whom the C.R.A.S.C. concerned is responsible for all executive duties in connection with transport.

Second line transport units are equipped with light and cross-country lorries.

11. Third line transport consists of maintenance companies, termed respectively G.H.Q. Troops Maintenance Company, Corps Troops Maintenance Company, Cavalry Maintenance Company, and Maintenance Company for a Division, of which the first is under the direct control of O.C. G.H.Q. Troops and the remainder of Corps H.Q.

Each maintenance company consists of sections for ammunition and supplies respectively. The sections of G.H.Q. and corps troops maintenance companies are each sub-divided into sub-sections allocated to units, e.g. army field brigade, heavy brigade, tank battalion.

Other maintenance companies are equipped with heavy lorries only, but the sections of the G.H.Q. troops maintenance company include both light and heavy lorries for the second and third line links of the chain respectively.

12. When units of corps troops are put under the command of divisions, the lorries supplying them are detached from the corps troops transport companies and attached to the corresponding companies for the supply of units of that division.

13. When units of G.H.Q. troops are transferred to a corps or lower formation the vehicles supplying them are detached from the G.H.Q. troops maintenance company and attached, the heavy lorries to the corresponding maintenance company and the light lorries to the corresponding ammunition, baggage and supply companies supplying the units of that formation.

TECHNICAL AND RESERVE TRANSPORT

14. Technical and reserve transport units are as follows :—

Name of unit	Duties	Allotment and remarks
<i>i. Technical transport units, R.A.S.C.</i>		
Pontoon Bridge Park, R.A.S.C.	Carriage of pontoon bridges and bridging material.	One allotted to each corps. Includes R.E. personnel for technical duties in connection with bridging.
Omnibus Companies	Conveyance of troops.	Formed and allotted as required.
<i>ii. Technical transport units, R.A.M.C.</i>		
Motor Ambulance Convoys.	Carriage of sick and wounded from field ambulances to casualty clearing stations, and thence to ambulance trains.	Medical units with R.A.S.C. transport wing attached. Allotted to corps as required.
<i>iii. Reserve transport units</i>		
Reserve Transport Company	Reserve transport.	Allotted to G.H.Q. and L. of C.
Ambulance Car Company	Carriage of sick and wounded.	Allotted to L. of C. areas as required.

The operation and maintenance of the above units are the responsibility of the R.A.S.C.

44. SUPPLY OF AMMUNITION AND EXPLOSIVES

(See F.S.R., Vol. I, 1930, Chapter XVII)

GENERAL PRINCIPLES

1. Ammunition must be passed systematically and automatically from rear to front to replace that expended in battle.

Troops in action should never have to turn their backs on the enemy to obtain further supplies.

2. Early reconnaissance of the lines of ammunition supply and of ammunition refilling points, etc., is necessary.

3. On the march or in action the various echelons should be so situated that when an engagement takes place a regular system of supply can at once begin.

Each echelon must be constantly aware of the position of, and be in communication with, the echelon next in front of it, so that the quantity and nature of ammunition wanted can be sent forward promptly to the points required.

All expenditure from ammunition echelons must be replaced immediately. Each echelon will therefore assist by keeping the echelon behind informed of changes in location.

4. Preparations for an attack on a large scale must include the placing at the guns or at forward dumps of sufficient, but not excessive, ammunition to ensure that echelons remain full after the estimated initial expenditure.

If it is estimated that during subsequent stages of the attack the expenditure will exceed the available output from A.R.P.s., special arrangements must be made for forward dumps.

5. The formation of ammunition dumps and the quantities dumped will be carefully controlled by headquarters of formations. Any ammunition left in dumps in vacated positions should be utilized before drawing further from mobile echelons.

6. Indents for ammunition are not required. Ammunition receipts only are necessary and will be prepared by the officer handing over the ammunition for the number of rounds handed over and will be signed for by the officer receiving them, who is responsible for seeing that he obtains what he requires.

The accounts of rounds fired will be kept under the orders of commanders of units.

7. The supply from ammunition echelons is not necessarily restricted to troops of their own formation or to particular units. In an emergency any unit is to receive ammunition on demand from any echelon at hand which carries ammunition of the type required.

PROVISION OF AMMUNITION

8. The general staff is responsible for laying down the quantities of ammunition of various natures that are to be held in the theatre of operations. The D.M.G.O. is responsible that the quantities laid down are maintained and demands accordingly on the home authorities.

The D.Q.M.G. is responsible for the transportation and delivery of ammunition from ammunition base depots to railheads and to army or corps reserve dumps. The issuing and handling of the ammunition at railheads and at reserve dumps is the responsibility of the D.M.G.O.

9. The conveyance of ammunition from railhead or reserve dumps to selected delivery points within reach of the 1st line transport of units is effected by the R.A.S.C. in accordance with instructions issued by the Q.M.G.'s branch.

10. When an action is anticipated it is advisable that one or two days' normal expenditure of ammunition should be available for the quick replenishment of the maintenance companies. The reserve supply would be dumped at railhead or retained on railway trucks according to the nature of the operations and to the general requirements of the transportation service.

DISTRIBUTION OF AMMUNITION RESERVES

11. The work of replenishing ammunition is divided between :—

- i. Units with divisions, cavalry divisions and corps troops.
- ii. Units working on the lines of communication, which are responsible for the delivery of ammunition at ammunition railheads.

12. The channel of supply of ammunition from railhead to the troops is shown on Plate XXXII.

13. Maintenance companies (3rd line) are equipped with heavy lorries and, except G.H.Q. maintenance company, are under corps control.

Ammunition companies (2nd line) are designated divisional, cavalry divisional and corps troops. They are equipped with medium lorries. The two former are under divisional control and the corps troops ammunition company under corps control.

14. Ammunition railheads are fixed by corps or army H.Q. in consultation with G.H.Q.

Rendezvous, if required, are fixed by corps H.Q.

A.R.Ps. are normally fixed by divisional H.Q. in consultation with corps H.Q., but cases may arise where these points must be fixed by corps H.Q.

15. Forward ammunition points (F.A.Ps.) will be established when an action is imminent. A few lorries containing gun ammunition may be halted at F.A.Ps. if required. They are staffed by artillery personnel provided for the purpose in ammunition companies. They are fixed by the O.C. Div. Amn. Coy.

The delivery point for artillery ammunition is normally the battery wagon lines, or, if circumstances permit, the gun positions.

The delivery point for infantry units is normally the infantry brigade ammunition reserve. This is not a permanent organization, but its formation by withdrawing S.A.A. vehicles from units as necessary will be a normal procedure.

16. When army field, medium, heavy and anti-aircraft brigades and tank battalions of G.H.Q. troops are allotted to formations, the corresponding ammunition sub-sections and portions of the 3rd line section of the G.H.Q. maintenance company will be attached to the ammunition and maintenance companies respectively of the formations to which these artillery or tank units are allotted.

17. No regular ammunition echelons are provided for super-heavy artillery; that on railway mountings will receive its ammunition by rail as required, that on field mountings will receive ammunition by means of additional transport which will be added to ammunition echelons of the formations concerned.

SELECTION OF SITES FOR A.R.Ps.

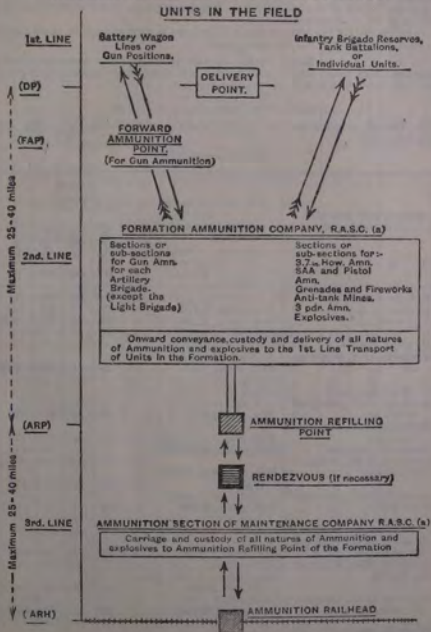
18. Since it is a principle that the vehicles of ammunition-carrying echelons would always be filled immediately they have been emptied, the normal requirements at an A.R.P. are that there should be facilities for the transfer of loads from a few lorries at a time of the maintenance company to corresponding lorries of the ammunition company.

19. The following considerations should be borne in mind in selecting the A.R.P. :—

- i. It should be easy of access by a good traffic circuit from the places where the ammunition section of the maintenance company and the ammunition company are located.
- ii. It should be on firm ground over which the lorries can be manoeuvred so that individual lorries of the two echelons can be placed tailboard to tailboard to facilitate the transfer of loads.
- iii. If the site selected is not on a road, which should be the case whenever possible, an area of 100 yards by 50 yards will meet normal requirements.
- iv. If no such area is available the site selected must be on a road. The road must be at least 25 feet in width to allow lorries to double-bank and permit other traffic to pass. The length of roadway which should normally be set aside for the A.R.P. should be 200 yards.
- v. Liability of attack from the air. This is reduced if the site is such that lorries can be placed under trees or in shade. Dispersal into small groups will also be of assistance in concealing the position of the A.R.P.

PLATE XXXII

NORMAL SYSTEM OF SUPPLY AND REPLENISHMENT OF AMMUNITION



(a) In the case of Units when forming part of G.H.Q. Troops, both the 2nd and 3rd line ammunition echelons are incorporated in the G.H.Q. Troops Maintenance Company, R.A.S.C. When such Units are detached to Corps or Divisions the 2nd and 3rd line ammunition echelons will be similarly detached from the G.H.Q. Troops Maintenance Company to the Ammunition and Maintenance Companies, R.A.S.C., of the Corps or Division concerned.

20. When preparations for an attack on a large scale are being made and extensive dumping of ammunition has been authorized, it will probably be necessary for the ammunition section of the maintenance company as a whole to dump its loads at the A.R.P. In this case the area required will be considerably larger and may extend to a length of 1,000 yards of roadway, flanked by a space 15 yards wide on which the ammunition can be dumped from the lorries of the maintenance company before being loaded into the lorries of the ammunition company.

It will facilitate the arrangements if the road is wide enough to allow lorries to be backed against the dumping space.

21. In all cases efficient traffic control is of primary importance and direction posts, easily legible both by day and night, must be erected to guide lorry drivers to the A.R.P.

AMMUNITION PACKAGES AND LOADS

22. Details of packages of artillery ammunition, S.A.A., grenades and fireworks :—

1. Artillery ammunition

Nature and quantity of ammunition	Name of package	Sizes of package			Weights
		Length	Width	Depth	
(1)	(2)	(3)	(4)	(5)	(6)
<i>Q.F. 3-pr. 2-cwt. Gun—</i>					
16 rounds, A.P. ..	Box, amn, C.176A ..	in. 25	in. 16	in. 14	lb. 142
12 rounds, A.P. ..	Box, amn., C.181 ..	22	15	11	104
<i>Q.F. 13-pr. Gun—</i>					
4 rounds, H.E. or shrapnel	Box, amn., C.53 ..	28	11	10	82
<i>Q.F. 18-pr. Gun—</i>					
4 rounds, H.E., shrapnel or smoke	Box, amn., C.51 ..	28	10	10	112
4 rounds, H.E., shrapnel or smoke	Box, amn., C.52, Mk. I	27	11	11	116
4 rounds, shrapnel	Box, amn., C.52, Mk. II	25	9	9	112
4 rounds, H.E., shrapnel or smoke	Box, amn., C.151 or C.151A	29	11	11	116
4 rounds, H.E., shrapnel or smoke	Box, amn., C.188 ..	28	9	9	122
<i>Q.F. 3-in. 20-cwt. Gun—</i>					
4 rounds, H.E., shrapnel or practice	Box, amn., C.147, Mk. II	33	12	12	126
4 rounds, H.E., shrapnel or practice	Box, amn., C.147, Mk. III and IIIM ..	34	12	12	128
4 rounds, H.E., shrapnel or practice	Box, amn., C.189 ..	32	10	10	131
<i>Q.F. 3-7-in. How.—</i>					
2 shell, H.E., shrapnel, smoke or star	Box, projectile, P.54 ..	17	11	7	53
2 shell, H.E. or smoke	Box, projectile, P.16 ..	17	11	7	51
2 shell, shrapnel	Box, projectile, P.15 ..	15	11	7	50
10 cartridges	Box, cartridge, C.27 ..	26	12	7	48
4 complete rounds, H.E. or shrapnel	Box, amn., C.178 ..	24	12	13	120

1. Artillery ammunition—continued

Nature and quantity of ammunition	Name of package	Sizes of package			Weights
		Length	Width	Depth	
(1)	(2)	(3)	(4)	(5)	(6)
Q.F. 4.5-in. How.—		in.	in.	in.	lb.
2 shell, H.E. or smoke	Box, projectile, P.10 ..	20	13	7	82
2 shell, H.E. or smoke	Box, projectile, P.10A ..	20	13	7	82
2 shell, H.E. or smoke	Box, projectile, P.21 ..	20	13	7	84
2 shell, H.E. or smoke	Box, projectile, P.53 ..	20	13	7	85
10 cartridges	Box, cartridge, C.19 ..	23	14	8	58
2 complete rounds, H.E.	Box, amn., C.174 ..	26	12	8	100
B.L. 60-pr. Gun—					
1 shell, H.E. or shrapnel	(Fitted with grummet) ..	20	6	—	60 or 56
10 cartridges, 9-lb. 7-oz.	Case, powder, M.L., whole, C.118 ..	18	17	22	145
10 cartridges, 9-lb. 7-oz.	Box, cartridge, C.125 ..	23	19	16	123
10 cartridges, 8-lb. 10-oz. 4-drs.	Case, powder, M.L., whole, C.118 ..	18	17	22	137
10 cartridges, 6-lb. 6-oz.	Case, powder, M.L., whole, C.118 ..	18	17	22	115
10 cartridges, 6-lb. 6-oz.	Box, cartridge, C.125 ..	23	19	16	93
B.L. 6-in. Gun—					
1 shell, H.E. or shrapnel	(Fitted with grummet) ..	23	7½	—	100
1 cartridge, 23-lb. ..	Cylinder, cartridge, No. 44, with skeleton case	30	9	9	43
B.L. 6-in. How.—					
1 shell, H.E. or smoke	(Fitted with grummet) ..	22	7½	—	100
1 shell, H.E., streamline	(Fitted with grummet) ..	22	7½	—	86
25 cartridges, 4-lb. 11½-oz.	Box, cartridge, C.1, Mk. 1	25	17	17	159
25 cartridges, 4-lb. 11½-oz.	Box, cartridge, C.1, Mk. 1A	27	18	17	168
20 cartridges, 4-lb. 11½-oz.	Box, cartridge, C.125 ..	23	19	16	183
20 cartridges, 4-lb. 11½-oz.	Box, cartridge, C.140 ..	28	20	11	136
20 cartridges, 4-lb. 11½-oz.	Case, powder, M.L., whole, C.118 ..	18	17	22	153
20 cartridges, 5-lb. 12-oz.	Box, cartridge, C.1, Mk. 1	25	17	17	155
20 cartridges, 5-lb. 12-oz.	Box, cartridge, C.1, Mk. 1A	27	18	17	164
15 cartridges, 5-lb. 12-oz.	Box, cartridge, C.125 ..	23	19	16	108
15 cartridges, 5-lb. 12-oz.	Box, cartridge, C.140 ..	28	20	11	111
B.L. 8-in. How.—					
1 shell	(Fitted with grummet) ..	30	9½	—	200
4 cartridges, 17½-lb. ..	Box, cartridge, C.141 ..	32	13	13	114
2 cartridges, 17½-lb. ..	Cylinder, cartridge, No. 50, with skeleton case	36	12	12	62
B.L. 9.2-in. How.—					
1 shell	(Fitted with grummet) ..	32½	11	—	290
1 cartridge, 23-lb. 12-oz.	Cylinder, cartridge, No. 50, with skeleton case	36	12	12	50
1 cartridge, 30-lb. 5-oz.	Cylinder, cartridge, No. 42, with skeleton case	23	15	15	62

i. Artillery ammunition—continued

Nature and quantity of ammunition	Name of package	Sizes of package			Weights
		Length	Width	Depth	
(1)	(2)	(3)	(4)	(5)	(6)
<i>Fuzes—</i>		in.	in.	in.	lb.
25 No. 80	Box, fuze, F.80	19	18	6	64
25 No. 88	Box, fuze, F.80	19	18	6	59
20 No. 101 and gaine ..	Box, fuze, F.100	18	13	11	75
20 No. 106 or 106e ..	Box, fuze, F.100 or F.101	18	13	11	70
20 No. 188, adapter and gaine	Box, fuze, F.101	18	13	11	70
<i>Tubes, percussion, S.A. cartridge—</i>					
200	Case, packing tubes, T3	15	7	4	12

ii. Small Arm Ammunition

Nature and quantity of ammunition and name of package (1)	Sizes of package			Weights (5)
	Length (2)	Width (3)	Depth (4)	
<i>.303-inch :—</i>	in.	in.	in.	lb.
1,000 rounds, Mk. VII, in Box, A.S.A., H.1—				
In bandoliers	17-0	8-5	10-85	75
In charger cases				
1,000 rounds, Mk. VII, in Box, A.S.A., H.19—				
In bandoliers	17-25	10-35	8-95	76
In charger cases				
1,248 rounds, Mk. VII, in Box, A.S.A., or Aiming Rifle, or Signal Cartridge, H.13—				
In cartons	17-0	8-5	10-85	84
1,300 rounds, Mk. VII, in Box, A.S.A., or Aiming Rifle, H.20—				
In cartons	17-25	10-35	8-95	88
500 rounds, Mk. VII, in Box, A.S.A., H.15—				
In stripless belts	16-875	8-8	7-125	40
<i>.455-inch Revolver :—</i>				
2,160 rounds, in Box, A.S.A., H.1—				
In cartons	17-0	8-5	10-85	120
240 rounds, in Box, A.S.A., H.9—				
In cartons	8-9	6-7	4-8	15
<i>.5-inch M.G. :—</i>				
370 rounds, in Box, A.S.A., or Aiming Rifle or Signal Cartridge, H.13—				
In cartons	17-0	8-5	10-85	81
380 rounds, in Box, A.S.A. or Aiming Rifle, H.20—				
In cartons	17-25	10-35	8-95	84

iii. Grenades and fireworks

Nature and quantity (1)	Description of package (2)	Overall size of package			Weight of package filled (6)
		L. (3)	W. (4)	D. (5)	
Cartridges, signal or illuminating, 1-in. 150	} Box, A.S.A. or Aiming rifle or signal cartridge, H.13, Mk. I or IA.	in.	in.	in.	lb.
Cartridges, signal or illuminating, 1½- in. 72		17	8.5	10.85	36 41
Grenade, -303-in. rifle, No. 36. 12 grenades	} Box, Grenades, G.36, Mk. I	22.0	7.25	6.75	28
12 detonators in tinned-plate cylinders					
14 S.A. cartridges in tinned-plate box					
12 gas checks and key					
Grenade, hand or rifle, No. 37. 12 grenades	} Box, Grenades, G.37, Mk. I	20.25	7.125	7.5	28
14 S.A. cartridges in tinned-plate box					
Grenade, signal, No. 42, 43, 45, 48 or 52. 24 grenades	} Box, Grenades, G.42, Mk. I	17.0	17.0	7.625	28 lb. with No. 42 Grenades. 32 lb. with Nos. 43, 45, etc.
28 cartridges in 2 tinned-plate boxes					
Grenade, Percussion, 2-in., No. 54. 16 grenades	} Box, Grenades, G.54, Mk. II	23.0	5.8	7.25	29
16 detonators in tinned-plate cylinders					
20 cartridges in tinned-plate boxes					

23. Maximum loads of various forms of transport in rounds of artillery ammunition and S.A.A.

Transport (1)	3" 20-cwt. gun (2)	3-pr. gun (3)	6-pr. gun (4)	13-pr. gun (5)	18-pr. gun (6)	3-7" how. (7)	4-5" how. (8)	60-pr. gun (9)	6" how. (10)	8" gun. (11)	8" how. (12)	9-2" how. (13)	.5" M.G. (h)	S.A.A., .303", in boxes			
														1,000 rds. at 76 lb. (15)	1,248 rds. at 84 lb. (16)	1,300 rds. at 88 lb. (17)	Strip- less belts, 500 rds. at 40 lb. (18)
Pack horse or mule ..	—	24	—	—	8(d)	8	4(d)	—	—	—	—	—	740	2,000	2,496	2,600	2,000
Gun-carriage limber ..	—	—	—	24	24 (e)	—	12	—	—	—	—	—	—	—	—	—	—
Ammunition wagon or limber ..	—	—	—	76	76	—	48	40	—	—	—	—	—	—	—	—	—
Wagon, limbered, G.S. ..	—	—	180	112	100	60	60	26	16	—	—	—	7,400 (i)	22,000 (i)	27,456 (i)	28,600 (i)	20,000 (m)
Wagon, G.S. ..	—	—	—	144	108	100	66	40	25	—	—	—	14,800 (m)	40,000 (m)	49,920 (m)	52,000 (m)	40,000 (n)
Motor van, heavy, 15- cwt. ..	52	176 (a)	156	80	60	54	35	20	15	12	—	—	7,400 (i)	22,000 (i)	24,960 (i)	24,700 (i)	20,000 (m)
Dragon ..	—	—	—	—	128	—	72	30	30	—	—	—	—	—	—	—	—
Lorry, light, 30-cwt. ..	104	368 (a)	312	164	120	108	70	40	30	25	15	—	14,800 (m)	40,000 (m)	49,920 (m)	52,000 (m)	40,000 (n)
Lorry, light, 6-wheeled ..																	
Lorry, heavy, 3-ton ..																	
Lorry, medium, 6- wheeled ..	208	752 (b)	636 (c)	328	220 (f)	220 (g)	140 (h)	85 (i)	60 (j)	50	30	20	29,600 (n)	80,000 (n)	99,840 (n)	104,000 (n)	80,000 (o)
Railway truck, 10-ton	800	2,640	2,120	1,000	800	712	450	250	200	150	100	70	102,120	294,000	331,968	330,200	280,000

(a) Packed in boxes of 16.

(b) 780 if packed in boxes of 12, 752 in boxes of 16.

(c) Packed in boxes of 12.

(d) Using carriers slung over saddle of draught harness.

(e) 20 in Mk. III carriage limber.

(f) 240 if packed in wooden boxes.

(g) 224 if packed in cases of 4.

(h) 90 56-lb. shells.

(i) 65 86-lb. shells.

(k) Packed in boxes of 370.

(l) 20 boxes.

(m) 40 boxes.

(n) 80 boxes.

(o) 160 boxes.

SUPPLY OF EXPLOSIVES

24. Explosives to replace wastage will be supplied in the same manner as S.A.A., *i.e.* through the S.A.A. sections of the maintenance and ammunition companies.

In addition, a strategic reserve of explosives will be maintained to ensure an adequate supply being available for demolitions on a strategic scale.

25. Explosives (demolition) authorized in War Equipment Tables to be carried by units in the field are shown in the following table:—

Detail (1)	Division					Cavalry Division				Corps Troops		
	Each Field Company, R.E. (2)	Field Park Company, R.E. (3)	Div. Amn. Company (4)	Maintenance Company (5)	Total in front of rail-head (6)	Field Squadron, R.E. (7)	Cav. Div. Amn. Company (8)	Cav. Maintenance Company (9)	Total in front of rail-head (10)	Each Army Troops Company, R.E. (11)	Corps Troops Amn. Company (12)	Corps Troops Maintenance Company (13)
1. Guncotton, dry primers, field, 1-oz.	960	720	540	240	2,940	480	480	240	1,200	720	540	240
2. Guncotton, wet slabs, field, 15-oz. (or 1-lb.).	640	736	(b) 546	280	3,010	1,120(a)	1,120(a)	560(a)	2,800(a)	728	546	280
3. Detonators, No. 8 ..	400	400	300	150	1,650	400	400	200	1,000	400	300	150
4. Detonators, electric, No. 13 or 9.	200	200	150	75	825	400	400	200	1,000	200	150	75
5. Fuze, safety, No. 11 (ft.) ..	1,344	1,344	1,008	528	5,368	1,152	1,152	576	2,880	1,344	1,008	528
6. Fuze, instantaneous, detonating (ft.).	1,600	1,600	1,200	800	6,800	1,600	1,600	800	4,000	1,600	1,200	800
7. Matches, fuze, safety ..	1,200	—	300	150	1,650	600	600	300	1,500	400	300	150

(a) Until present stocks of boxes, guncotton, wet, field, No. 2, W.32, containing 16 slabs, are used up, the figures in these columns will be 1,152, 1,152, 576 and 2,880 respectively.

(b) Or 540 1-lb. slabs.

26. Details of packages of explosives are given in the following table:—

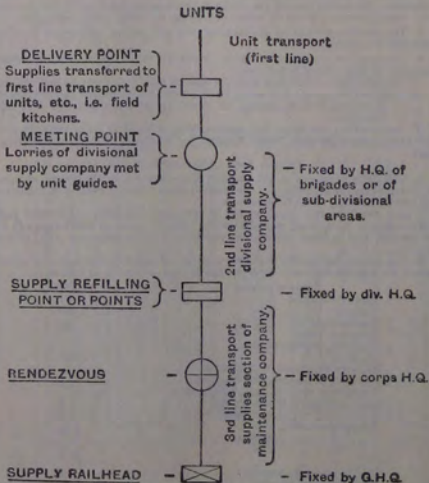
Store (1)	Nature and contents of package (2)	Size of package			Weight of package, lb. (6)
		Length, inches (3)	Width, inches (4)	Depth, inches (5)	
Guncotton, dry, primers ..	Box, guncotton, dry, primers, filled, 1 oz., W.3, Mk. III. Guncotton, dry, primer, field, 1 oz., Mk. I—60 in 6 tinned-plate cylinders.	16	6	7	14
Guncotton, wet, slabs ..	Box, guncotton, wet, field, 14 slabs, W.31, Mk. II. Guncotton, wet, slabs, field, 15 oz., Mk. I—14.	14	8	8	27
Ditto ..	Crate, guncotton, wet, field, 14 slabs, W.56, Mk. I. Guncotton, wet, slabs, field, 15 oz., Mk. I—14.	13	8	8	24
Ditto ..	Box, guncotton, wet, field, 14 lb., W.31, Mk. II Guncotton, wet, slabs, field, 1 lb.—14	14	8	8	27
Ditto ..	Crate, guncotton, wet, field, 14 slabs, W.56, Mk. I. Guncotton, wet, slabs, field, 1 lb.—14	13	8	8	25
Detonators, No. 8 ..	Box, detonator, D.1, Mk. 1 or Ia Detonators, No. 8, VII, with 2 feet of safety fuze attached—24 in 4 tinned-plate cylinders, No. 49.	20	7	7	14
Detonators, electric, No. 13 ..	Case, wood packing, detonator, electric, No. 13 Detonators, electric, No. 13, in cylinder, No. 13d, with rectifier (25 in a cylinder).	22	10	6	18
Detonator, electric, No. 9 ..	Cases, packing, detonator, electric, D.2, Mk. I and Ia. Detonators, electric, No. 9, Mk. IV—100 in 4 tinned-plate cylinders.	22	10	6	18
Fuze, safety, No. 11 ..	Cases, powder, M.L., whole (containing 60 cylinders). Fuze, safety, No. 11—8 fathoms in one tinned-plate cylinder.	17	17	21	129
Fuze, instantaneous detonating ..	Box, instantaneous fuze, Mk. VI Fuze, instantaneous detonating, trotyl, Mk. I—400 feet on reel box, instantaneous fuze, Mk. VI.	14	14	4	46
Matches, fuze, safety ..	Case, wood packing Matches, fuze, safety—3,500 in 140 boxes ..	12	7	7	8

Note.—Measurements are given to the nearest inch and weights to the nearest lb.

PLATE XXXIII

SYSTEM OF SUPPLIES

NORMAL SYSTEM OF FORWARDING SUPPLIES FROM RAIL-
HEAD TO THE TROOPS OF A DIVISION OR A CAVALRY
DIVISION



(Note.—The system of supplies for corps troops is identical, except that supply refilling points are fixed by corps H.Q. and meeting points by formation or other commanders subordinate to corps.)

9. For transport vehicles it may be taken that the consumption of lubricating oils amounts to approximately 5 per cent. of that of petrol, i.e. 4 per cent. of engine oil plus 1 per cent. of other lubricants for gear-boxes, back axles and chassis.

For estimating purposes an approximate guide to the percentage of lubricants required in proportion to petrol may be arrived at as follows:—

Class of vehicle (1)	Oil, lubricating					Grease M.T. (7)
	Vacuum B.B. (2)	M.120 (3)	M.220 (4)	M.600 (5)	M.800 (6)	
All vehicles except as below	—	—	4	1	—	$\frac{1}{2}$
Dragons, Mk. III	6	—	—	2	2	$\frac{1}{2}$
Tanks, medium	6	—	—	2	3	$\frac{1}{2}$
Burford-Kegresse	—	—	—	4	2	$\frac{1}{2}$
Carden-Loyd	—	5	—	2	1	$\frac{1}{2}$
Armoured cars	—	—	5	1 $\frac{1}{2}$	—	$\frac{1}{2}$

Grease.— $\frac{1}{2}$ per cent. (of petrol consumption) for grease is sufficient for all contingencies, but its use is declining.

Note.—As the above table is only a guide, actual types of lubricants, being variable, need to be definitely ascertained as events progress. For example, M.220 and Vacuum B.B. are closely similar.

A useful table, giving an approximate comparison between commercial lubricants and those of service nomenclature, is given in Maintenance Handbook for Mechanical Vehicles, 1930, paragraph 169.

10. The weight of petrol and lubricants is approximately as follows:—

Petrol, in cans and cases	176 gals. = 1 ton gross
" in 2-gal. cans (uncased)	250 " = 1 "
" in bulk	300 " = 1 "
Lubricating oil, in 5-gal. drums	210 " = 1 "
Grease, in cases (60 2-lb. tins)	1,500 lbs. = 1 "
" " (22 5-lb. ")	1,000 " = 1 "

11. The capacity of vehicles in terms of petrol, cased (four 2-gallon cans in each case), and in 2-gallon cans, uncased, is given in Sec. 49.

NOTES ON THE SELECTION OF S.R.Ps.

12. The number of supply refilling points required will depend upon the distribution of the formation to be served. Under favourable conditions one refilling point for each division will suffice.

13. The lorries of the maintenance company, when the ground permits, before being unloaded should be turned to face in the direction they will proceed when empty. Similarly the lorries of the supply company, before being loaded, should be turned to face in the direction they will proceed when full.

14. Normally the maintenance company on arrival at S.R.P. will unload the supplies on to the selected dumps, each commodity of supply being heaped separately. The lorries of this unit will when empty normally move away from the vicinity. It may be necessary, however, to leave one or more vehicles to collect salvage and empties.

15. Efficient traffic control will be established at supply refilling points to avoid congestion.

16. The operation of refilling for a divisional formation should be completed in 1 $\frac{1}{2}$ hours from the time the lorries of the divisional supply company take up position.

17. The following factors should be considered in selecting the position of supply refilling points:—

- i. Lateral roads should be selected and not main roads leading from front to rear.
- ii. Wide open spaces having a hard, level surface and solid foundations, which allow some room for the movement of lorries, form ideal sites, but these are rarely available.
- iii. The dumping of the supplies requires ground available alongside the road for the purpose. Roads lined by ditches, low-lying swamps, etc., should be avoided.
- iv. The site should be on a good traffic circuit and not on a steep gradient.
- v. Turning space for vehicles is required.
- vi. The road space required for a division and a brigade is approximately 1,000 yards and 250 yards respectively.
- vii. The liability of attack from the air. This is reduced if concealment can be provided by carrying out the operation in shade, under trees, etc., or in darkness, mist, etc. Dispersion into small groups will also assist, if practicable.
- viii. If ground conditions permit, supply refilling points will not be restricted to roads. Hard tracks running through wooded country may suit and provide excellent concealment.

REQUISITIONS

(See F.S.R., Vol. I, 1930, Chapter XIX)

18. Requisitions can only be made for the needs of the army and in proportion to the resources of a district.

The quantity of food to be left in the possession of inhabitants must be decided by the commander ordering the requisition. The usual practice is to leave at least 3 days' supply of food for a household, and rather more than that at outlying farms or villages.

The details of the requisitioning service will be arranged under the direction of the D.Q.M.G. at the outbreak of hostilities.

19. As a general principle only officers of the administrative service concerned detailed for the duty are authorized to requisition, but in cases of emergency, e.g. when troops are on patrol duty or where no officer of a service or duly appointed requisitioning officer is available, requisitions may be carried out by the commander, the circumstances being reported without delay to superior authority. Indiscriminate requisitioning and granting of requisition receipt notes are strictly forbidden.

20. Authority to requisition will not be delegated to any but a commissioned officer, and requisitioning on the part of warrant officers, N.C.Os. or men will be treated as plundering under the Army Act, unless the case is one of extreme urgency and no commissioned officer is present.

Requisitions will generally be made by a demand on A.F. F. 780, which may be altered to suit local conditions.

21. Except when payment is made on the spot, the requisitioning officer will give to each local civil authority a requisition receipt note, A.B. 361 (see below), for all goods or services rendered.

When payment is made on the spot no acknowledgment for the goods or services will be given by the requisitioning officer, but a receipt for the amount paid will be obtained.

22. When in exceptional circumstances requisitioning has to be carried out direct, i.e. without the agency of the civil authorities, it will not be necessary to present a demand; but, except when payment is made on the spot, a requisition receipt note (A.B. 361) will be given to the owners for goods or services rendered.

23. Requisition receipt notes will in all cases be made out in triplicate, but the original note only will be given to the civil authority (or owner in the exceptional circumstances when requisitioning has to be carried out direct).

The *duplicate note* will be sent direct to the central office by the representative of the service concerned, or if no representative is attached to the force, by the commander.

The *triplicate note* will be sent as soon as possible through the representative of the service concerned to the directorate to whom he is responsible.

24. *The original requisition receipt note will in no circumstances show the rank, unit or force of the requisitioning officer, but this information will in all cases be inserted by that officer on the duplicate and triplicate of the note.*

Unless special orders are issued to the contrary, face values will not be entered on requisition receipt notes. A requisition receipt note is merely a record of the transaction shown thereon. The quality of the articles should be indicated in each case by one of the words, "Good," "Average," "Indifferent."

25. If goods are taken for protection and not for the use of the troops a statement to that effect will be written by the requisitioning officer on the duplicate and triplicate of the requisition receipt note.

26. All authorities or persons to whom requisition receipt notes are given will be directed to send them at the earliest possible date to the officer in command of the nearest British garrison. This officer will give an acknowledgment and will at once transmit the notes to the central requisition office.

27. Should requisition receipt notes be presented for payment, such payment will on no account be made until the notes have been forwarded to the central office and the authority of that office to pay obtained, unless the claim is one for settlement by the service concerned.

Army Book 361

REQUISITION RECEIPT NOTE

(Not negotiable)

No. Date
 Requisition from (full name)
 Address

Articles or services requisitioned	Quantity	Quality (good, average, or indifferent)

Signature of Requisitioning Officer.

46. REPLACEMENT OF VEHICLES

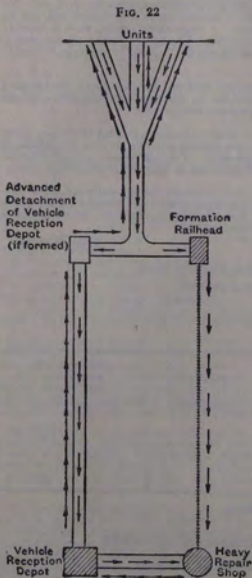
HORSE TRANSPORT VEHICLES

1. The replacement of horse transport vehicles is normally effected by the advanced horse transport depot, R.A.S.C., supplying complete turnouts, consisting of drivers, horses, vehicle and equipment. This depot, which is a G.H.Q. unit, is so located and organized as to enable it to supply complete turnouts promptly to units by march route.

2. When replacement by complete turnouts is not required, indent for vehicles and harness will be placed with the ordnance service and for horses with the remount service.

R.A.S.C., M.T., VEHICLES

3. The following diagram (Fig. 22) illustrates the process of evacuation and replacement :—



NOTES

Evacuation = \downarrow or \downarrow

Replacement = \uparrow

When evacuation is by road the unit driver goes with the vehicle to vehicle reception depot or its advanced detachment, and returns with the replacement vehicle. When evacuation is by rail the replacement vehicle will be delivered to the unit by the vehicle reception depot. The evacuation and replacement of vehicles of R.A.S.C. responsibility held as 1st line transport of units will be effected through the formation supply company.

M.T. VEHICLES (Non-R.A.S.C.)

4. The following diagram (Fig. 23) illustrates the process of evacuation and replacement :—

FIG. 23

NOTES

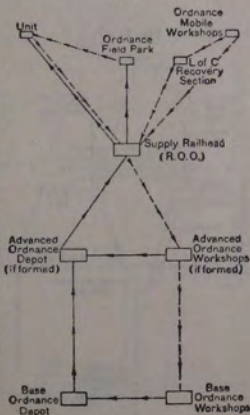
→ → → → shows normal channel of supply from base ordnance depot to unit.

→ . . . → shows supply from field park. Issue is only made in urgent cases. Fighting vehicles such as tanks and armoured cars are not held by field park.

→ → → → shows channel of evacuation to base ordnance workshops.

2 Supply.—If unit drivers are available they will collect vehicles from formation supply railhead or ordnance field park. If unit drivers are not available R.A.O.C. will make arrangements for delivery to units.

3 Evacuation.—If vehicles can proceed under their own power they will be driven by unit personnel to formation supply railhead. Vehicles incapable of self-propulsion will be evacuated by ordnance workshops or L. of C. recovery sections.

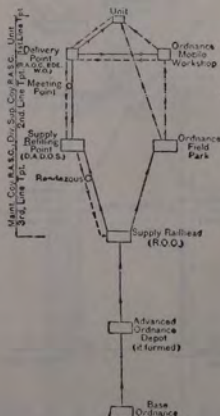


47. SUPPLY OF ORDNANCE STORES

1. Ordnance stores comprise personal and unit equipment, including armament and small arms, ammunition, explosives, engineer and signal stores, tanks, armoured cars, tractors, carriers and mechanical transport vehicles other than those belonging to the R.A.S.C., or driven by R.A.S.C. drivers, clothing and necessities, barrack and camp (movable) equipment, and materials for workshops.

2. The following diagram (Fig. 24) illustrates the normal system of evacuation and replenishment of ordnance stores except M.T. vehicles (for which see Sec. 46, 4, Fig. 23, page 183).

Fig. 24



NOTES

→ → → → shows normal channel of supply.

→ - - - → shows supply of spare parts (mainly M.T. and armament) to units from ordnance mobile workshops. Only items required for immediate use are issued from the workshop.

- - - - - → shows supply from field park. Spares for M.T. vehicles, armament, machine guns, also complete machine guns, are held for urgent issues only.

→ - - - - - → shows normal channel of evacuation.

Supply.—Stores are despatched from base or advanced ordnance depot by pack train to formation supply railhead, where they are loaded into the lorries of the maintenance company, R.A.S.C., by R.O.O. They are conveyed to S.R.P. and handed over to the O.C. supply company, R.A.S.C., who conveys them to D.P. and hands them over to unit representatives. R.A.O.C. representatives will attend S.R.P. and D.P. unless circumstances do not permit.

Guns, carriages, limbers, H.T. vehicles, etc., are supplied by the same source. In the case of heavy loads such as guns and carriages, R.A.S.C. arrange delivery by special methods.

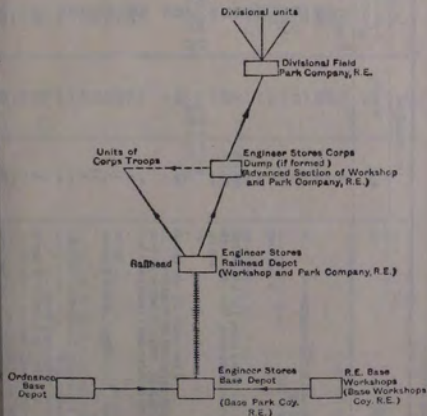
Evacuation.—The normal method of evacuation is by returning R.A.S.C. transport. In the case of large consignments D.A.D.O.S. of the formation will make special arrangements with O.C. R.A.S.C.

48. SUPPLY OF ENGINEER STORES

1. Engineer stores comprise material and plant, other than unit equipment, required for engineer work of all kinds, whether carried out by engineers or other arms. The term "engineer stores" embraces permanent line signal stores, but does not include explosives.

2. The following diagram (Fig. 25) illustrates the normal system of supply :—

FIG. 25



Note.—Until the scale of operations necessitates the formation of the Base Park and Base Workshop Companies, R.E., the Engineer Stores Base Depot and R.E. Base Workshops will be operated by the Workshop and Park Company, R.E., an advanced section of which will operate the Engineer Stores Railhead Depot.

2. Supplies :—

Article (1)	Weight of each package, lb. (2)	Van, 12-cwt. (3)	Lorry, medium, 6-whld. (4)	Lorry, light, 6-whld. (5)	G.S. wagon (6)	L.G.S. wagon (7)	Remarks (8)
Petrol, gallons, cased (four 2-gallon cans) (d)	95	112	512	256	—	—	(a) 54 in 3-ton lorry (4-wheeled).
Petrol, gallons, uncased (2-gallon cans) (d)	18	160	700	350	—	—	(b) 36 in 30-cwt. lorry (4-wheeled).
Biscuits, cases	74	18	90	45	45	8	(c) 126 in 3-ton lorry (4-wheeled).
Bread, chests (35 loaves in chest) ..	84	16	(a) 36	(b) 14	20	4	
Bread, sacks (40 2-lb. loaves)	84½	16	48	24	24	8	
Frozen meat	—	12 cwt.	3 tons	30 cwt.	30 cwt.	10 cwt.	(d) These loads permit of the carriage of the necessary quota of lubricants.
Preserved meat, cases	56	24	120	60	60	20	
Hay, bales	156	9	25	12	12	4	
Hay, bales (compressed)	79	17	84	42	42	11	
Oats, sacks	80	17	84	42	42	14	
Bran, sacks	112	12	60	30	25	5	
Rum, cases (2-gallon jars)	53	24	(c) 116	63	50	10	

CHAPTER XI

MEDICAL SERVICE

*(For detailed instructions on this subject, see F.S.R., Vol. I, and
R.A.M.C. Training.)*

50. GENERAL ORGANIZATION

1. The D.G.M.S. or, if the strength of the force is limited to one army, the D.M.S., is the head of the medical services and as such is the adviser of the Commander-in-Chief on all medical and other matters affecting the health of the troops, and is responsible to him for the medical and health services of the force.

2. The D.G.M.S. of a force is represented in lesser formations and areas by directors, deputy-directors and assistant directors of medical services, who bear the same relationship to their commanders as he does to the Commander-in-Chief. These administrative medical officers also command the R.A.M.C. in their respective formations and areas, and receive their instructions from the appropriate branch of the staff.

HYGIENE ORGANIZATION

General

3. The importance of measures whereby the health and effective strength of the army are maintained cannot be over-estimated. A high standard of health and a low incidence of sickness are important signs of efficiency, and to achieve these the co-operation of every individual is necessary. It is therefore essential that every officer, warrant officer, N.C.O. and man should have a knowledge of the principles of sanitation and the best means of maintaining health.

In a formation

4. The commander of every formation is responsible for the health and well-being of the troops under his command and for applying all measures necessary to that end, and for the prevention and mitigation of disease.

He is also responsible for the sanitary condition of the area occupied by his command, irrespective of the period for which it may be occupied, and for seeing that officers and other ranks obey all orders regarding health and sanitation.

In the medical service

5. The hygiene directorate is represented in the field by an assistant director of hygiene at General Headquarters, and by a deputy-assistant director of hygiene at each corps headquarters, and at the headquarters of each base and lines of communication, sub-area. In a division and cavalry division the D.A.D.M.S. is the sanitary officer.

These officers will:—

- i. Act as technical advisers of the administrative medical officers of the formations and sub-areas to which they are allotted, and will furnish skilled technical advice to unit medical officers and others when necessary.
- ii. Either alone, or in conjunction with their administrative medical officers, supervise, inspect and report on health conditions and all sanitary measures in the units and areas for which they are responsible, and at once bring to notice any culpable neglect of sanitary measures, and make recommendations for remedying defects.
- iii. Immediately investigate the cause of any outbreak or unusual prevalence of disease among the troops or local inhabitants, and recommend suitable measures for dealing with the same.
- iv. Advise on the selection of sites for camps and bivouacs, and on questions relating to the sanitary condition of towns, villages or buildings about to be occupied, and to this end they should accompany the officers charged with the selection of billets, camps and bivouacs.
- v. Advise regarding the protection, purification and distribution of water for drinking purposes.

6. A field hygiene section is allotted to each division and cavalry division, and to corps, army, base and L. of C. areas as required. They are under the direct control of the senior administrative medical officer of the formation or area to which they are allotted.

The personnel of a field hygiene section act as sanitary police and perform duties corresponding to those of sanitary inspectors in civil life. They supervise labour employed in the removal and destruction of excreta and refuse, also the construction by units of sanitary works and appliances, and advise regarding the best types and methods.

They carry out sanitary measures requiring skilled knowledge beyond that possessed by regimental personnel, e.g. disinfection, disinfestation, bulk purification of water supplies, and they are available to give instruction to units in technical sanitary matters.

The existence of a sanitary section in a formation or area in no way relieves unit commanders of their essential responsibility in regard to sanitation, nor is it the function of a sanitary section to carry out for units any sanitary measures within the capacity of regimental personnel.

They do not as a rule construct elaborate sanitary appliances, such work being allotted to the engineers.

Hygiene laboratories for the scientific investigation of disease prevention and other problems affecting the health of the troops are allotted to forces in the field and located in forward and rearward areas as required. A special mobile hygiene laboratory is allotted to each army.

REGIMENTAL

7. *Commanding officer.*—Every unit commander is responsible for the cleanliness of his men, for the sanitary condition of the area occupied by his unit and for taking all measures necessary for the well-being and the preservation of the health of those under him, and for ensuring that all orders in regard to health and sanitation are rigidly carried out by the troops under his command.

War establishments provide, for the majority of units, a medical officer and specially trained personnel for water and sanitary duties. Special arrangements are made for units which do not possess this personnel as part of their war establishment.

8. *Officer in medical charge of a unit.*—Advises the C.O. on all matters relating to the preservation of the health of the troops under his command and the prevention or reduction of disease. He is responsible to the C.O. for the efficient performance of their duties by the regimental water duty and sanitary personnel. In technical matters he is under the direct control of the senior administrative medical officer of the formation or area.

Trained subordinate personnel

9. *Water duties.*—Personnel specially trained in methods of purification and protection of water-supplies. They have charge of the water-carts and of any apparatus or chemicals issued for sterilization of water.

10. *Sanitation.*—Personnel specially trained in sanitary duties to act as sanitary police, and to perform all sanitary duties in the unit, e.g. disposal of excreta and refuse, construction of latrines, urinals, soak pits, etc.

11. *Chiropody.*—One specially trained man is allotted to certain dismounted units for the care of the men's feet. His duties are to teach men how to look after their own feet, and to treat such minor disabilities as corns, ingrowing toe nails, blisters and sweaty feet.

All these trained subordinate personnel perform their duties under the orders of the officer in medical charge of the unit. Trained reserves should be maintained in the unit.

MEDICAL UNITS OF A FORCE IN THE FIELD

12.—i. *Medical establishment with units.*—Battalions and similar units have a medical officer attached. He is provided with a limited medical equipment carried in a Maltese cart or motor-van. A lance-corporal and one man of the unit are provided to assist him. When an action is imminent the regimental stretcher-bearers are placed under his orders.

- ii. *Field ambulances*, three to each division; two cavalry field ambulances to each cavalry division. Duties, to collect sick and wounded from regimental aid posts, to provide treatment for slight cases, and to evacuate to casualty clearing stations those requiring further treatment.
- iii. *Motor ambulance convoys*.—Army units. One for each corps. Duties, to collect sick and wounded from field ambulances and to convey them to casualty clearing stations or from casualty clearing stations to ambulance trains or barges.

Ambulance car companies, R.A.S.C., are employed at the base to convey patients from general hospitals to hospital ships.
- iv. *Casualty clearing stations*.—Army units, one for each division. Duties, to receive sick and wounded from field ambulances and local units, to provide surgical treatment and to evacuate casualties to general hospitals.
- v. *Ambulance trains*, one for each division of a small force, fitted to carry about 400 lying-down cases and to furnish any treatment required on the journey. Used to convey patients from casualty clearing stations to general hospitals.
- vi. *General hospitals* of 600 and 1,200 beds, located at the base or in L. or C. area. Number calculated to afford beds for 10 per cent. of the force. Duties, to provide any medical or surgical treatment and to evacuate selected cases to home territory.
- vii. *Convalescent depots*.—Capacity, 2,000 men, located near general hospitals, for men who do not require any further active medical or surgical treatment, but who are not fit to return to the front until they have gone through a course of hardening exercises.
- viii. *Base and advanced depots of medical stores*.—Base depots receive medical supplies in bulk from the home territory; they are located near the port of disembarkation. Base depots replenish the advanced depots, usually three to an army. Advanced depots issue supplies on indent to medical units. Regimental medical officers obtain their supplies from the nearest medical unit of their formation.
- ix. *Laboratories*.—One mobile hygiene and two mobile bacteriological laboratories are attached to each army, for the scientific investigation of disease prevention and for the study of disease in the field.
- x. *Hospital ships* are fitted out to afford all necessary treatment during the voyage. The usual capacity is 600 to 700 beds. Smaller ships may be used for short voyages. A hospital carrier is a passenger ship temporarily adapted as a hospital ship and used while the latter are being fitted out.

EVACUATION AND TREATMENT

13. Sick are seen by the M.O. of the unit and are, if necessary, detained at the regimental aid post (which is usually at unit headquarters) or sent to a field ambulance for treatment or evacuation. If evacuated from the divisional area they are struck off the strength of their unit.

A wounded man is attended to by the M.O., stretcher-bearers, or medical orderly of the unit, and (unless able to walk to the collecting post for walking wounded) is carried back by the regimental stretcher-bearers to the regimental aid post, and is removed thence by the bearers of the nearest field ambulance to the advanced dressing station, or direct to the main dressing station of the ambulance. From the field ambulance he is transferred by means of motor ambulance convoys to a casualty clearing station, where, if the military situation permits, all necessary and urgent treatment of his wound is completed before he is evacuated further. If the wound is not of a nature to require his retention, or as soon as he is able to travel, the wounded man is transferred down the L. or C., generally by ambulance train, to a general hospital, and when no further treatment is required, to a convalescent depot.

If evacuated from the theatre of operations he proceeds in a hospital ship; thence he is transferred to a military hospital. Should he require no further active treatment, although still unfit for duty, he is transferred to a convalescent depot; from this he may proceed on sick furlough. When

recovered, he is discharged to a military depot for training and hardening until fit for duty again.

DENTAL TREATMENT

14. Army Dental Corps personnel for the provision of dental treatment are attached to field ambulances, casualty clearing stations, general hospitals and convalescent depots.

FIRST FIELD DRESSING

15. Every officer and man carries in the field a dressing which is placed in the pocket of the right side of the skirt of the frock. It consists of a packet of khaki cotton cloth containing in a linen cover two dressings, each composed of 2½ yards of bandages, some gauze and a safety pin. Simple instructions as to the method of using it are printed on the outer and inner covers. The first field dressing of the wounded man himself and not that of a comrade should always be used.

Field dressings should be inspected frequently, and all ranks instructed and tested periodically by the medical officer in their knowledge of the application of the first field dressing.

TREATMENT OF CASES OF EMERGENCY

16.—i. *Gassed cases*.—Men who have been exposed to gas, even slightly, should not be allowed to walk or otherwise exert themselves, but should be carried, or at least assisted (if no form of ambulance transport can be procured for them), to the nearest aid post or dressing station. Care must be taken that they do not attempt to remove their respirators so long as there is need to wear them.

ii. *Mustard gas*.—Contaminated clothing should be removed. Skin which has been exposed to the vapour can be cleansed by scrubbing with soap and water frequently changed or by rubbing in bleach ointment.

iii. *Bleeding*.—Every care should be taken to check loss of blood from wounds.

When internal bleeding is suspected, skilled medical assistance must be obtained with the utmost speed. Do not give stimulants.

To treat external bleeding, cut away clothing, expose the wound, and without attempting to wash, apply first field dressing and bandage moderately firmly. Next raise the wounded limb and keep it at perfect rest. If bleeding should still continue, apply steady firm pressure with the hand outside the dressing.

Should smart bleeding still continue, apply direct pressure between the wound and the heart with the hand; if this is unavailing, resort should be had to some form of tourniquet.

A tourniquet can be quickly improvised by tying a handkerchief or puttee around the limb between the wound and the heart; and then by introducing a stick or bayonet underneath and twisting; the constriction can be increased until the bleeding ceases. The stick is then secured to prevent untwisting. The rubber tourniquet (Samway's Anchor pattern), if available, is much safer to use than the improvised type.

A tourniquet should only be used as a last resort. If wrongly applied it tends to increase the bleeding; if left on too long the limb below the constriction will die. Consequently, all cases so treated must be got under medical care as quickly as possible. Apply a tourniquet as low as possible to the stump of a limb which has been blown off.

If the wound is in the neck, direct pressure by the hand outside the first field dressing must be relied upon, taking care that the pressure is not so great as to interfere with breathing.

iv. *Burns and scalds*.—Apply oil, vaseline, or boracic powder. Cover from air; quickly cut off clothes; they should never be pulled off.

v. *Drowning*.—*Restoration by Schafer's method*.—If breathing has ceased, immediately on removal from the water place the patient face downwards on the ground, with the arms drawn forward and the face turned to the side.

Without stopping to remove or loosen clothing, commence artificial respiration. To effect this place yourself astride or on one side of the patient's body, in a kneeling or squatting position, facing his head. Placing the hands flat on the small of his back, with the thumbs parallel and nearly touching, and the fingers spread out over the lowest ribs, lean forward with the arms straight and steadily allow the weight of your body to fall on the wrists, and so produce a firm downward pressure, which must not be violent, on the loins and the lower part of the back. This part of the operation should occupy the time necessary to count slowly one—two—three. By this means the air (and water, if any) is driven out of the patient's lungs. Water and slime from the air passage must also run out.

Immediately after making the downward pressure, swing backwards so as to relax the pressure and allow air to enter the lungs. Do not lift the hands from the patient's body. This part of the operation should occupy the time necessary to count slowly one—two. Repeat this forward and backward movement (pressure and relaxation of pressure) 12 or 15 times a minute, without any marked pause between the movements.

While the operator is carrying out artificial respiration others may, if there is an opportunity, apply hot flannels, hot bottles, etc., between the thighs and to the arm-pits and feet, or promote circulation by friction, but no attempt should be made to remove wet clothing or give restoratives by the mouth till natural breathing has recommenced.

When this has taken place allow the patient to lie on the right side and apply friction over the surface of the body by using handkerchiefs, flannels, etc., rubbing legs, arms and body, all towards the heart, and continue after the patient has been wrapped in blankets or dry clothing. As soon as possible after complete recovery of respiration remove patient to nearest shelter. On restoration, and if power of swallowing has returned, small quantities of warm coffee, tea, milk, wine, etc., may be given. Encourage patient to sleep, but watch carefully for some time and allow free circulation of air around patient.

Note.—Artificial respiration must also be resorted to in cases of suffocation by charcoal fumes or coal gas, mining accidents, hanging, lightning stroke and severe electric shock.

- vi. *Fractures.*—It is of the utmost importance to protect a fractured limb with some form of splint before moving the patient. This is essential in the case of fractures of the thigh and lower limb. Any form of unyielding material, such as wood, iron, pasteboard, the bayonet or rifle, may be used for an improvised splint. The upper limb may be bandaged to the trunk or the injured leg bandaged to the sound one in the absence of any form of splint.
- vii. *Poisoning.*—Send at once for medical assistance. Look for the source of the poison. Try to lessen the poisonous effects by giving the proper remedy, called an antidote. The labels of bottles containing poisons frequently have the antidotes printed on them. Poisons are classified as:—

- (a) Corrosive.
- (b) Irritant.
- (c) Systematic (constitutional).

Symptoms.—(a) Great pain, immediately after poison has been swallowed, in mouth and throat, which look as if scalded. Lips stained and blistered. Shock, difficulty of breathing and breath smells sour.

(b) Pain at first is not very marked. There is a sensation of burning, and vomiting sets in, accompanied by pain in the stomach and collapse.

(c) No sign of burning, redness or pain. May be giddiness, dimness of sight, drowsiness, difficulty of breathing, delirium, cramp, and convulsions.

Treatment:—

- (a) *Corrosive.*—Do not give emetics. If available, scrapings from whitewashed walls or ceilings mixed with water should be given.

(b) *Irritant* and (c) *Systematic*.—Give emetics. For example, a tablespoonful of mustard or salt to a tumbler of water. An emetic promptly given may save the patient's life.

In (c) after emetic, if the patient is drowsy, walk him about and give him hot coffee; if breathing fails resort to artificial respiration.

viii. *Snake-bite or poisoned wound*.—Apply a ligature or tourniquet above the bite, *i.e.* between it and the heart.

Make half-inch deep cruciform incision with a clean knife and rub in crystals or solution of permanganate of potash. Give stimulants such as brandy, sal volatile or hot coffee.

If breathing is bad artificial respiration should be tried.

51. MAINTENANCE OF HEALTH

(For further details of the subjects dealt with in this section, see Army Manual of Sanitation.)

GENERAL

Cleanliness

1. Cleanliness of person and clothing is of great importance. A hot bath should be arranged for all ranks at least once every ten days. At the same time clean underclothing should be issued, outer clothing disinfected and soiled underclothing collected for disinfection, disinfestation and washing.

2. When the situation permits, units should make local arrangements for more frequent baths. A sharp watch must be kept for the appearance of lice and for scabies, impetigo and other skin affections. These conditions, which are directly or indirectly attributable to dirt, are most easily and conveniently detected by careful inspections at bathing parades. The condition of the hair should receive attention at the same time. Special care should be given to the teeth. They should be brushed after meals whenever possible.

3. The following provision should be made for disinfestation, bathing and washing of clothes:—

i. *For troops other than those on L. of C.*—

(a) *Disinfestation*.—Each unit should be provided with an easily portable type of disinfector, which will be operated by the sanitary personnel of the unit.

(b) *Bathing*.—"Six-spray" shower bath apparatus should be provided on the basis of one for each brigade or body of 5,000 troops, held under corps control, and sent forward when required.

(c) *Laundry*.—Mobile laundries should be provided on the basis of one for each 20,000 troops, held on L. of C. and sent forward on demand by army and corps for allotment to divisions.

ii. *For troops on L. of C.*—Suitable disinfestation, bathing and laundry arrangements must be organized.

Camps

4. The utmost care will be taken to prevent fouling of ground by excreta and refuse. Urinals and latrines will be made immediately on arrival at a camp or bivouac, and filled in and the site marked when the unit leaves camp.

If the camp is to be re-occupied at an early date, and urinals, deep fly-proof trench or bucket latrines have been made, they should be left *in situ* ready for use by the incoming units.

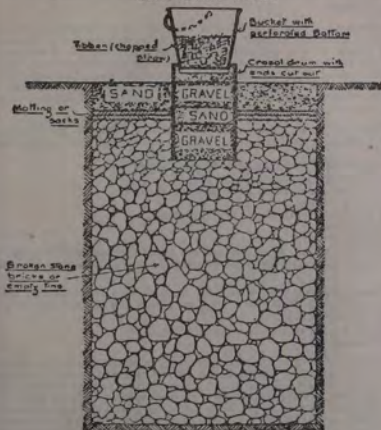
Great attention must be paid to camp kitchens. If the halt is of short duration, kitchen slop water should be filtered into pits through brushwood or straw, which is subsequently burned (Plate XXXIV, Fig. 1). For longer periods grease traps should be installed (see Plate XXXIV, Fig. 2).

5. Carcasses of animals should be disembowelled, the internal organs buried, and the remainder burned. Stuffing the interior with oily tow or other material assists combustion.

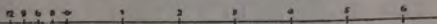
6. To keep tents dry they should be trenched, flies rolled up daily and blankets and kits aired.

PLATE XXXIV GREASE SALVAGE TRAP AND STRAINER

FIG. 1.—GREASE STRAINER AND SOAKAGE PIT FOR TEMPORARY CAMPS

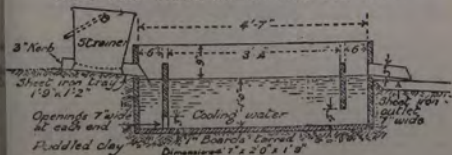


SECTION



Scale $\frac{3}{4}$ inch = 1 foot

FIG. 2.—COLD WATER GREASE TRAP FOR CAMPS



Wooden cover required which must be fly-proof.

7. Latrines, urinals, refuse pits, horse and cattle lines and slaughtering places must be placed as far as possible from the kitchens, food stores, source of water, and to leeward if possible. Slaughtering places should not be near horse lines.

The positions of all old latrines should be marked with the letter "L" made with stones.

8. *Disinfection.*—For general use cresol solution, in the proportion of $1\frac{1}{2}$ oz. of cresol to 1 gallon of water, is the most suitable disinfectant. Nuisances, however, should be removed rather than masked by the use of chemicals. Clothing is best disinfected by one of the processes employing steam, but in emergencies boiling may be adopted for small quantities. Dry heat is the most economical for the destruction of vermin in clothing. This may be utilized in ovens, hot-air huts, etc. For small quantities of clothing careful ironing (especially of the seams) will serve the purpose.

9. *Precautions against disease conveyed by food and drink.*—The important diseases in this class are diarrhoea, dysentery, cholera and the various forms of enteric.

The most effective measures against these diseases are :—

- i. Prevention and destruction of flies.
- ii. Complete and rapid fly-proof disposal of excreta.
- iii. Food cleanliness.
- iv. A sufficient supply of safe drinking-water.
- v. Inoculation.
- vi. General hygiene.

No N.C.O. or man who has suffered from typhoid, para-typhoid or dysentery will be employed in the preparation or distribution of food and drink.

10. *Measures against flies.*—Flies fit from filth to food—human food ; therefore cover your food, swat, trap or poison the fly, and also stop it breeding. This it does in :—

- i. Dung, human or animal, especially horse.
- ii. Decaying refuse.

11. *Disposal of manure and camp refuse.*—All manure must be removed daily and disposed of within 48 hours. Where burning cannot be carried out the manure will be collected in piles on a concrete or prepared base surrounded by a drain, and packed tightly by beating down with the back of a shovel. Fermentation in such a heap results in a temperature sufficient to kill practically all the maggots. When fresh manure is added to a heap, it will be buried under at least 1 foot (preferably 3 feet) of the fermenting manure. Each day's addition should be stripped after an interval of 4 days to a depth of 6 inches and the stripped material buried to a depth of 3 feet in the fermenting heap. When a heap is completed it will be earthed over, the surface of the earth being well rammed down and moistened with heavy oil. This drain should be treated with oil or cresol solution for the following week or ten days.

12. In hot, dry climates, with the approval of the sanitary officer concerned, the manure may be spread in thin layers over the ground, so that it will dry before flies can breed in it.

13. Manure used for agricultural purposes must be dug in immediately after removal or treated as detailed in para. 11, above.

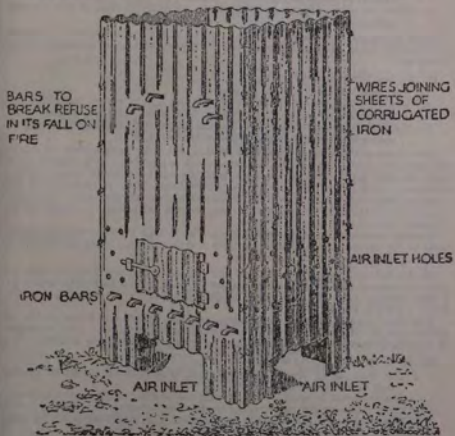
14. Refuse must never be left in open pits. If pits have to be used the contents should be kept covered with a thick layer of earth. Covered receptacles, water-tight and fly-proof, must be used whenever possible, and the contents must be burned daily (see Plate XXXV). Where burning is impossible refuse must be buried deeply.

15. Flies in huts, tents, cockhouses, dining shelters, dugouts, etc., may be killed by spraying with a fluid obtained from the nearest field hygiene section. Spraying should be done in the evening or in the early morning when the flies have settled. After spraying, the flies should be swept up and burned, as all may not be killed outright.

PLATE XXXV

REFUSE DESTRUCTOR-INCINERATOR

Vertical Corrugated Iron Incinerator. (4 ft. high, 2 ft. 3 in. wide.)



Perspective Sketch

16. Flies may be trapped by fly-papers, wires or tapes coated with "tangle-foot" or in "balloon" fly traps. Large fly traps are of use if placed outside cookhouses, messes, etc. They should be placed in the sun, out of the wind, and baited. Designs can be supplied by hygiene officers.

17. *Disposal of excreta.*—In no case will open trench latrines be used where it is possible to construct either of the following types:—

Deep trench latrine (Plate XXXVI, Fig. 1).

Bucket latrine (Plate XXXVI, Figs. 3 and 4).

18. Deep trench latrines must be:—

- i. Sited so that there is no possibility of contaminating water-supplies.
- ii. Dug 6 to 8 feet deep, with the back wall of the trench sloping outwards from the top.
- iii. Fly-proof, *i.e.* provided with boxed-in seats and automatically closing lids, the number of seats being in the usual proportion of five per cent. up to 100 men and three per cent. for larger numbers.
- iv. Filled in when the contents come to within two feet of the ground surface.

When filling in the trench the earth must be well rammed down, the upper 6 to 9 inches being puddled if the nature of the soil permits, or moistened with heavy oil.

19. Bucket latrines must have:—

- i. Fly-proof covers to all receptacles.
- ii. Boxed-in seats with automatically closing lids wherever possible.
- iii. Three inches of cresol solution ($\frac{1}{2}$ oz. to 1 gallon) in each bucket.
- iv. Daily removal of contents and cleansing of receptacles, the inside of the drums or pails being wiped with heavy oil.

The contents of the receptacles will be disposed of by incineration (which is the better method), or by burial in a pit as deep as possible. If by burial, each daily deposit will be covered with a layer of earth 18 to 24 inches thick, moistened with heavy oil and beaten down hard. All proposed sites for burial of night soil will be approved by a medical officer before use. Incinerators for destruction of excreta will be constructed according to designs to be obtained from a field hygiene section.

Shallow trench latrines (Plate XXXVI, Fig. 2) will only be used for short halts or for camps not lasting more than a day or two. They should be 3 feet long, 2 feet deep, and 1 foot wide.

20. *Urinals.*—The best type of field urinal for day and night use is made of plain galvanized iron, and is in the form of a trough with a high back and with a pipe leading from the lower end of the trough to a closed soak-pit (see Plate XXXVI, Fig. 5).

Whatever type is adopted all surfaces exposed to urine and the inside of all tins will be painted daily with a thin coating of heavy oil. The outsides of troughs or drums will be whitewashed so as to be more visible at night.

21. In all types of latrine or urinal:—

- i. The floor, when not of concrete, will be of broken stones or gravel well rammed down.
- ii. The seats will be scrubbed daily with cresol solution ($\frac{1}{2}$ oz. to 1 gallon).
- iii. Covered boxes will be provided for latrine paper.
- iv. Where shelter from weather is provided, the structure must be well ventilated and the walls whitewashed inside.

22. Fly-proofing of cookhouses is unnecessary. A well-ventilated shelter whitewashed inside, freely open, but with all foodstuffs strictly protected, is the most useful type of cookhouse. If protection from dust is required, light screens should be provided.

23. Cookhouse floors, if not concrete, should have the top 6 inches dug up, treated with heavy oil, and well rammed down so as to obtain as impervious a surface as possible. Shelves and tables should be provided, being improvised if necessary.

24. Dish cloths should be boiled each evening and hung up to dry. Brushes intended for use in cookhouses and dining places, *i.e.* in connection with food, must not be used for any other purpose. The use of mud or un-

PLATE XXXVI

LATRINES

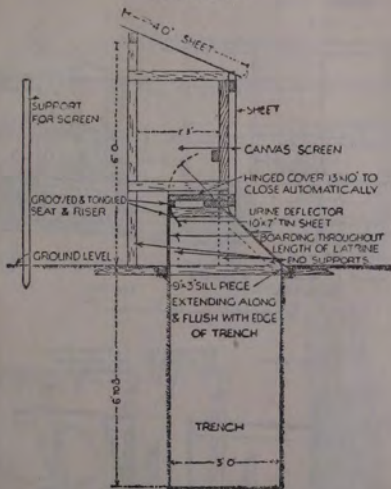


FIG. 1.—FIELD LATRINE, DEEP TRENCH FLY-PROOF TYPE



Trenches—3 ft. long, 2 ft. deep, 1 ft. wide, 2 ft. apart.

FIG. 2.—SHALLOW TRENCH LATRINE

PLATE XXXVI—continued

LATRINES—continued.

BUCKET TYPE

Fig. 3.

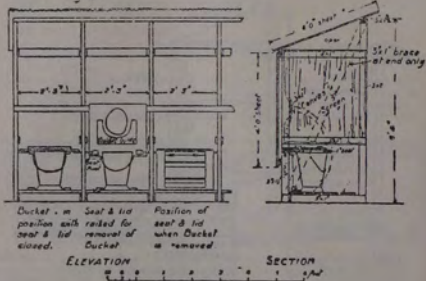
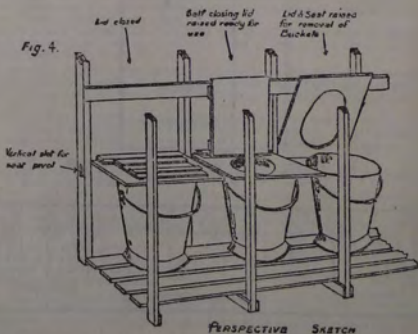


Fig. 4.

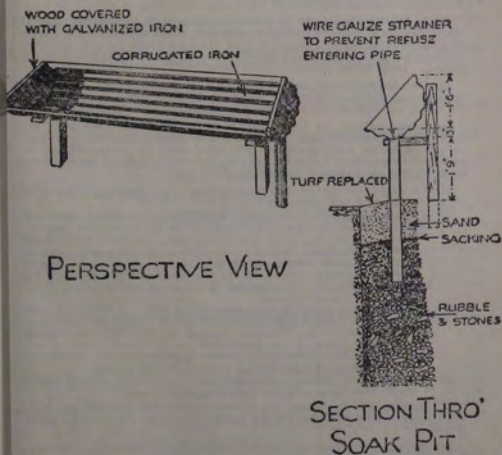


Note. The guides & slips to Buckets should be so arranged that the seats & lids fit accurately over the Buckets and should be fly proof.

PLATE XXXVI—continued

TRINES—continued.

FIG. 5.—URINAL



baked sand for cleaning knives, forks, kettles, mess-tins, or other utensils is forbidden. Wood ashes from the fire or baked sand may be used for this purpose. Washing-up must be done on a table, not on the ground, and a soakage pit with grease trap is essential.

25. All drain gullies in connection with cookhouses or washing-up places should be cleaned daily and treated by brushing with a mixture of heavy oil and paraffin. When flies are prevalent all grease traps should be provided with fly-proof covers. All refuse must be placed in covered receptacles, the contents removed daily and burned.

26. Nothing unconnected with the preparation of food is permitted in any cookhouse. Clothing or equipment must not be kept there.

27. Meat safes should be provided in all units for the protection of food from flies. These must be kept clean, placed in the shade out of the sun and contain nothing except food.

28. In dining places and shelters cleanliness and precautions against contamination of food are as important as in the case of cookhouses. After each meal all refuse and scraps of food must be swept up and removed. Tables must be used wherever possible so that no food need be placed on the ground. These tables will be scrubbed daily.

29. Cleanliness of person and of clothing is essential in a cook. Canvas or other special clothing and aprons are required, and washing accommodation (including nail brushes) for cooks should be arranged near the cookhouse.

30. *Drinking-water*.—In units that have trained water duty men the purification of drinking-water is carried out by them, under the supervision of the regimental medical officer. For other units this is carried out by field hygiene sections. Trained water duty personnel employed as such must never be used for fatigue or general sanitary duties.

31. All receptacles for the storage or carriage of drinking-water should be regularly inspected and cleaned as follows:—

- i. Main storage tanks by arrangement with the engineer officers concerned.
- ii. All other tanks, also water-carts, pakhals or any receptacles used for the conveyance or storage of drinking-water, should be emptied and thoroughly cleaned twice a week. All receptacles except those in which the actual chlorination of water is carried out should also be disinfected, after cleaning, by swilling out with water to which has been added twice the quantity of bleaching powder required for drinking-water sterilization.
- iii. All water-bottles should be disinfected once a week. A solution is made by filling a water-bottle with water, adding to this the number of measures of powder (chlorine) required for the water and mixing well. The bottles to be disinfected are filled with water, a tea-spoonful of the above strong solution is added to each, the bottles corked and shaken and allowed to stand for half an hour.
- iv. In hot countries adequate measures should be taken to protect water-tanks and other receptacles from the heat of the sun.

32. *Inoculation*.—The inoculation of every unit should show 100 per cent. of all ranks protected by anti-typhoid inoculation during the previous twelve months.

33. Commanding officers will use every endeavour to maintain the inoculation state of their units at the above standard, and are responsible that any failure to reach that standard is not due to causes within their control.

34. Whenever possible, as a routine measure after each inoculation, men should be excused duty for the remainder of the day and for the whole of the following day.

PRECAUTIONS AGAINST MALARIA

35. Malaria results from the bites of infected mosquitoes.

36. Mosquitoes can breed only in water and at least a week must elapse before the life cycle is complete. Therefore all unwanted water should be drained, emptied away or the surface covered with oil at least once a week.

Water receptacles which cannot be treated in this manner must be provided with tightly fitting lids or be covered with gauze.

37. Mosquitoes are not naturally infected with malaria. They acquire infection chiefly from natives. Their normal range of flight is half to one mile and during the day they shelter in long grass or undergrowth.

38. Therefore, in selecting camp sites avoid swamps, valleys, jungle and the proximity of native villages.

39. Most malaria-carrying mosquitoes bite only between sunset and dawn. Infection is therefore usually acquired during these hours. See that your men have mosquito nets (Plate XXXVII) and use them properly. Prohibit the wearing of shorts and sleeveless shirts after dusk or in the early morning.

Sentries should be provided with head-nets and gloves or mosquito-repellent oil.

40. Camps of native followers should be sited half to one mile from troops.

41. A daily search for mosquitoes in dark corners of tents and huts and the use of swatters will do much to diminish their numbers.

42. Those liable to suffer from malaria should avoid chills and should wear warm clothing after exercise and in the cool of the evening.

PRECAUTIONS AGAINST SAND-FLY FEVER

43. Sand-fly fever is conveyed from man to man by the bite of a small midge about the size of a pin's head.

44. The midge breeds in cracks or crevices of buildings, walls and compounds.

45. When occupying localities where sand-fly fever occurs the following precautions should be completed before the advent of the hot weather.

46. Wash down and repaint or limewash all rooms.

47. Survey and if necessary reface, point or tar all outside walls to a height of 3 feet and ground surface for a distance of 20 feet beyond living quarters.

48. During the sand-fly season huts, tents and corners of barracks in which they settle should be sprayed with 1 per cent. cresol solution and all refuse and decaying vegetable matter swept up and removed daily. Crude oil should be sprinkled over outlying broken ground for a distance of 50 yards from quarters once a week.

49. Fine mesh sand-fly nets may be issued and are used in the same manner as mosquito nets.

PRECAUTIONS AGAINST TRENCH FOOT AND FROST-BITE

50. True frost-bite is caused by exposure to severe dry cold, especially in mountainous regions. Trench foot is caused by long contact with cold and damp, e.g. by prolonged standing in cold water or mud, or by the continued wearing of wet socks, boots and puttees. The onset of both conditions is much more rapid when the blood circulation is interfered with, e.g. by tight boots, tight puttees or duties requiring men to stand or sit still for a long time, especially in a cramped attitude.

51. These disabilities may occur behind the line as well as in the trenches, for example, in men standing in cold mud or melted snow while signalling, wiring, road-making, on stable guard, piquet, etc., and also in transport personnel, exposed to cold and damp, on duties allowing little or no active exercise to stimulate the blood circulation.

52. *Individual preventive measures.*—When there is likelihood of trench foot or frost-bite occurring, boots must be in good repair and easy fitting and kept water-tight by frequent application of grease or dubbin. They must not be laced tightly, and the laces must not be tied round the ankle. Two pairs of socks or inner soles should be worn, and to allow of this boots should be large enough to admit of two pairs of socks, and these should be worn at the time of fitting the boots.

PLATE XXXVII

MOSQUITO-PROOF "DUGOUT"

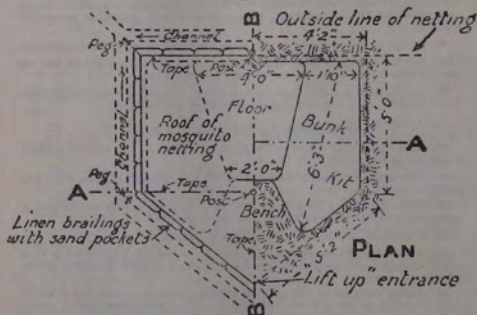
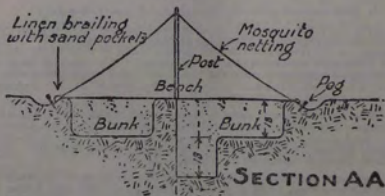
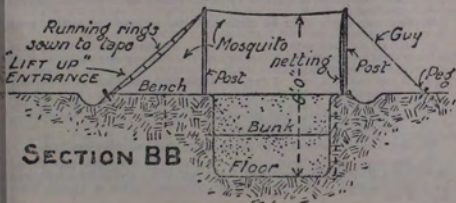
Fig. 1.Fig. 2.

PLATE XXXVII—continued

Fig. 3.

53. Before going on duty in wet trenches, in exposed situations or on convoy, the legs and feet, and the hands also in the case of transport personnel, will be washed and dried; warm whale oil will then be thoroughly rubbed in until the skin is dry, and dry socks put on. Puttees must be put on loosely, and it is a good plan to loosen them and the laces of boots one hour after putting them on. A dry pair of socks should be carried in the pocket. Boots, socks and puttees should be taken off at least once in 24 hours (more often if circumstances permit), the legs and feet rubbed dry and the dry pair of socks put on.

54. When wearing gum boots the socks may be supported by some form of fastening such as a safety pin, but on no account will anything in the form of a garter be worn.

55. The body must be kept as warm as possible by exercise. In the event of frost-bite the part affected should on no account be warmed at a fire, but well rubbed to re-establish the circulation.

56. Commanding officers will ensure not only that facilities for these measures are provided, but also that they are systematically carried out.

57. When the onset of trench foot or frost-bite is probable :—

- i. Whenever practicable, before going on duty in exposed places, men should be given a hot meal. Meals should be regular, and men on duty should have hot food by night as well as by day.
- ii. Tours of duty in exposed or wet situations should be short. As few men as possible should be detailed for duty in wet trenches, braziers being provided for troops to warm themselves and dry their clothes, and arrangements made for socks to be dried and re-issued during the tours of duty.
- iii. Feet inspections must be made daily by platoon and section commanders.
- iv. Men should sleep with boots and puttees off, the feet being wrapped in blankets, newspaper, straw or hay, etc. In any case the boots must not be tightly laced.
- v. At the end of a tour of duty men should be marched to a specially prepared rest station where braziers and fires can be arranged. They should receive a hot meal and then strip, at any rate as regards the legs and feet, and rub down, and while they are wrapped in blankets their clothes are dried.

58. Dry standings should be provided in trenches and other localities.

59. The lining of gum boots gets wet quickly. To dry them they should be hung in a drying-room from racks, feet down, with upper portion kept open by a piece of wood. If hung feet uppermost the process is a much more lengthy one.

60. Transport units will ensure that a shelter of some sort is available for men on return from convoy duty in bad weather, to which they can go and get warmed and dried, have a hot meal, change wet boots, etc., for dry ones, and if necessary rub feet and hands with warm oil.

61. Similar arrangements will be made at rest camps to ensure warmth, hot food and means for drying clothes for parties arriving in bad weather.

62. A warmed dry place should be provided in which the men of guards and piquets can rest when not actually on sentry.

CHAPTER XII

REMOUNT AND VETERINARY SERVICES

52. REMOUNT

1. The unit of organization of the remount service is the remount squadron, as laid down in war establishments. Squadrons may be grouped together under a depot headquarters to form remount depots.

Remount depots comprise :—

- i. Base remount depots.
- ii. Advanced remount depots.

Base remount depots are located at bases for the reception, training and distribution of all animals received from overseas, purchased or requisitioned locally and those discharged from veterinary hospitals for re-issue.

The head of the service will be the Director of Remounts (D. Remounts); he will be represented at the headquarters of armies.

2. Remount accounts (animal account, A.F. A. 2004) will be rendered at the end of each month to the Director of Remounts, supported by vouchers. These accounts will be transmitted to the local auditor for audit in due course.

3. Casualties are replaced on indent through the usual channel of divisional and corps headquarters, the administrative remount officer of the corps or of the army being responsible for the issue. Remount squadrons provide any necessary conducting party. Indents should usually be forwarded by divisions in a consolidated form, showing the classification and arm of the service for which required.

In the case of an emergency, units may indent direct on the remount directorate or on the nearest remount depot, sending copies of their indents to the headquarters of their formations.

4. When practicable, captured animals will be taken charge of by the mobile veterinary sections for quarantine before re-issue in the usual manner; in no circumstances will they be sent to remount formations until they have passed through veterinary units. For large captures special arrangements will be made by the Q.M.G.'s branch of the staff.

5. No privately owned horses are allowed with an army in the field. Any private chargers on the strength of units proceeding with horses to a theatre of operations will be taken over at a valuation by the remount department.

53. VETERINARY

1. The veterinary service is responsible for the care of sick, injured and debilitated animals, advice regarding the maintenance of health and condition of animals, the prevention of disease amongst animals and maintaining and distributing veterinary stores.

2. The veterinary service is controlled by a director of veterinary services (D.V.S.). He is represented at the headquarters of armies, corps and divisions.

3. Evacuation of sick and injured animals is carried out as shown in the following diagram (Fig. 26) :—

4. All captured stock should be passed through a veterinary unit before issue to the remount service.

VETERINARY HINTS FOR COMMON AILMENTS AND INJURIES, WHEN
VETERINARY ADVICE IS NOT AVAILABLE

5. Bit injuries :—

Treatment.—Work in snaffle or with bridle over nose; improvise martingale if necessary. Rinse mouth out with clean water after feeding, and give soft food.

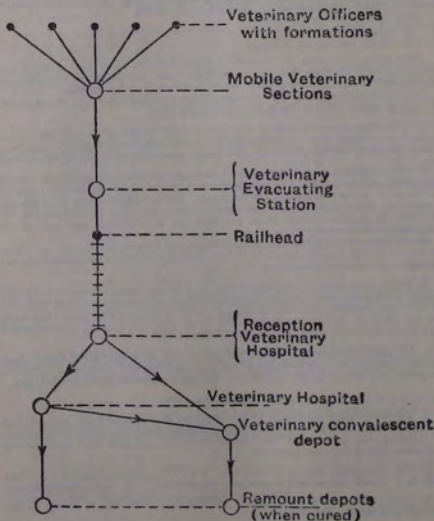
6. Broken knees :—

Treatment.—Cleanliness, apply tincture of iodine and cover with clean pad of lint, wool or tow, and bandage.

7. Bullet wounds :—

Treatment.—Observe cleanliness in all treatment of wounds. Dust with boric acid and cover with clean pad of lint, wool or tow, and bandage, which must not be applied tightly unless to stop bleeding.

FIG. 26



8. Colic :—

Symptoms.—Horse looks round at his sides, tries to lie down and roll; stamps with hind legs and kicks at belly.

Treatment.—Walk about, give chloral hydrate ball, if available, or 2 oz. turpentine well shaken up either with a pint of linseed oil or eggs and milk. If not relieved in an hour repeat the dose and give in addition an aloes ball. In the absence of drugs give half tumbler of rum or whisky in a pint of warm water, or $1\frac{1}{2}$ pints of warm beer with a teaspoonful of ginger mixed in it. Hand-rub belly and give frequent enemas of soapy water.

9. Constipation :—

Treatment.—Soft and green food if available; regular work and frequent enemas.

10. Coughs and colds :—

Treatment.—Steam head and apply liniment, or mustard mixed as for the table, to throat from ear to ear, and leave on for 15 minutes. Give soft food. Keep body warm with rugs and bandages and give plenty of fresh air. Any animal with a nasal discharge should be isolated and veterinary aid obtained as soon as possible.

11. Cracked heels and mud fever :—

Treatment.—Cleanse and dry (if greasy apply dry bran poultices), dust on boric acid or powdered starch.

Prevention.—Do not wash legs when muddy, but leave until dry and then brush dirt out.

12. Cuts and tears :—

Treatment.—As for 6, bandage if necessary.

13. Diarrhoea :—

Treatment.—Dry bran. Chilled water in small quantities. Keep body warm with rugs and bandages.

14. Dirty sheath :—

Treatment.—Draw out penis and wash it and sheath with soap and warm water or dirt will accumulate and maggots may appear.

15. Epizootic lymphangitis :—

Symptoms.—Sores similar to and in similar situations to farcy. They have a greater tendency to heal. They usually originate from wounds, from which point cord-like swellings appear. It is on the course of these swellings that the sores form.

Very contagious.

Treatment.—Proceed as for farcy.

16. Exhaustion after hard work :—

Treatment.—Give 1 oz. spirits nitrous ether or pint of warm beer, or half tumbler of rum or whisky in a pint of water. Rug up and bandage. Rest and light exercise. Feed with bran mash, steamed oats, boiled linseed, oatmeal, gruel, etc., if available, in small quantities and often.

17. Farcy :—

Symptoms.—Skin form of glanders. Appears as a string of running sores, usually on inside of hind legs, occasionally neck and face. No tendency to heal.

Treatment.—Proceed as for glanders.

18. Fever :—

Symptoms.—Horse off feed, dull, temperature over 100 deg. Fah.

Treatment.—Isolate and apply for veterinary aid. Give soft food, and green stuff when available. Keep water always handy and change frequently. If procurable give a handful of Epsom salts in each bucket of water. Keep body warm with rugs and bandages, and give plenty of fresh air.

19. Girth galls :—

Treatment.—If simply a swelling, lightly smooth over the swollen surface with the hand in the direction of the hair, as if to smooth it out, for 15 minutes at a time. If skin is chafed treat as for wounds. To work horse, strap girth back, tying it under the belly to surcingle, which should be placed over fawn of saddle. When healed, place piece of sheep-skin under girth.

20. Glanders :—

Symptoms.—Thick gluey discharge from one or both nostrils, ulcers on the membrane inside nostrils; glands between lower jaws enlarged, hard and appear to be fixed to bone.

Procedure.—Very contagious. Rigid isolation of affected cases, in-contacts and whole unit if possible. On suspicion immediately obtain veterinary aid.

Very contagious to human beings.

21. Heel-rope galls :—

Prevention.—Keep head-rope short.

Treatment.—Grease when marching. On return to camp wash with soap and warm water, thoroughly dry and apply bran poultice.

22. Mange :—

Symptoms.—Marked skin irritation. Horse bites and rubs himself against any available object. Hair comes off in patches and skin becomes thickened and corrugated.

Treatment.—Prevention of spread. Obtain veterinary aid without delay. *Very contagious.* Isolate affected and suspicious cases with their equipment. Men looking after them should not go amongst healthy animals, as they may carry infection in their clothing. Thoroughly disinfect all stables, utensils, harness, etc. Clip, singe and wash in hard soap and warm water, then dress all over with sulphur 1 part, sperm oil 4 parts, mixed thoroughly together. Do not use linseed oil. Rub in dressing thoroughly with a body brush, work it in with the hands for 2 days, then wash thoroughly with hard soap and warm water, taking great care to remove all dressing to prevent blistering. Sweat and groom thoroughly daily after washing off the first dressing and in 10 days repeat the dressing, washing and grooming. In cases where itchiness or other signs of the disease remain a third dressing should be applied and a final washing, etc., carried out. Daily exercise and a liberal diet are essential. If weather permits, clothing should be withdrawn from any unit in which the disease exists till the outbreak is over, as it is one of the main sources of contagion. All gear, blankets, etc., should be thoroughly disinfected before being used again. Daily inspections of all animals are imperative until the unit is declared free from the disease.

23. Picked-up nail.—Pare away the horn where the nail penetrates until bleeding starts. Apply tincture of iodine, plug with wool and keep the foot clean.

24. Ringworm :—

Symptoms.—Hair falls out in circular patches.

Treatment.—Clip affected parts and burn clippings. Wash animal all over with some disinfectant (i.e. cresol, 1 part in 80 of water).

Apply tincture of iodine, paraffin or soft soap to spots.

Disinfect harness, etc. Obtain veterinary aid.

25. Sand colic :—

Prevention.—Feed off blankets, etc. Clean food.

Treatment.—Same as for No. 8, Colic.

26. Sore backs and saddle galls.

Prevention.—Careful supervision and fitting of saddlery.

Treatment.—If swelling only, treat as for "Girth Galls," or bathe with cold, salt water. If skin chafed, treat as for wounds. Keep saddle off back until healed.

27. Sore withers.

Treatment.—Keep arch of saddle well clear of withers.

If swelling only, treat as for "Girth Galls," or bathe with cold, salt water. If skin broken, treat as for wounds.

28. Sprained tendons, etc. :—

Treatment.—Rest. Apply cotton wool and linen bandage and stand in cold water; or apply layer of soft clay. Renew when dry.

29. Strangles :—

Symptoms.—Swelling at the back of or under the jaw, may be some difficulty in swallowing.

Treatment.—Isolate and obtain veterinary aid.

Rest, soft food, rug up and bandage, plenty of fresh air and foment swelling, when swelling bursts treat as for wounds.

30. Thrush :—

Prevention.—Dry standings and pick out feet daily.

Treatment.—Clean frog, dress cleft with boric acid and then plug with piece of tow. If severe, poultice or soak foot before applying dressing.

Stand on driest ground available.

31. Ticks :—

Treatment.—Pull out, taking care not to leave head in the skin ; or touch with paraffin, turpentine or carbolic acid.

32. To make :—

(a) Bran mash.—Put 2 double handfuls of bran in a bucket and pour on as much boiling water as the bran will soak up. Cover bucket with rug and leave till cool enough to eat.

(b) Steamed oats.—Substitute oats for bran and proceed as above.

(c) Gruel.—Cook oatmeal as for porridge and thin down with water, or may mix oatmeal with water straight away.

33. To shoot a horse.—Lift up forelock and place it under brow band. Place muzzle of revolver almost touching the skin where the lowest hairs of the forelock grow.

CHAPTER XIII

DISCIPLINE AND OFFICE WORK

54. DISCIPLINE

(Note.—Certain of the following provisions concerning the performance of duties when under arrest, and those relating to field punishment and forfeiture of ordinary pay, are applicable only on active service. When, therefore, troops not on active service are engaged on manoeuvres or exercises, these provisions should be referred to for instructional purposes only, but must not be put into practical use.)

ARREST

1. Under Sec. 45 of the Army Act any person subject to military law when charged with an offence punishable under the Army Act may be taken into military custody, which means that the offender is placed under arrest.

Arrest is either close arrest or open arrest. When arrest is not described by the authority ordering it as open arrest it means close arrest.

Close arrest in the case of an officer, warrant officer or N.C.O. means placed under the charge of an escort consisting of another officer, warrant officer or N.C.O. of the same rank, if possible. If circumstances so require, he may be placed for custody under the charge of a guard, piquet, patrol, sentry or provost-marshal.

Close arrest in the case of a private soldier means being placed in confinement under charge of a guard, piquet, patrol, sentry or provost-marshal. On being placed in close arrest he will be searched and deprived of knives or other weapons. If drunk he may, except in cold weather, be deprived of his boots.

An officer or warrant officer against whom charges are preferred will invariably be placed under arrest.

A N.C.O. charged with a serious offence will be placed under arrest, but if the offence alleged is not serious it may be disposed of without previous arrest.

A private soldier charged with a serious offence will be placed under arrest. He will not be placed under close arrest unless he disobeys an order distinctly given or resists the authority of an officer, warrant officer or N.C.O., or unless confinement is necessary to ensure his safe custody or for the maintenance of discipline.

An officer, warrant officer or N.C.O. under close arrest will not leave his quarters, except to take such exercise under supervision as the medical officer considers necessary. When under open arrest he may take exercise at stated periods and within stated limits, but is not to use his own or any other mess premises or to appear in any place of amusement or public assembly.

A private soldier in open arrest will not quit barracks except on duty and will not enter a liquor bar.

An officer or warrant officer under arrest will not perform any duty other than as may be necessary to relieve him from the charge of any cash, equipment, accounts, etc., of which he may have charge. A N.C.O. under arrest or a private soldier under close arrest may be ordered to bear arms, attend parades and perform all such duties as may be required of him. A private soldier under open arrest will attend parades and may be ordered to perform all duties.

Care will be taken to ensure that a soldier under arrest is called upon to perform no duties in addition to those performed by soldiers not under arrest or undergoing punishment.

POWERS OF A COMMANDING OFFICER

2. A commanding officer may, subject to the soldier's right to elect, previous to the award, to be tried by district court-martial, inflict the following summary punishments:—

On a private soldier

- i. Detention not exceeding 28 days, but the power of awarding detention exceeding seven days, except in cases of absence without leave, will not be exercised by a C.O. under the rank of field officer.
- ii. Field punishment not exceeding 28 days.
- iii. Forfeiture of all ordinary pay under Sec. 46 (2) (d) of the Army Act for a period commencing on the date of award and not exceeding 28 days.
- iv. In the case of drunkenness a fine not exceeding 40s.
- v. Any deduction from ordinary pay allowed under Sec. 138 (4) and (6) of the Army Act, except that in the case of a soldier who, by neglect or culpable mismanagement, loses or damages any articles of his personal equipment or any other government property, the approval of the G.O.C. must be obtained if the amount proposed to be recovered from any soldier exceeds £4.

On a non-commissioned officer

- vi. Any deduction from the ordinary pay of a N.C.O. allowed by Sec. 138 (4) of the Army Act.

A commanding officer may also inflict the following minor punishments, the offender having no right to elect trial by a court-martial :—

Private soldier

- vii. Confinement to barracks not exceeding 14 days.
- viii. Extra guards or piquets as punishment for minor offences or irregularities when on or parading for these duties.
- ix. Admonition.

Non-commissioned officers

- x. Reprimand or severe reprimand.
- xi. Admonition.

Notes :—

- (a) Any N.C.O. or man holding any appointment or acting rank or lance appointment may be ordered by his C.O. to revert to the rank (whether permanent or temporary) which he was holding at the time of appointment to acting rank, or revert to any intermediate acting rank or lance appointment, but is not to be awarded for the same offence any other punishment in addition. A N.C.O. holding temporary rank cannot be ordered by his C.O. to revert to any lower rank by way of punishment for an offence.
- (b) A C.O. has no power to award summary or minor punishment in the case of any warrant officer. Summary punishment in such cases can only be awarded as laid down in Section 47, Army Act.

POWERS OF A COMPANY COMMANDER

3. A company, etc., commander may award a private soldier punishment not exceeding seven (7) days C.B. for minor offences, extra guards and piquets, fines for drunkenness, and he may deal with cases of absence without leave, where pay is automatically forfeited, and may award any punishment within his ordinary powers for such absence. He may admonish or reprimand, but not severely reprimand, a N.C.O. below the rank of serjeant (or the appointment of lance-serjeant).

55. COURTS-MARTIAL

1. Courts-martial under the Army Act.—

Description of court-martial	Minimum number of members	Minimum service of members in years	Rank of president	Maximum powers	Convening authority
General	5	3	F.O. (colonel if possible)	Death (and all less punishments)	The King or G.O.C. by warrant.
District	3	2	F.O., but if a F.O. is not available a captain may sit	2 years Impt. H.L. Reduction of N.C.O. Discharge	G.O.C. or other officer having a warrant to convene a D.C.M.
Field General ..	3*	1	Same as for a D.C.M. ..	Same as G.C.M. (unless less than 3 members)	O.C., or any officer in immediate command of a body of forces, on active service where G.C.M. not possible, or no superior authority.

* Except that, if 3 officers are not available, the court may consist of 2 officers.

Note.—Officers can only be tried by G.C.M. or F.G.C.M.

Any court-martial may award field punishment for any offence committed on active service, and may, in addition to or without further punishment, sentence an offender to forfeiture of pay for a period not exceeding 3 months commencing on the day of sentence.

A sentence of penal servitude is ordinarily undergone in a penal servitude prison in the United Kingdom, but where the sentence is passed for an offence committed on active service, part of the sentence, not exceeding two years, may be ordered to be served in a military prison (A.A., Sec. 58, proviso).

2. *Field general courts-martial.*—A field general court-martial has the same power as a general court-martial, provided that the court is composed of at least three officers. If, in the opinion of the convening officer, three officers are not available, two officers are legally sufficient, but a court consisting of two officers cannot award a sentence in excess of imprisonment (A.A., Sec. 49 (1)). The president of a F.G.C.M. may be of any rank, but, if practicable, must not be below the rank of captain.

A sentence of death requires the concurrence of all the members (A.A., Sec. 49 (2)).

The provost-marshal, an assistant provost-marshal, the prosecutor or a witness for the prosecution must not be appointed as a member of the court. In certain circumstances the convening officer may appoint himself president. (A.A., Sec. 49 (1) (c); R.P. 106 (B)).

The convening officer may appoint a judge-advocate.

A F.G.C.M. is subject to exceptional rules under which the procedure is or can be of a more summary character than that of other courts-martial (A.A., Sec. 49; R.P. 105-123). But provision is made whereby a large number of the rules which are applicable to district or general courts-martial should be applied to a field general court-martial so far as is practicable having regard to the public service (R.P. 121).

3. *Suspended sentences.*—Under Sec. 57A of the Army Act the execution of a sentence on a soldier of penal servitude, imprisonment or detention may be recommended by the confirming authority to be suspended. Such suspension may be ordered by a superior authority either before or after the soldier has been committed. When suspension is ordered the sentence or remainder of such sentence will not be operative until the soldier is subsequently ordered to be committed to prison or detention barracks.

During suspension all sentences will be considered at intervals of not more than three months, and, if the soldier's conduct has justified it, a remission of the whole of the sentence may be ordered by the competent military authority. Partial remission must be effected (if at all) under A.A., Sec. 57.

A superior military authority may, at any time whilst a sentence is suspended, order that the soldier be committed to undergo such unexpired portion of the sentence as has not been served or remitted.

4. *Field punishment.*—Rules for field punishment made under Sec. 44 of the Army Act.

i. A court-martial, or a commanding officer, may award field punishment for any offence committed on active service, and may sentence an offender to such punishment for a period not exceeding, in the case of a court-martial, 3 months, and in the case of a C.O., 28 days.

ii. Where an offender is sentenced to field punishment he may, during the continuance of his sentence, unless the court-martial or the C.O. otherwise directs, be punished as follows:—

(a) He may be kept in irons, i.e. in fetters or handcuffs, or both fetters and handcuffs; and may be secured so as to prevent his escape.

(b) Straps or ropes may be used for the purpose of these rules in lieu of irons.

(c) He may be subjected to the like labour, employment and restraint, and dealt with in like manner as if he were under sentence of imprisonment with hard labour.

iii. Every portion of a field punishment shall be inflicted in such a manner as is calculated not to cause injury or to leave any permanent mark on the offender; and a portion of a field punishment must be discontinued upon a report by a responsible medical officer that the continuance of that portion would be prejudicial to the offender's health.

iv. Field punishment will be carried out regimentally when the unit to which the offender belongs or is attached is actually on the move, but when the unit is halted at any place where there is a provost-marshal or an assistant provost-marshal, the punishment will be carried out under that officer.

- v. When the unit to which an offender under sentence of field punishment belongs or is attached is actually on the move, such offender shall march with his unit, carry his arms and accoutrements, perform all his military duties as well as extra fatigue duties, and be treated as a defaulter.

56. THE PROVOST SERVICE

1. The provost marshal is head of the provost service. He is responsible for the organization, efficiency and general distribution of the military police. The military police are organized in units as :—

- i. Provost squadrons.
- ii. Provost companies.
- iii. Sections (L. of C.).

Provost squadrons and provost companies (divisional and non-divisional) are allotted to divisions and higher formations as laid down in War Establishments. Provost sections (L. of C.) are allotted to base and L. of C. areas in accordance with the local conditions and length of the lines of communications.

2. The above units are under the orders of assistant provost marshals, who receive their instructions through the A.G.'s staff of the formation to which they are attached. The legal status of provost officers is governed by the Army Act, Sec. 74. Where no provost officer is appointed, or where the personnel of the military police are attached to formations, they are under the orders of an officer of the A.G.'s branch.

3. The principal duties of the provost service are :—

- i. Assisting generally in the maintenance of discipline, and ensuring compliance with standing orders and police regulations.
- ii. Assisting in the collection and disposal of stragglers.
- iii. Taking into custody and disposing of prisoners of war.
- iv. Arranging the arrest of unauthorized persons found within the lines, of persons plundering, marauding, making unlawful requisitions or committing offences of any kind.
- v. The executive duties in connection with the control of road traffic.
- vi. The protection of soldiers against frivolous or unjust charges brought against them by inhabitants, and for ensuring that due facilities for stating and proving their cases are given to inhabitants bringing complaints against the troops.

In connection with the duty of controlling the civil population (under i, iv and vi above), the provost service will work in close touch with the field security police, which are administered and controlled by the intelligence section of the general staff as part of the intelligence corps.

4. The closest co-operation between the provost-marshal's representative and all branches of the staff of formations, area commandants, town majors and the troops is essential.

5. In cases of emergency the military police may call on any troops to assist them in providing guards, sentries or patrols, etc. All persons belonging to or employed with the forces in the field are required to give every assistance to the military police in the execution of their duty.

57. OFFICE WORK

GENERAL RULES

1. Office work in the field is to be restricted to what is absolutely indispensable; no office work will be transacted with a unit on service in the field that can possibly be dealt with at a stationary office.

2. Equipment accounts will not be kept by units.

3. Routine work connected with the provision, pay and records of personnel will, as far as possible, be dealt with by the officer i/c 2nd echelon and the paymaster-in-chief.

4. Documents which contain anything of a nature likely to prove useful when the history of the campaign is written will, when no longer required, be sent to the officer i/c 2nd echelon.

5. A *state* is a report whereby a commander is kept informed of the fighting condition of his command. Punctuality in rendering it is usually more important than extreme accuracy.

A daily strength state (A.F. W. 3006) denoting losses incurred, reinforcements received, total strength and names of officer battle casualties will be rendered daily by all fighting units to brigade headquarters (a copy being telegraphed to officer i/c 2nd echelon). After noting at brigade headquarters these states are passed to divisional headquarters for consolidation into approximate divisional fighting strength on A.F. W. 3007, which is passed to corps headquarters for consolidation into corps fighting strength, thence to army headquarters for respective consolidation.

This procedure will result in supplying automatically all commanders and the War Office with the daily approximate fighting strength, giving the base an idea of probable reinforcement requirements and supplying the 2nd echelon with names of officer battle casualties for telegraphic transmission to the War Office for notification to next of kin.

6. A *return* is a document for statistical purposes, or to show the condition of the forces more accurately than is possible in a state. Accuracy in their compilation is essential.

Returns will be forwarded by commanders of *all* units and formations to the officer i/c 2nd echelon, as follows:—

Field return, officers (A.F. W. 3008)	..	{ Weekly on Sunday, made up to and for the previous day.
Field return, other ranks (A.F. W. 3007 series)	..	
Casualty return, officers (A.F. W. 3010)	..	{ Daily or as often as practicable.
Casualty return, other ranks (A.F. W. 3011)	..	

7. The senior staff officer of each branch is responsible for the custody of secret or confidential books, etc.; he will take necessary precautions to prevent them falling into the hands of the enemy.

8. Letters in the field should be drawn up in minute form. The same rules should be applied to them as given in Sec. 11, for orders and messages.

9. *Duties at the base.*—The duties of the officer i/c 2nd echelon are as follows:—

- i. To relieve all units and formations in the field of the routine work regarding the strength and record of their personnel which is dealt with in peace time by the orderly-room staff.
- ii. Verification and communication to military authorities of casualties in the field, including followers and authorized civilians.
- iii. Supplying reinforcements from the base to the forces in the field.
- iv. Compilation of returns and statistics as regards personnel.
- v. Custody of personal effects of deceased soldiers.
- vi. Personal services, posting, transfers and promotion of other ranks.
- vii. Deal with matters of detail, the policy of which is laid down in regulations or has been decided by the C-in-C.
- viii. Questions affecting prisoners of war, personal effects of enemy dead.
- ix. Custody and transmission of war diaries and other documents of an historical nature.

10. The officer i/c 2nd echelon will maintain on the duplicate A.F. B. 199a (for officers) and on A.F. B. 103 (for other ranks) a record of service for each officer and other rank of the force, and also on a similar form for any enrolled civilian, labourer, etc., who is not employed and paid locally as a casual labourer.

11. The officer i/c 2nd echelon corresponds direct with the headquarters of formations on all matters with which they are mutually concerned and with Os. C. units in the field on questions regarding the records or whereabouts of officers and other ranks. The office of the officer i/c 2nd echelon acts as the channel of correspondence between units in the field and branches of the War Office (for officers) and officers i/c records (for other ranks).

WAR DIARIES

12. A war diary is a secret document. Its objects are:—

- i. To furnish a historical record of operations.
- ii. To provide data on which to base future improvements in army training equipment, organization and administration.

It will be entered up daily, each entry initialised by the officer detailed to keep it, on A.F. C. 2118. It is to be noted that the extraction and retention of appendices, maps, etc., from a war diary is an offence under the Official Secrets Acts.

13. A war diary will be kept in duplicate from the first day of mobilization or creation of the particular command or appointment by:—

- i. Each branch of the staff in the headquarters of a formation, a subordinate command and area or sub-area on the L. of C.
- ii. Unit commanders.
- iii. Commanders of detachments of a unit.
- iv. Officer i/c 2nd echelon, officers holding technical appointments and personal staff.
- v. Base, auxiliary and advanced depot commanders.
- vi. Heads of services and their representatives, controller of salvage and his representatives.

14. In so far as they are applicable the following points should be recorded when preparing a diary:—

- i. Important orders, instructions, reports, messages or despatches received and issued, and decisions taken.
- ii. Daily location. Movements during the past twenty-four hours and present dispositions. March tables in the case of large units or of formations are of assistance.
- iii. Important matters relating to the duties of each branch of the staff.
- iv. Detailed account of operations. Exact hour of important occurrences, factors affecting operations, topographical and climatic. Clear sketches showing positions of troops at important phases.
- v. Nature and description of field engineering works constructed or quarters occupied.
- vi. Changes in establishment or strength. As regards casualties the names and ranks of officers and the number of other ranks or followers and of animals should be noted. In addition in the case of units on the L. of C. changes in stores, transport, etc.
- vii. Meteorological notes.
- viii. Summary of important information received, whether military or political.

15. Appendices as under will be attached to the original copy of each war diary:—

- i. A copy of each field return (A.F. W. 3008 and A.F. W. 3009) and of each operation or routine order or instruction issued during the period covered by the current volume of the war diary.
- ii. Copies of orders, or instructions, received from higher commands if no longer required for reference.
- iii. A copy of each narrative or report on operations drawn up by a subordinate formation or unit, including any sketches or maps relating thereto, to supplement the account of operations furnished in the text of the diary (para. 14, iv, above).

Appendices will be numbered, and each will have a brief descriptive heading naming the author. References to appendices will be made in the last column of A.F. C. 2118.

16. Disposal of war diaries will be as follows:—

- i. Unless otherwise ordered, the original copy, complete with appendices, for the preceding month will be forwarded on the first day of the succeeding month direct to the O. i/c 2nd echelon for transmission to the War Office.
- ii. The duplicate copy, marked as such, of a cavalry or infantry brigade or higher formation will be forwarded within a period of two months to the O. i/c 2nd echelon for transmission to the Under-Secretary of State, The War Office. Duplicate copies of diaries of units will be sent within a period of three months to the O. i/c 2nd echelon for transmission to record offices at home for safe custody.

POSTAL CORRESPONDENCE

17. Private postal correspondence of officers, soldiers, foreign attaches, and civilians employed by or accompanying the army is permitted by means of—

- i. Printed postcards (A.F. A. 2042).
- ii. Ordinary postcards.
- iii. Letters (unregistered) in the green envelope (A.F. W. 3078).
- iv. Letters (registered or unregistered) in ordinary envelopes.
- v. Parcels, including photographs and sketches, of private diaries.

All such correspondence, after censorship, must be posted in boxes or offices controlled by the army postal service. The posting of such correspondence in civil post offices is forbidden.

18. Correspondence carried out under para. 16, ii, iii, iv, is liable to delay in transmission owing to the necessity for censorship. All ranks should therefore, in their own interests, employ the printed postcards as far as possible.

19. Postal orders are issued and paid when possible, and registered letters and parcels received. All private correspondence must adhere strictly to censorship regulations in force. Private letters and parcels (other than registered) are carried at the sender's risk.

20. Private correspondence must be addressed with the addressee's number (if any), rank, name, squadron, battery, company, regiment, battalion, service, or appointment, or the unit or service to which he is attached. The title of the expeditionary force and name of the country in which operations are taking place should be added, but no town should be mentioned in the address.

21. In no circumstances is specific reference to be made on postcards, in letters, on matter posted in parcels, or in private diaries sent from the theatre of operations, to the place from which they are written or despatched; to plans of future operations, whether rumoured, surmised or known; to organization, numbers and movements of troops; to the armament of troops or fortresses; to defensive works; to the moral or physical condition of the troops; to casualties previous to the publication of official lists; to the service of maintenance; or, in case the writer is one of the garrison of a besieged fortress, to the effects of hostile fire.

Criticism of operations is forbidden, as are statements calculated to bring the army or individuals into disrepute.

All correspondence must be in "clear." The rank and unit of the writer will not be added to his signature.

22. The green envelope (A.F. W. 3078) is issued for the use of troops for the transmission of letters relating to private and family matters only. These envelopes may be posted uncensored by the sender's unit, but are liable to examination by the censor staff at the base.

Writers may enclose up to three of their own letters, in ordinary covers, in one green envelope, which should in this case be addressed to the "base censor." The contents will then be examined and despatched by the censor staff at the base.

Green envelopes cannot be registered, and should not contain money or other valuables.

APPENDIX I

ABBREVIATED TITLES, ADDRESSES, DISTINGUISHING LETTERS AND OTHER ABBREVIATIONS

For use in the field and during training.

Note.—Officers are not expected to memorize all the following abbreviations. Many of them will be used only by special or technical services and units.

Abbreviations other than those in this list will be used only when no abbreviation is authorized and when the writer is satisfied that there is no possibility of the addressee mistaking the meaning of the abbreviation.

The writer of an order, report, etc., must exercise judgment in the employment of abbreviations, and must not use those with which the addressee is unlikely to be familiar.

I. HEADQUARTERS, FORMATIONS, ETC.

Full title (1)	Abbreviations * (2)
General Headquarters	G.H.Q.
First (Second, etc.) Army	First (Second, etc.) Army
1st (2nd, etc.) Cavalry Corps	1 (2, etc.) Cav. Corps
1st (2nd, etc.) Corps	1 (2, etc.) Corps
1st (2nd, etc.) Cavalry Division	1 (2, etc.) Cav. Div.
1st (2nd, etc.) Division	1 (2, etc.) Div.
1st (2nd, etc.) Cavalry Brigade	1 (2, etc.) Cav. Bde.
1st (2nd, etc.) Infantry Brigade	1 (2, etc.) Inf. Bde.
Operations headquarters of formations	Ops. G.H.Q. (First Army, 1 Corps, 1 Div.)
<i>Royal Artillery :—</i>	
1st (2nd, etc.) Corps Artillery	R.A. 1 (2, etc.) Corps
1st (2nd, etc.) Corps Medium Artillery	M.A. 1 (2, etc.) Corps
1st (2nd, etc.) Divisional Artillery	R.A. 1 (2, etc.) Div.
1st (2nd, etc.) Brigade, R.H.A.	1 (2, etc.) Bde. R.H.A.
1st (2nd, etc.) Light Brigade, R.A.	1 (2, etc.) Lt. Bde.
1st (2nd, etc.) Field Brigade, R.A.	1 (2, etc.) Fd. Bde.
1st (2nd, etc.) Army Field Brigade, R.A.	1 (2, etc.) A. Fd. Bde.
1st (2nd, etc.) Medium Brigade, R.A.	1 (2, etc.) Med. Bde.
1st (2nd, etc.) Heavy Brigade, R.A.	1 (2, etc.) Hy. Bde.
1st (2nd, etc.) Anti-Aircraft Brigade, R.A.	1 (2, etc.) A.A. Bde.
<i>Royal Engineers :—</i>	
1st (2nd, etc.) Divisional Engineers	R.E. 1 (2, etc.) Div.
<i>Royal Corps of Signals :—</i>	
General Headquarters Signals	Sigs. G.H.Q.
First (Second, etc.) Army Signals	Sigs. First (Second, etc.) Army.
1st (2nd, etc.) Corps Signals	Sigs. 1 (2, etc.) Corps
1st (2nd, etc.) Cavalry Divisional Signals	Sigs. 1 (2, etc.) Cav. Div.
1st (2nd, etc.) Divisional Signals	Sigs. 1 (2, etc.) Div.
<i>Air Defence :—</i>	
1st (2nd, etc.) Air Defence Brigade	1 (2, etc.) A.D. Bde.
<i>Royal Army Service Corps :—</i>	
1st (2nd) Divisional Royal Army Service Corps	R.A.S.C. 1 (2, etc.) Div.
<i>Royal Air Force :—</i>	
Royal Air Force contingent with the Army in the field.	Air G.H.Q.

* When it is desired to refer specifically in the text of an order, report or message to the H.Q. of a unit or formation, the abbreviation will be preceded by the letters "H.Q.", e.g. "H.Q., 1 Inf. Bde."

2. COMMANDERS, STAFF, APPOINTMENTS AND SERVICES

Full title (1)	Abbreviated title (2)	Distinguishing letter to be used with originator's number or as abbreviation for use in the address <i>To</i> and <i>From</i> in addressing correspondence and signal messages. [See note (a)] (3)
Chief of the Imperial General Staff at the War Office	C.I.G.S.	
Commander-in-Chief ..	C.-in-C.	
<i>General Staff Branch :—</i>		
Operations Section ..	—	O
Intelligence Section ..	—	I
Staff Duties and Training Section	—	SD (at GHQ only)
Chief of the General Staff in the Field	C.G.S.	
Deputy Chief of the General Staff ..	D.C.G.S.	
Major General, General Staff ..	M.G.G.S.	
Brigadier, General Staff	B.G.S.	
General Staff Officer ..	G.S.O.	
Brigade Major	B.M.	O
<i>Adjutant-General's Branch :—</i>		A
Deputy Adjutant-General	D.A.G.	
Officer in Charge 2nd Echelon	O,2,E.	ECH
Assistant-Adjutant General	A.A.G.	
Deputy Assistant Adjutant-General	D.A.A.G.	
Staff Captain	S.C.	
<i>Quarter-Master-General's Branch :—</i>		Q
Maintenance Section ..	—	Q
Movement Section ..	—	QM
Deputy Quarter-Master-General	D.Q.M.G.	
Assistant Quarter-Master-General	A.Q.M.G.	
Staff Captain	S.C.	
Deputy Assistant Quarter-Master-General ..	D.A.Q.M.G.	
Deputy Adjutant and Quarter-Master-General	D.A. and Q.M.G.	
Assistant Adjutant and Quarter-Master-General	A.A. and Q.M.G.	
Deputy Assistant Adjutant and Quarter-Master-General	D.A.A. and Q.M.G.	

2. COMMANDERS, STAFF, APPOINTMENTS AND SERVICES—continued.

Full title (1)	Abbreviated title (2)	Distinguishing letter to be used with originator's number or as abbreviation for use in the address <i>To</i> and <i>From</i> in addressing correspondence and signal messages. [See Note (a)] (3)
<i>Branch of the Master-General of the Ordnance :—</i>		MGO
Deputy Master-General of the Ordnance ..	D.M.G.O.	
Assistant Master-General of the Ordnance ..	A.M.G.O.	
Deputy Assistant Master-General of the Ordnance	D.A.M.G.O.	
Staff Captain	S.C.	
<i>Officers holding miscellaneous appointments at a headquarters :—</i>		
Major-General, Royal Artillery	M.G.R.A.	[See note (b)]
Commander Corps, Royal Artillery	C.C.R.A.	[See note (b)]
Director-General Engineer Services	D.G.E.S.	RE
Chief Engineer	C.E.	RE
Signal Officer-in-Chief ..	S.O.-in-C.	X
Chief Signal Officer ..	C.S.O.	X
Military Secretary ..	M.S.	MS
Deputy Judge Advocate-General	D.J.A.G.	JAG
Naval Staff Officer ..	N.S.O.	
Principal Sea Transport Officer.. ..	P.S.T.O.	
Air Officer Commanding	A.O.C.	
<i>Advisers to the D.M.G.O. :—</i>		
Director of Artillery ..	D. of A.	MGO
Director of Mechanization	D. of M.	MGO
<i>Subordinate Commanders :—</i>		
Commander Corps Medium Artillery ..	C.C.M.A.	[See note (b)]
Commander Royal Artillery	C.R.A.	[See note (b)]
Commander Royal Engineers	C.R.E.	RE
Officer Commanding, Signals.. ..	—	Sigs.
Commander, Royal Army Service Corps	C.R.A.S.C.	ST.
<i>Officers holding appointments for local administration of a headquarters :—</i>		
Camp Commandant ..	—	CP
Officers of the services, assisting the Camp Commandant.	—	No authorized abbreviation. The abbreviated form of the title of the service will not be used.

2. COMMANDERS, STAFF, APPOINTMENTS AND SERVICES—continued.

Full title (1)	Abbreviated title (2)	Distinguishing letter to be used with originator's number or as abbreviation for use in the address <i>To</i> and <i>From</i> in addressing correspondence and signal messages. [See Note (a)] (3)
<i>Personal appointments:—</i>		
Aides-de-Camp	A.D.C.	A.D.C.
Personal Assistant ..	P.A.	
<i>Heads of services and their representatives:—</i>		
Chaplains	Chaplains	CH
Canteen	Canteens	CAN
Engineer stores	Restores	ES
Graves	Graves	GR
Hirings	Hirings	HGS
Labour	Labour	LB
Medical	Medical	M
(i) Medical and Surgical	Medical	M
(ii) Hygiene	Hygiene	M
(iii) Pathology	Pathology	M
(iv) Dental Surgery ..	Dental	M
(v) Nursing	Nursing	M
Ordnance	Ordnance	OS
Pay	Pay	PAY
Postal	Postal	P
Printing and stationery	Print	PS
Provost	Provost	PRO
Remount	Remounts	RM
Supply	Supplies	S [See note (d)]
Survey	Survey	SV
Transport	Transport	T [See note (d)]
Transportation	Transit	TN
(i) Docks	Docks	D
(ii) Inland Water Transport	I.W.T.	IW
(iii) Railways	Rail	RY
(iv) Light Railways ..	Lightrail	LR
Veterinary	Vet	V
Works	Works	W

- (a) Subordinate commanders, heads of services and officers holding special appointments will be addressed in correspondence and signal messages by the distinguishing letter of their arm, etc., followed by that of their formation, e.g. :—

Director of Railways at G.H.Q. RY. GHQ.
C.R.E., 1st Division RE. 1 Div.

Names of officers will not appear in addresses, except for some special reason, and messages will not be addressed to individual staff officers or branches of the staff—e.g., "AA and QMG 1 Div" or "Q 1 Div" are incorrect as addresses. "1 Div" is the correct form of address in this case.

- (b) Staff captains and intelligence officers of infantry and cavalry brigades will use the distinguishing letters "Q" and "I" respectively. The staff of M.G.R.A., C.C.R.A., C.C.M.A., and divisional artilleries will use the letters R.A.O., R.A.I., R.A.Q., in originators' numbers. In the address space R.A., followed by the abbreviated title of the formation, will be used for all artillery headquarters except that of C.C.M.A., in which case M.A., followed by the abbreviated title of the formation, will be used.
- (c) Units (e.g. cavalry regiments, infantry battalions, etc.) will use the distinguishing letters "O," "I" and "Q" only.
- (d) A D.S. and T. of a corps will use the distinguishing letters "ST".

3. REGIMENTS AND CORPS OF THE REGULAR ARMY

Full title	Abbreviation *
The Life Guards (1st and 2nd)	L.G.
Royal Horse Guards (The Blues)	R.H.G.
1st King's Dragoon Guards	K.D.G.
The Queen's Bays (2nd Dragoon Guards)	Bays.
3rd Carabiniers (Prince of Wales's Dragoon Guards)	3 D.G.
4th/7th Dragoon Guards	4/7 D.G.
5th Inniskilling Dragoon Guards	5 Innis D.G.
1st The Royal Dragoons	Royals
The Royal Scots Greys (2nd Dragoons)	Greys
3rd The King's Own Hussars	3 H.
4th Queen's Own Hussars	4 H.
7th Queen's Own Hussars	7 H.
8th King's Royal Irish Hussars	8 H.
9th Queen's Royal Lancers	9 L.
10th Royal Hussars (Prince of Wales's Own)	10 H.
11th Hussars (Prince Albert's Own)	11 H.
12th Royal Lancers (Prince of Wales's)	12 L.
13th/18th Hussars	13/18 H.
14th/20th Hussars	14/20 H.
15th/19th Hussars	15/19 H.
16th/5th Lancers	16/5 L.
17th/21st Lancers	17/21 L.
Royal Regiment of Artillery	R.A.
Corps of Royal Engineers	R.E.
Royal Corps of Signals	R. Sigs.
Grenadier Guards	Gren. Gds.
Coldstream Guards	Coldm. Gds.
Scots Guards	S.G.
Irish Guards	I.G.
Welsh Guards	W.G.
The Royal Scots (The Royal Regiment)	R.S.
The Queen's Royal Regiment (West Surrey)	Queen's.
The Buffs (East Kent Regiment)	Buffs.
The King's Own Royal Regiment (Lancaster)	King's Own.
The Northumberland Fusiliers	N.F.
The Royal Warwickshire Regiment	Warwick.
The Royal Fusiliers (City of London Regiment)	R.F.
The King's Regiment (Liverpool)	Kings.
The Norfolk Regiment	Norfolk.
The Lincolnshire Regiment	Lincolns.
The Devonshire Regiment	Devon.
The Suffolk Regiment	Suffolk.
The Somerset Light Infantry (Prince Albert's)	Som. L.I.
The West Yorkshire Regiment (The Prince of Wales's Own)	W. Yorks.
The East Yorkshire Regiment	E. York.
The Bedfordshire and Hertfordshire Regiment	Bedfs. Herts.
The Leicestershire Regiment	Leicesters.
The Green Howards (Alexandra, Princess of Wales's Own Yorkshire Regiment)	Green Howards.
The Lancashire Fusiliers	L.F.
The Royal Scots Fusiliers	R.S.F.
The Cheshire Regiment	Cheshire.
The Royal Welch Fusiliers	R.W.F.
The South Wales Borderers	S.W.B.
The King's Own Scottish Borderers	K.O.S.B.
The Cameronians (Scottish Rifles)	Cameronians.
The Royal Inniskilling Fusiliers	Inniskg.
The Gloucestershire Regiment	Glsters.
The Worcestershire Regiment	Worc. R.
The East Lancashire Regiment	E. Lan. R.
The East Surrey Regiment	Surreys.
The Duke of Cornwall's Light Infantry	D.C.L.I.

Full title	Abbreviation *
The Duke of Wellington's Regiment (West Riding)	D.W.R.
The Border Regiment	Border.
The Royal Sussex Regiment	R. Sussex.
The Hampshire Regiment	Hamps.
The South Staffordshire Regiment	S. Staffords.
The Dorsetshire Regiment	Dorset.
The Prince of Wales's Volunteers (South Lancashire)	P.W.V.
The Welch Regiment	Welch.
The Black Watch (Royal Highlanders)	Black Watch.
The Oxfordshire and Buckinghamshire Light Infantry	Oxf. Bucks.
The Essex Regiment	Essex.
The Sherwood Foresters (Nottinghamshire and Derbyshire Regiment)	Foresters.
The Loyal Regiment (North Lancashire)	Loyals.
The Northamptonshire Regiment	Northampton.
The Royal Berkshire Regiment (Princess Charlotte of Wales's)	R. Berks.
The Queen's Own Royal West Kent Regiment	R.W.K.
The King's Own Yorkshire Light Infantry	K.O.Y.L.I.
The King's Shropshire Light Infantry	K.S.L.I.
The Middlesex Regiment (Duke of Cambridge's Own)	Mx.
The King's Royal Rifle Corps	K.R.R.C.
The Wiltshire Regiment (Duke of Edinburgh's)	Wilt.
The Manchester Regiment	Manch.
The North Staffordshire Regiment (The Prince of Wales's)	N. Staffs.
The York and Lancaster Regiment	Y. & L.
The Durham Light Infantry	D.L.I.
The Highland Light Infantry (City of Glasgow Regiment)	H.L.I.
The Seaforth Highlanders (Ross-shire Buffs, the Duke of Albany's)	Seaforth.
The Gordon Highlanders	Gordons.
The Queen's Own Cameron Highlanders	Cameron.
The Royal Ulster Rifles	R.U.R.
The Royal Irish Fusiliers (Princess Victoria's)	R.Ir.F.
The Argyll and Sutherland Highlanders (Princess Louise's)	A. & S.H.
The Rifle Brigade (Prince Consort's Own)	R.B.
Royal Tank Corps	R. Tanks.
Royal Army Chaplain's Department	R.A.Ch.D.
Royal Army Service Corps	R.A.S.C.
Royal Army Medical Corps	R.A.M.C.
Royal Army Ordnance Corps	R.A.O.C.
Royal Army Pay Corps	R.A.P.C.
Royal Army Veterinary Corps	R.A.V.C.
Army Educational Corps	A.E.C.
The Army Dental Corps	A.D. Corps.
Corps of Military Police	C.M.P.
Military Provost Staff Corps	M.P.S.C.
Queen Alexandra's Imperial Military Nursing Service	Q.A.I.M.N.S.

4. REGIMENTS OF THE TERRITORIAL ARMY AND MILITIA

Units forming part of a regiment or corps of the Regular Army will adopt its abbreviated title except as given below.

Abbreviations for other regiments and corps will be as follows:—

North Irish Horse	N.I. Horse.
The Ayrshire Yeomanry (Earl of Carrick's Own)	Ayr Y.
The Cheshire Yeomanry (Earl of Chester's)	Cheshire Y.
The Lanarkshire Yeomanry	Lanark Y.
The Duke of Lancaster's Own Yeomanry	D.L.O.Y.

Full title	Abbreviation *
The Leicestershire Yeomanry (Prince Albert's Own)	Leicester Y.
The Northumberland Hussars	N.H.
The Nottinghamshire Yeomanry (Sherwood Rangers)	Notts. Y.
The Shropshire Yeomanry	Shrops. Y.
The North Somerset Yeomanry	N.S.Y.
The Staffordshire Yeomanry (Queen's Own Royal Regiment)	Staffs. Y.
The Warwickshire Yeomanry	Warwick Y.
The Royal Wiltshire Yeomanry (Prince of Wales's Own)	Wilts. Y.
The Yorkshire Dragoons (Queen's Own)	Yorks. D.
The Yorkshire Hussars (Alexandra, Princess of Wales's Own)	Yorks. H.
The Lovat Scouts	Lovat Scouts.
The Scottish Horse	Scot. Horse.
Honourable Artillery Company	A. Bty. H.A.C. B. Bty. H.A.C. H.A.C. Inf.
The Monmouthshire Regiment	Mon. R.
The Cambridgeshire Regiment	Camb. R.
1st City of London Regiment (The Royal Fusiliers)	1 London.
2nd City of London Regiment	2 London.
3rd City of London Regiment	3 London.
4th City of London Regiment	4 London.
5th City of London Regiment (London Rifle Brigade)	5 London.
6th City of London Regiment (City of London Rifles)	6 London.
7th City of London Regiment (Post Office Rifles) ..	7 London.
9th London Regiment (Queen Victoria's Rifles) ..	9 London.
10th London Regiment (Hackney)	10 London.
11th London Regiment (Finsbury Rifles)	11 London.
12th London Regiment (Rangers)	12 London.
13th London Regiment (Princess Louise's Kensington Regiment)	13 London.
14th London Regiment (London Scottish)	14 London.
16th London Regiment (Queen's Westminster and Civil Service Rifles)	16 London.
17th London Regiment (Tower Hamlets Rifles) ..	17 London.
18th London Regiment (London Irish Rifles) ..	18 London.
19th London Regiment (St. Pancras)	19 London.
20th London Regiment (Queen's Own)	20 London.
21st London Regiment (First Surrey Rifles) ..	21 London.
22nd London Regiment (The Queen's)	22 London.
23rd London Regiment	23 London.
24th London Regiment (The Queen's)	24 London.
28th London Regiment (Artists Rifles)	28 London.
The Hertfordshire Regiment	Herts. R.
The Herefordshire Regiment	Hereford R.
The Buckinghamshire Battalion, The Oxfordshire and Buckinghamshire Light Infantry	Bucks.
The Hallamshire Battalion, The York and Lancaster Regiment	Hallams.

* The abbreviations must never be employed as distinguishing letters by the originator of a message to denote his identity.

5. EXAMPLES OF ABBREVIATED TITLES OF UNITS OTHER THAN CAVALRY AND INFANTRY

R.A.	
"C" Battery, Royal Horse Artillery	C. Bty. R.H.A.
97th Field Battery, R.A.	97 Fd. Bty.
10th Field Battery, R.A. (How.)	10 Fd. Bty. (H)
2nd Light Battery, R.A.	2 Lt. Bty.
17th Medium Battery, R.A.	17 Med. Bty.
4th Heavy Battery, R.A.	4 Hy. Bty.
3rd Anti-Aircraft Battery, R.A.	3 A.A. Bty.
Survey Company, R.A.	Svy. Coy. R.A.

Full title	Abbreviation
<i>R.E.</i>	
12th (Field) Company, R.E.	12 Fd. Coy.
6th (Field Park) Company, R.E.	6 Fd. Park Coy.
3rd (Fortress) Company, R.E.	3 Frt. Coy.
19th (Field Survey) Company, R.E.	19 Fd. Svy. Coy. R.E.
Anti-Aircraft Searchlight Battalion, R.E.	A.A.S.L. Bn.
Electrical and Mechanical Company, R.E.	E. & M. Coy.
100th (Army Troops) Company R.E.	100 (101, etc.) A. Tps. Coy.
<i>R. Signals.</i>	
No. 1 (No. 2 etc.) Field Artillery Signal Section ..	1 (2 etc.) Fd. Arty. Sig. Sec.
No. 1 (No. 2 etc.) Medium Artillery Signal Section ..	1 (2 etc.) Med. Arty. Sig. Sec.
No. 1 Anti-Aircraft Signal Company	1 A.A. Sig. Coy.
No. 1 Air Defence Brigade Signals	1 A.D. Bde. Sigs.
<i>R. Tanks.</i>	
3rd Battalion Royal Tank Corps	3 R. Tanks.
1st Armoured Car Company	1 Armcd. C. Coy.
<i>R.A.S.C.</i>	
G.H.Q. Troops Maintenance Company	G.H.Q. Maint. Coy.
1st (etc.) Corps Troops Maintenance Company ..	1 (etc.) C.T. Maint. Coy.
1st (etc.) Corps Troops Ammunition Company ..	1 (etc.) C.T. Amn. Coy.
1st (etc.) Corps Troops Baggage Company ..	1 (etc.) C.T. Bag. Coy.
1st (etc.) Corps Troops Supply Company ..	1 (etc.) C.T. Sup. Coy.
1st (etc.) Cavalry Maintenance Company ..	1 (etc.) Cav. Maint. Coy.
1st (etc.) Cavalry Divisional Ammunition Company	1 (etc.) Cav. Div. Amn. Coy.
1st (etc.) Cavalry Divisional Baggage Company ..	1 (etc.) Cav. Div. Bag. Coy.
1st (etc.) Cavalry Divisional Supply Company ..	1 (etc.) Cav. Div. Sup. Coy.
Maintenance Company for 1st (etc.) Division ..	Maint. Coy. 1 (etc.) Div.
1st (etc.) Divisional Ammunition Company ..	1 (etc.) Div. Amn. Coy.
1st (etc.) Divisional Baggage Company ..	1 (etc.) Div. Bag. Coy.
1st (etc.) Divisional Supply Company ..	1 (etc.) Div. Sup. Coy.
Reserve M.T. Company	Res. M.T. Coy.
Motor Ambulance Convoy	M.A.C.
Pontoon Bridge Park	P.B. Park.
Vehicle Reception Depot	V.R. Depot.
<i>R.A.M.C.</i>	
Field Ambulance	1 (2, etc.) Fd. Amb.
Cavalry Field Ambulance	1 (2, etc.) Cav. Fd. Amb.
Field Hygiene Section	1 (2, etc.) Fd. Hyg. Sec.
Casualty Clearing Station	1 (2, etc.) C.C.S.
General Hospital	1 (2, etc.) Gen. Hosp.
<i>R.A.O.C.</i>	
G.H.Q. Ordnance Workshop	G.H.Q. Ord. Wkshop.
Corps Ordnance Workshop	Ord. Wkshop. 1 (2, etc.) Corps.
Divisional Ordnance Workshop	Ord. Wkshop 1 (2, etc.) Div.
Ordnance Ammunition Company	Ord. Amn. Coy.
Ordnance Field Park	Ord. Fd. Park.

Full title	Abbreviation
<i>Veterinary.</i>	
Mobile Veterinary Section	1 (2, etc.) Mob. Vet. Sec.
Veterinary Evacuating Station	1 (2, etc.) V.E.S.
<i>Provost.</i>	
Provost Company	1 (2, etc.) Pro. Coy.
Provost Squadron	1 (2, etc.) Pro. Sqn.

6. OTHER ABBREVIATIONS

Acknowledge	Ack.
Addressed	Addsd.
Administration or Administrative	Adm.
Advanced dressing station	A.D.S.
Advanced guard	Adv. Gd.
Air defence	A.D.
Ammunition	Amn.
Ammunition railhead	A.R.H.
Ammunition refilling point	A.R.P.
Anti-aircraft or Army Act	A.A.
Anti-tank	A.T.
Appendix	Appx.
Armour piercing	A.P.
Armoured car	Armd. C.
Armoured fighting vehicle	A.F.V.
Army book	A.B.
Army co-operation squadron	A.C. Sqn.
Army Council Instruction	A.C.I.
Army form	A.F.
Army order	A.O.
Army routine order	A.R.O.
Army troops	A.Tps.
Artillery	Arty.
Artillery reconnaissance	Arty. R.
Assistant Inspector of Armourers	A.I.A.
Battalion	Bn.
Battery	Bty.
Batteries	Btys.
Battery commander	B.C.
Battery quarter-master-serjeant	B.Q.M.S.
Battery serjeant-major	B.S.M.
Bombardier	Bdr.
Bomber (aeroplane)	B.
Branch field post office	B.F.P.O.
Breech loading	B.L.
Brigade	Bde.
Brigade intelligence officer	B.I.O.
Brigade machine gun officer	B.M.G.O.
Brigadier	Brig.
Captain	Capt.
Casualty clearing station	C.C.S.
Cavalry	Cav.
Cavalry Armoured Car Regiment (Squadron)	Cav. Armd. C. Regt. (Sqn.).
Central wireless station	C.W.S.
Chaplain to the Forces	C.F.
Chief Ordnance Mechanical Engineer	C.O.M.E.
Chief Ordnance Officer	C.O.O.
Close reconnaissance	Cl.R.
Colonel	Col.
Column	Coln.
Commandant	Comdt.
Commander	Comdr.
Commanding	Comdg.
Commanding officer	C.O.

Full title	Abbreviation.
Communication	Comm.
Company	Coy.
Companies	Coys.
Company quarter-master-serjeant	C.Q.M.S.
Company serjeant-major	C.S.M.
Controller of Canteen Service	C. Can.
Corporal	Cpl.
Corps routine order	C.R.O.
Corps troops or Communication trench	C.T.
Counter-battery or Confinement to barracks	C.B.
Counter-battery officer	C.B.O.
Delivery point	D.P.
Despatch rider	D.R.
Despatch rider letter service	D.R.L.S.
Detachment	Det.
Detention	Detn.
Direction finding	D.F.
Director of Engineer Stores Service*	D.E.S.
Director-General of Medical Services*	D.G.M.S.
Director-General of Transportation Services*	D.G. Tn.
Director of Docks Service*	D. Docks
Director of Graves Registration*	D.G.R.
Director of Hirlings Service*	D. Hgs.
Director of Hygiene*	D.H.
Director of Inland Water Transport Service*	D.I.W.T.
Director of Labour Service*	D. Lab.
Director of Light Railways*	D.L.Ry.
Director of Medical Services*	D.M.S.
Director of Ordnance Services*	D.O.S.
Director of Postal Services*	D. Post.
Director of Printing and Stationery Services	D.P.S.S.
Director of Railways*	D. Ry.
Director of Remounts*	D. Remounts.
Director of Supplies and Transport*	D.S.T.
Director of Survey*	D. Svy.
Director of Veterinary Services*	D.V.S.
Director of Works*	D. of W.
Distant reconnaissance	Dist. R.
District	Dist.
District court-martial	D.C.M.
Divisional or Division	Div.
Divisional routine orders	D.R.O.
Dragoon	Dgn.
Driver or drummer	Dr.
Echelon	Ech.
Embarkation medical officer	E.M.O.
Embarkation staff officer	E.S.O.
Emergency operations	E.O.
Establishment	Est.
Exclusive	Excl.
Farrier	Far.
Field ambulance	Fd. Amb.
Field battery	Fd. Bty.
Field brigade	Fd. Bde.
Field company	Fd. Cov.
Field general court-martial	F.G.C.M.
Field Hygiene Section	Fd. Hyg. Sec.
Field-marshal	P.M.
Field officer	F.O.
Field service	F.S.
Field Service Manual	F.S.M.
Field Service Regulations	F.S.R.
Field squadron	Fd. Sqn.
Fighter (aeroplane)	F.
Financial adviser	F.A.

Full title	Abbreviation
Staff-serjeant	S. Sjt.
Staff serjeant-major	S.S.M.
Starting point	S.P.
Station	Sta.
Supply officer	Sup. O.
Supply railhead	S.R.H.
Supply refilling point	S.R.P.
Territorial Army	T.A.
Tractor drawn	T.D.
Transport	Tpt.
Transport officer	T.O.
Troop	Tp.
Trooper	Tpr.
Trumpeter	Tptr.
Vertical interval	V.I.
Veterinary evacuating station	V.E.S.
Veterinary officer	V.O.
Visual telegraphy	V/T.
Walking wounded collecting post	W.W.C.P.
War establishment	W.E.
Wing artillery officer	W.A.O.
Wireless telegraphy	W/T.

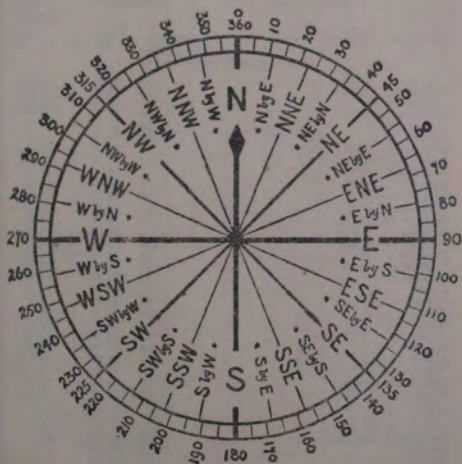
* The titles of Assistant and Deputy Assistant-Director-Generals and Directors of the various services are abbreviated as follows :

A.D.G.Tn. D.A.D.G.Tn. A.D.M.S. D.A.D.M.S.

APPENDIX II

PLATE XXXVIII

POINTS OF THE COMPASS



APPENDIX III

MAGNETIC VARIATIONS

(Note.—The figures in column 2 give the declination on July 1st, 1932.
For other dates adjustment must be made in accordance with the
annual change in declination given in column 3.)

Name of place (1)	Declination (2)	Annual change (3)
----------------------	--------------------	-------------------------

GREAT BRITAIN AND IRELAND

	Deg.	Min.	Min.
Aldershot	12	04 W	11 E
London	11	49 W	11 E
Salisbury	12	29 W	11 E
Chester	13	24 W	11 E
York	13	04 W	11 E
Maidstone	11	24 W	11 E
Jersey (St. Helier)	11	51 W	11 E
Wimborne	12	16 W	11 E
Oxford	12	23 W	11 E
Great Grimsby	12	16 W	11 E
Plymouth	13	32 W	11 E
Merthyr Tydvil	13	36 W	11 E
Morpeth	13	26 W	11 E
Newcastle-on-Tyne	13	20 W	11 E
Cardigan	14	20 W	11 E
Whitehaven	14	24 W	11 E
Edinburgh	14	34 W	11 E
Dublin	15	33 W	11 E
Belfast	15	27 W	11 E
Ayr	15	18 W	11 E
Glasgow	15	45 W	11 E
Inverness	15	25 W	11 E
Mallow	16	17 W	11 E
Londonderry	16	36 W	11 E
Portree	15	37 W	11 E
Connemara (Clifden)	17	19 W	11 E
Mayo	17	17 W	11 E

CANADA

St. John's (Newfoundland)	28	44 W	5 E
Halifax	22	55 W	2 W
Quebec	19	38 W	3 W
Montreal	16	23 W	4 W
Ottawa	13	58 W	5 W
Toronto	7	28 W	5 W
Sault Ste. Marie	5	3 W	6 W
Port Arthur	0	52 E	7 W
Winnipeg	11	22 E	7 W
Regina	17	42 E	6 W
Calgary	24	2 E	5 W
Vancouver	24	47 E	2 W
Esquimault	24	2 E	2 W
Prince Rupert	28	12 E	1 W

MAGNETIC VARIATIONS—continued

Name of place (1)						Declination (2)	Annual change (3)
AUSTRALIA							
Brisbane .. .. .	..	..	..	..	..	9 12 E	1 E
Sydney .. .. .	..	..	..	..	..	9 32 E	1 E
Hobart .. .. .	..	..	..	..	..	9 1 E	1 E
Rockhampton .. .. .	..	..	..	..	..	8 10 E	1 E
Melbourne .. .. .	..	..	..	..	..	8 11 E	1 E
Townsville .. .. .	..	..	..	..	..	6 41 E	1 E
Adelaide .. .. .	..	..	..	..	..	5 36 E	1 E
Port Darwin .. .. .	..	..	..	..	..	3 41 E	1 E
Coolgardie .. .. .	..	..	..	..	..	1 20 W	1 E
Perth .. .. .	..	..	..	..	..	4 43 E	0
Port Moresby (New Guinea) .. .. .	..	..	..	..	..	5 42 E	0
NEW ZEALAND							
Auckland .. .. .	..	..	..	..	..	16 22 E	4 E
Wellington .. .. .	..	..	..	..	..	17 32 E	4 E
Dunedin .. .. .	..	..	..	..	..	18 18 E	5 E
SOUTH AFRICA AND RHODESIA							
Cape Town .. .. .	..	..	..	..	..	24 0 W	10 E
Port Nolloth .. .. .	..	..	..	..	..	22 40 W	8 E
Port Elizabeth .. .. .	..	..	..	..	..	21 51 W	12 E
Walvis Bay .. .. .	..	..	..	..	..	18 38 W	11 E
Bloemfontein .. .. .	..	..	..	..	..	19 37 W	10 E
Durban .. .. .	..	..	..	..	..	17 19 W	12 E
Pretoria .. .. .	..	..	..	..	..	17 26 W	10 E
Livingstone .. .. .	..	..	..	..	..	12 19 W	12 E
Buluwayo .. .. .	..	..	..	..	..	12 49 W	12 E
Broken Hill .. .. .	..	..	..	..	..	10 6 W	10 E
Abercorn .. .. .	..	..	..	..	..	5 59 W	10 E
INDIA							
Peshawar .. .. .	..	..	..	..	..	2 52 E	3 W
Quetta .. .. .	..	..	..	..	..	2 13 E	3 W
Simla .. .. .	..	..	..	..	..	1 23 E	4 W
Karachi .. .. .	..	..	..	..	..	0 48 E	3 W
Delhi .. .. .	..	..	..	..	..	0 45 E	4 W
Nagpur .. .. .	..	..	..	..	..	1 5 W	5 W
Patna .. .. .	..	..	..	..	..	0 40 W	5 W
Bombay .. .. .	..	..	..	..	..	1 10 W	4 W
Calcutta .. .. .	..	..	..	..	..	1 3 W	5 W
Mandalay .. .. .	..	..	..	..	..	1 19 W	5 W
Rangoon .. .. .	..	..	..	..	..	1 15 W	4 W
Madras .. .. .	..	..	..	..	..	2 38 W	5 W
EGYPT AND SUDAN							
Port Said .. .. .	..	..	..	..	..	0 25 E	7 E
Suakin .. .. .	..	..	..	..	..	0 24 E	7 E
Cairo .. .. .	..	..	..	..	..	0 1 E	7 E
Kassala .. .. .	..	..	..	..	..	0 3 E	7 E
Alexandria .. .. .	..	..	..	..	..	0 18 W	7 E
Khartoum .. .. .	..	..	..	..	..	0 57 W	7 E
Roseires .. .. .	..	..	..	..	..	0 51 W	7 E
El Obeid .. .. .	..	..	..	..	..	1 48 W	7 E
Mongalla .. .. .	..	..	..	..	..	2 16 W	6½ E
El Fashar .. .. .	..	..	..	..	..	2 57 W	6½ E

MAGNETIC VARIATIONS—continued

Name of place (1)						Declination (2)	Annual change (3)
PALESTINE, IRAQ, ARABIA							
Haifa .. .. .	..	..	..	..	..	1 19 E	8 E
Jerusalem .. .. .	..	..	..	..	..	1 13 E	7 E
Amman .. .. .	..	..	..	..	..	1 38 E	7 E
Medina .. .. .	..	..	..	..	..	1 30 E	6 E
Aden .. .. .	..	..	..	..	..	0 44 E	4 E
Musqat .. .. .	..	..	..	..	..	1 34 E	0
Mosul .. .. .	..	..	..	..	..	3 21 E	6 E
Baghdad .. .. .	..	..	..	..	..	3 7 E	5 E
Basra .. .. .	..	..	..	..	..	3 6 E	4 E
MEDITERRANEAN							
Gibraltar .. .. .	..	..	..	..	..	12 40 W	8 E
Malta .. .. .	..	..	..	..	..	4 23 W	10 E
Nicosia (Cyprus) .. .. .	..	..	..	..	..	1 18 E	7 E
ASIA							
Colombo .. .. .	..	..	..	..	..	3 25 W	5 W
Penang .. .. .	..	..	..	..	..	0 29 W	2 W
Singapore .. .. .	..	..	..	..	..	0 36 E	0
Hong-Kong .. .. .	..	..	..	..	..	0 41 W	2 W
AFRICA							
St. Helena .. .. .	..	..	..	..	..	25 19 W	1 W
Freetown .. .. .	..	..	..	..	..	17 34 W	1 E
Accra .. .. .	..	..	..	..	..	12 51 W	4 E
Lagos .. .. .	..	..	..	..	..	11 5 W	5 E
Zaria .. .. .	..	..	..	..	..	8 35 W	6 E
Blantyre .. .. .	..	..	..	..	..	7 1 W	14 E
Ujiji .. .. .	..	..	..	..	..	5 24 W	5 E
Ruvuma River (mouth) .. .. .	..	..	..	..	..	3 59 W	10 E
Entebbe .. .. .	..	..	..	..	..	3 20 W	5 E
Dar-es-Salaam .. .. .	..	..	..	..	..	2 40 W	10 E
Mombasa .. .. .	..	..	..	..	..	2 18 W	4 E
Berbera .. .. .	..	..	..	..	..	0 15 E	6 E
Seychelles .. .. .	..	..	..	..	..	2 40 W	8 W
Mauritius .. .. .	..	..	..	..	..	12 27 W	11 W
AMERICA							
Bermuda .. .. .	..	..	..	..	..	12 10 W	4 W
Barbados .. .. .	..	..	..	..	..	7 54 W	10 W
Antigua .. .. .	..	..	..	..	..	8 8 W	10 W
Dominica .. .. .	..	..	..	..	..	7 34 W	10 W
Anguilla .. .. .	..	..	..	..	..	5 55 W	10 W
St. Kitts .. .. .	..	..	..	..	..	7 35 W	10 W
St. Lucia .. .. .	..	..	..	..	..	6 47 W	10 W
St. Vincent .. .. .	..	..	..	..	..	6 24 W	10 W
Georgetown (Br. Guiana) .. .. .	..	..	..	..	..	6 57 W	10 W
Grenada .. .. .	..	..	..	..	..	6 30 W	10 W
Trinidad I. (Port of Spain) .. .. .	..	..	..	..	..	5 58 W	10 W
Caicos Is. .. .. .	..	..	..	..	..	3 18 W	4 W
Nassau (Bahamas) .. .. .	..	..	..	..	..	0 28 W	2 W
Kingston (Jamaica) .. .. .	..	..	..	..	..	1 10 E	0
Belize (Br. Honduras) .. .. .	..	..	..	..	..	6 1 E	1 E
Stanley (Falkland Is.) .. .. .	..	..	..	..	..	8 27 E	5 W

MAGNETIC VARIATIONS—*continued*

Name of place (1)	Declination. (2)	Annual change (3)
OCEANIA		
Solomon Is.	7 10 E	0
New Hebrides (Central)	11 28 E	1 E
Samoa (Apia)	10 40 E	2 E
Suva (Fiji)	11 0 E	2 E
Vavau (Tonga)	11 18 E	3 E
EUROPE		
Brest	13 15 W	11 E
Lisbon	13 52 W	8 E
Bergen	10 40 W	13 E
Bordeaux	11 0 W	10 E
Madrid	11 43 W	9 E
Paris	10 37 W	11 E
Brussels	9 32 W	11 E
Cologne	8 24 W	12 E
Marseilles	8 6 W	11 E
Oslo	7 4 W	13 E
Berne	7 42 W	12 E
Verona	6 15 W	11 E
Copenhagen	5 38 W	11 E
Venice	5 32 W	11 E
Rome	5 22 W	11 E
Berlin	5 12 W	12 E
Pola	4 38 W	11 E
Vienna	3 32 W	11 E
Taranto	3 27 W	10 E
Stockholm	2 32 W	12 E
Budapest	2 17 W	11 E
Corfu	2 32 W	10 E
Salonica	1 38 W	9 E
Athens	1 21 W	9 E
Warsaw	1 36 W	10 E
Sofia	1 11 W	10 E
Constantinople	2 5 E	8 E
Riga	2 40 E	10 E
Helsingfors	0 51 E	11 E
Odessa	0 40 W	8 E
Leningrad	4 22 E	8 E
Baku	5 13 E	2 E
Moscow	6 38 E	4 E
Archangel	10 22 E	6 E

APPENDIX IV DATES OF FULL MOON, 1932-1937

Month (1)	1932 (2)	1933 (3)	1934 (4)	1935 (5)	1936 (6)	1937 (7)
January	23	11	30	19	8	26
February	22	10	—	18	7	25
March	22	12	1 and 31	20	8	26
April	20	10	29	18	6	25
May	20	9	28	18	6	25
June	18	8	27	16	5	23
July	17	7	26	16	4	23
August	16	5	24	14	3	22
September	14	4	23	12	{ 1 30 }	20
October	14	3	22	12	30	19
November	13	2	21	10	28	18
December	13	{ 2 31 }	20	10	28	17

APPENDIX V

SUNRISE AND SUNSET—LOCAL MEAN TIMES

The following table gives the local mean times of sunrise and sunset on certain dates in each month of the year at latitudes between 60° north and 40° south; the times for intermediate dates and latitudes can easily be interpolated.
When "Summer time" is in operation the tabulated values within that period should be increased by one hour.

Latitude	60° N.		50° N.		40° N.		30° N.		20° N.		10° N.		Equator		10° S.		20° S.		30° S.		40° S.		Latitude
	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
Jan. 1	09-03	15-04	07-59	16-08	07-22	16-45	06-56	17-11	06-35	17-32	06-17	17-50	06-00	18-07	05-42	18-25	05-24	18-43	05-02	19-05	04-34	19-33	Jan. 1
" 16	08-49	15-31	07-53	16-26	07-20	16-59	06-57	17-22	06-38	17-41	06-21	17-58	06-06	18-13	05-51	18-29	05-34	18-46	05-14	19-05	04-50	19-30	"
Feb. 1	08-17	16-11	07-36	16-52	07-10	17-18	06-51	17-36	06-36	17-51	06-23	18-05	06-10	18-17	05-58	18-30	05-44	18-43	05-28	18-59	05-08	19-19	Feb. 1
" 16	07-39	16-51	07-11	17-18	06-53	17-36	06-40	17-49	06-30	17-59	06-20	18-09	06-11	18-18	06-02	18-27	05-52	18-37	05-40	18-48	05-28	19-03	"
Mar. 1	07-09	17-27	06-44	17-42	06-34	17-52	06-26	17-59	06-20	18-05	06-15	18-11	06-09	18-16	06-04	18-21	05-58	18-27	05-51	18-33	05-42	18-42	Mar. 1
" 16	06-15	18-04	06-12	18-06	06-11	18-07	06-09	18-09	06-05	18-10	06-07	18-11	06-05	18-12	06-04	18-14	06-03	18-15	06-01	18-17	05-58	18-19	"
Apr. 1	05-28	18-43	05-38	18-31	05-45	18-24	05-50	18-19	05-54	18-14	05-58	18-11	06-01	18-07	06-04	18-04	06-08	18-01	06-11	17-57	06-16	17-53	Apr. 1
" 16	04-41	19-20	05-06	18-55	05-21	18-39	05-33	18-28	05-41	18-18	05-49	18-10	05-56	18-03	06-04	17-56	06-11	17-49	06-19	17-40	06-29	17-30	"
May 1	03-59	19-57	04-37	19-18	05-01	18-54	05-18	18-37	05-31	18-23	05-43	18-12	05-54	18-01	06-04	17-49	06-15	17-38	06-38	17-25	06-44	17-09	May 1
" 16	03-21	20-33	04-13	19-40	04-44	19-09	05-06	18-47	05-24	18-29	05-39	18-14	05-53	18-00	06-06	17-46	06-21	17-31	06-38	17-14	06-58	16-54	"
June 1	02-49	21-07	03-56	20-00	04-33	19-22	04-59	18-56	05-20	18-35	05-38	18-18	05-54	18-01	06-11	17-45	06-28	17-28	06-48	17-08	07-12	16-43	June 1
" 16	02-36	21-26	03-50	20-11	04-30	19-31	04-55	19-02	05-20	18-41	05-39	18-22	05-57	18-04	06-14	17-46	06-32	17-28	06-54	17-07	07-20	16-40	"
July 1	02-41	21-25	03-54	20-13	04-34	19-33	05-02	19-05	05-24	18-43	05-42	18-25	06-00	18-07	06-18	17-51	06-36	17-32	06-57	17-11	07-23	16-45	July 1
" 16	03-04	21-06	04-08	20-03	04-44	19-27	05-09	19-02	05-29	18-42	05-46	18-25	06-02	18-09	06-18	17-54	06-35	17-38	06-55	17-19	07-18	16-35	"
Aug. 1	03-39	20-31	04-28	19-43	04-58	19-14	05-18	18-53	05-35	18-37	05-49	18-23	06-03	18-09	06-16	17-57	06-30	17-43	06-45	17-28	07-05	17-03	Aug. 1
" 16	04-16	19-51	04-50	19-17	05-12	18-56	05-28	18-40	05-40	18-28	05-51	18-17	06-01	18-07	06-11	17-58	06-21	17-48	06-33	17-36	06-47	17-22	"
Sept. 1	04-54	19-05	05-14	18-45	05-27	18-32	05-37	18-23	05-44	18-15	05-51	18-09	05-57	18-03	06-03	17-57	06-29	17-51	06-16	17-45	06-24	17-36	Sept. 1
" 16	05-29	18-19	05-37	18-12	05-41	18-08	05-45	18-05	05-47	18-02	05-50	18-00	05-52	17-58	05-54	17-57	05-56	17-55	05-58	17-54	06-00	17-51	"
Oct. 1	06-04	17-34	05-59	17-39	05-56	17-43	05-53	17-46	05-51	17-48	05-49	17-51	05-46	17-53	05-45	17-56	05-42	17-58	05-40	18-01	05-36	18-05	Oct. 1
" 16	06-41	16-49	06-23	17-08	06-11	17-20	06-02	17-29	05-55	17-36	05-49	17-43	05-42	17-49	05-36	17-55	05-29	18-03	05-21	18-11	05-11	18-21	"
Nov. 1	07-21	16-05	06-49	16-38	06-29	16-53	06-14	17-13	06-01	17-26	05-51	17-37	05-40	17-47	05-30	17-57	05-18	18-09	05-05	18-22	04-49	18-38	Nov. 1
" 16	08-00	15-29	07-14	16-15	06-46	16-43	06-26	17-04	06-09	17-20	05-55	17-35	05-41	17-48	05-28	18-02	05-13	18-17	04-56	18-34	04-35	18-56	"
Dec. 1	08-34	15-03	07-36	16-01	07-02	16-36	06-38	17-00	06-19	17-19	06-02	17-36	05-45	17-53	05-30	18-09	05-12	18-27	04-52	18-47	04-26	19-13	Dec. 1
" 16	08-58	14-53	07-53	15-59	07-15	16-36	06-49	17-02	06-28	17-24	06-09	17-42	05-52	17-59	05-34	18-16	05-15	18-35	04-53	18-57	04-25	19-25	"

APPENDIX VI

WEIGHTS, MEASURES, THERMOMETER,
MONEYS, ETC.

1. The following tables contain information regarding English and foreign weights and measures, and the coinage of foreign countries, etc. :—

*English Weights and Measures*2. *Linear measure.*—

	In.	Ft.	Yds.	Pls.	Ch.	Fs.
Foot	12	1				
Yard	36	3	1			
Rod, pole or perch	198	16½	5½	1		
Chain	792	66	22	4	1	
Furlong	7,920	660	220	40	10	1
Mile	63,360	5,280	1,760	320	80	8

3. *Particular measures of length.*—

A fathom = 6 feet.

A cable's length = $\frac{1}{10}$ nautical mile = 202·7 yards.

A degree of latitude varies from 68·7 statute miles at the Equator to 69·41 at the Pole.

The following is the length in geographical miles of 1 degree of longitude at various latitudes :—At the Equator, 69·176 ; at 15° N. or S., 66·832 ; at 30° N. or S., 59·96 ; at 45° N. or S., 48·992 ; at 60° N. or S., 34·676.

A league = 3 miles.

A nautical mile or geographical mile = 2,026½ yards.

A half-penny is 1 inch in diameter.

4. *Square measure.*—

	In.	Ft.	Yds.	Pls.	Ch.	R.
Square foot ..	144	1				
Square yard ..	1,296	9	1			
Rod, pole, or perch	39,204	272½	30½	1		
Square chain ..	627,264	4,356	484	16	1	
Rood	1,568,160	10,890	1,210	40	2½	1
Acre	6,272,640	43,560	4,840	160	10	4

A square mile contains 640 acres = 2,560 roods = 6,400 chains = 102,400 rods, poles, or perches = 3,097,600 square yards.

N.B.—The term square feet must not be confounded with feet square. A piece of cloth said to measure 6 square feet, consists of 6 squares of a foot each, but a piece said to measure 6 feet square would be 6 feet along each side, and comprise 36 squares of a foot each.

5. *Cubic measure.*—

1,728 cubic inches	..	..	..	1 cubic foot.
27 cubic feet	..	..	..	1 cubic yard.
42 cubic feet timber	..	..	..	1 shipping ton.
108 cubic feet	..	..	..	1 stack of wood.
128 cubic feet	..	..	..	1 cord of wood.

6. *Liquid measure.*—

	Gals.	Qts.	Pts.
4 gills	—	—	1
Quart	—	1	2
Gallon	1	4	8
Firkin	9	36	72
Kilderkin	18	72	144
Barrel	36	144	288
Hogshead of ale	54	216	432
Puncheon	72	288	576
Butt of ale	108	432	864

7. *Dry measure.*—

4 gills	1 pint.
2 pints	1 quart.
4 quarts	1 gallon.
2 gallons	1 peck.
4 pecks	1 bushel.
8 bushels (2 sacks)	1 quarter.
26 bushels	1 chaldron.

MEASURES OF WEIGHT

8. *Avoirdupois weight.*—

27½ grains	= 1 drachm	= 27.34375 grains.
16 drachms	= 1 ounce	= 437.5 "
16 ounces	= 1 pound	= 7,000 "
14 pounds	= 1 stone.	
28 pounds	= 1 quarter (qr.).	
4 quarters	= 1 hundredweight (cwt.).	
20 cwt.	= 1 ton.	

This weight is used in almost all commercial transactions and common dealings.

9. *Troy weight.*—

24 grains	= 1 pennyweight.
20 pennyweights	= 1 ounce.
12 ounces	= 1 lb.

10. *Apothecaries' weight.*—

20 grains	= 1 scruple.
3 scruples	= 1 drachm (dr.).
8 drachms	= 1 oz.

11. *Apothecaries' fluid measure.*—

60 minims (drops)	= 1 fluid drachm.
8 drachms	= 1 oz.
20 ounces	= 1 pint.

Useful weights and measures :—1 sovereign = 2 drams ; 1 half-crown, 3½ drs. ; 1 florin, 3 drs. ; 1 shilling, 1½ drs. ; 1 threepenny piece, ½ dr. ; 1 table-spoonful holds 1 oz. ; 1 dessert spoon, ½ oz. ; 1 teaspoon, ¼ oz. These measures are used for veterinary medicine.

12. *Hay and straw.*—

Truss of straw	= 36 lb.
„ old hay	= 56 „
„ new hay	= 60 „

Load, 36 trusses = straw, 11 cwt. 2 qrs. 8 lb. ; old hay, 18 cwt. ; new hay, 19 cwt. 1 qr. 4 lb.

13. *Weight of coal, wood, etc.—*

Anthracite, a cubic yard solid	.. ..	= 2,160 lb.
Bituminous, a cubic yard solid	.. ..	= 2,025 "
Cannel, a cubic yard solid	.. ..	= 1,400 "
Coal, stored in the usual way, solid	.. ..	= 2,160 "
A cubic foot fresh water	.. ..	weighs 62½ lb.
.. salt water	.. ..	63 "
.. Timber, ash	.. ..	49 "
.. beech	.. ..	43 "
.. birch	.. ..	44 "
.. cork	.. ..	15 "
.. elm	.. ..	36 "
.. pine	.. ..	41 "
.. oak	.. ..	59 "
.. clay	.. ..	125 "
.. loose earth	.. ..	95 "
A cubic yard compressed hay	.. ..	about 225 lb.
.. hay in stack	.. ..	126 "
.. compressed straw	.. ..	145 "
.. straw in stack	.. ..	90 "
.. of grain	.. ..	20 bushels.

FOREIGN WEIGHTS AND MEASURES

14. *The Metric System used in.—*

Argentine Republic, Austria, Belgium, Bolivia, Brazil, Bulgaria, Chili, Colombia, Costa Rica, Czechoslovakia, Denmark, Ecuador, France, Germany, Greece, Hayti, Hungary, Italy, Netherlands, Norway, Poland, Portugal, Rumania, San Domingo, Yugoslavia, Soviet Russia, Spain, Switzerland, Sweden, Turkey, United States (partially), Venezuela.

15. *Linear measure.—*

<i>Imperial</i>	<i>Metric</i>
1 inch = 25·4 millimetres	1 millimetre = 0·039 in.
1 foot = 0·305 metre	1 centimetre (10 mms.) = 0·394 in.
1 yard = 0·9144 metre	1 decimetre (10 cms.) = 3·937 in.
1 mile = 1·609 kilometres	1 metre = { 39·370 in. 3·281 ft. 1·093 yds.
	1 kilometre = 0·621 mile.

16. *Square measure.—*

1 sq. in. = 6·451 sq. centimetres	1 sq. centimetre = 0·155 sq. in.
1 sq. yd. = 0·836 sq. metre	1 sq. metre = 10·764 sq. ft. 1·196 sq. yds.

17. *Cubic measure.—*

1 cub. in. = 16·387 cub. centimetres	1 cub. centimetre = 0·061 cub. in.
1 cub. ft. = 0·028 cub. metre	1 cub. decimetre = 61·024 cub. in.
1 cub. yd. = 0·764 cub. metre	1 cub. metre = 35·315 cub. ft. 1·308 cub. yds.

18. *Measures of weight.—*

1 lb. = 0·454 kilogram	1 kilogram = 2·204 lb.
1 ton = 1·016 kilograms	

19. *Measures of capacity.—*

1 pint = 0·568 litre	1 litre = 1·759 pints 0·22 gallon
1 gallon = 4·546 litres	1 hectolitre = 175·98 pints 21·997 gallons

To convert yards to metres multiply by 0·914.

.. miles to kilometres multiply by 1·609.

.. acres to hectares multiply by 0·405.

.. lb. avoird. to kilograms multiply by 0·454.

.. gallons to litres multiply by 4·54.

20. Other Foreign Weights and Measures.—

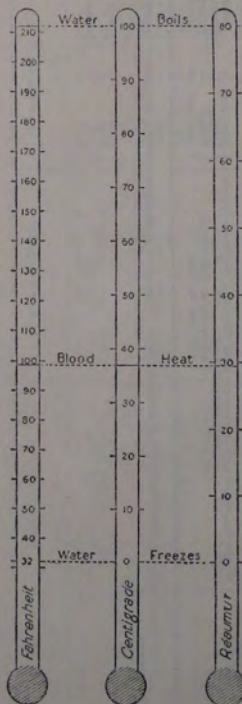
(1)	Measures of Length (2)	Measures of Weight (3)	Measures of Capacity (4)
Burma	1 Pulgat = 1 inch 1 Toun = 22 inches 1 Tain = 1069.44 yards 1 Dain = 2 miles (variable)	1 Mu = 50.4 Tr. gr. 1 Tikal = 252 1 Viss = 3.65 lb. av.	1 Salay = 1 pint 1 Sak = 1 gallon 1 Saik = 1 peck 1 Teng = 1 bushel
China	1 Ts'un = 1.41 inches 1 Ch'ib = 14.1 " 1 Chang = 141 " 1 Li = $\frac{1}{3}$ mile (app.)	1 Liang = 1.333 oz. av. 1 Chin = 1.333 lb. av. 1 Picul = 133.3 "	1 Ko = 2 pints (app.) 1 Shêng = 20 pints (app.) 2.735 gallons
Egypt	1 Pic = 29.53 inches 1 Qasaba = 3.8824 yards	1 Rotl = 0.9905 lb. av. 1 Oke = 2.7514 lb. av. 1 Kantar = 99.05 lb. av.	1 Kela = 0.454 bushels 1 Ardeb = 5.444 "
Japan	1 Sun = 1.193 inches 1 Shaku = 11.930 " 1 Ken = 5.965 ft. (= 6 Shaku) 1 Chō = 5.422 chains (= 60 Ken) 1 Ri = 2.44 miles (= 36 Chō)	1 Kin = 1.32 lb. av. 1 Kwan = 8.27 "	1 Gō = 0.316 pint 1 Shō = 3.16 pints 1 To = 3.96 gallons = 1.98 pecks 1 Koku = 39.68 gallons = 4.96 bushels
Malta	1 Piede = 11.166 inches 1 Canna = 2.283 yards	1 Libbra (12 Oncia) = 4886 Tr. gr. 1 Rotolo = 1.745 lb. av.	1 Pint = 0.8331 pint 1 Salma = 7.9372 bushels

Persia	1 Charak = 10 inches	1 Miskai = 71 gr. av.	1 Collothun = 1-809 gallons
	1 Zar = 40-95 inches	1 Seer = 0-162 lb. av.	Liquids are weighed, not measured
	1 Farsakh = 4 miles (app.)	1 Maun = 6-49 "	
		1 Kharrar = 650 "	
Siam	1 Niew = 0-83 inches	1 Tical = 15 gr.	See Note below
	1 Keub = 10 "	1 Chang = 2-675 lb. av.	
	1 Sen = 44-4 yards	1 Picul = 133½ lb. av.	
	1 Yote = 10 miles (app.)		
Turkey	1 Arshin = 26-75 inches	1 Oke (400 Drains) = 2-8326 lb. av.	1 Kileh = 0-9120 Imperial bushel
	The metric system is mostly employed. Roads and railways are marked in "kilometro."	1 Kantar (44 Okes) = 125 "	816 Kilehs = 100 Imperial quarters
		78 Okes = 100 kilos = 22-94 lb. av.	
United States ..	Weight, length and surface measures as in England; the metric system is also permitted		1 Pint (dry) = 0-9685 pint
			1 Gallon = 0-9685 gallon
		1 Short ton = 2000 lb. av.	1 Bushel = 0-9685 bushel
		1 Long ton = 2240 "	1 Pint (spirit) = 0-8331 pint
			1 Pint (beer) = 1-017 "

Note.—There are no standard weights and measures in Siam. Those given as measures of weight are commonly used by rice mill owners.

21. Thermometer.—

FIG. 27.

*NOTE*

To convert Centigrade or Réaumur degrees into Fahrenheit use formulae as follows:—

$$F = \frac{9C}{5} + 32$$

$$F = \frac{9R}{4} + 32$$

$$F = C + R + 32$$

$$\frac{F-32}{9} = \frac{C}{5} = \frac{R}{4}$$

Fig. 27 shows the respective values of the various thermometers.

22. *Currencies of British Dominions, Colonies, etc.—*

(The English equivalent at the par of exchange is shown, where possible, in parenthesis.)

ADEN.—Indian rupees (1s. 6d.).

AUSTRALIA.—Notes and coins of similar denominations to those issued in Great Britain.*

BERMUDA.—Same as Great Britain.

BRITISH GUIANA.—British and American coins and notes issued locally in denominations of \$2 and \$1 (\$4-86½ = £1).

BRITISH HONDURAS.—Local coins of similar denominations to those of the American coinage. American notes circulate freely (\$4-86½ = £1).

BRITISH NORTH BORNEO.—Same as Straits Settlements.

CANADA.—Notes and coins issued by the Dominion Government of similar denominations to those of the American currency (\$4-86½ = £1).

CEYLON.—Indian rupees (1s. 6d.), but subsidiary coins are in cents (1 rupee = 100 cents).

CYPRUS.—The monetary unit is the British sovereign, which is equivalent to 180 piastres (local coinage).

EGYPT.—The monetary unit is the Egyptian pound divided into 100 piastres or 1,000 milliemmes (97½ piastres = £1 sterling).

FALKLAND ISLANDS.—Same as Great Britain and notes issued locally.

GIBRALTAR.—Same as Great Britain.

HONG-KONG.—The monetary unit is the British silver dollar, but notes issued by the European banks are largely in circulation.*

INDIA.—Rupee notes and coins issued by the Government of India (1 rupee = 1s. 6d.).

IRAQ.—Same as India.

JAMAICA.—Same as Great Britain and notes issued locally.

KENYA.—The monetary unit is the silver shilling of 100 cents (20 shillings = £1 sterling). Notes and coins are issued locally.

MALTA.—Same as Great Britain.

MAURITIUS.—The Indian rupee (1s. 6d.) and notes and coins issued locally; the smaller coins being cents (1 rupee = 100 cents).

NEWFOUNDLAND.—Same as American currency. Notes and coins being issued by the Government and notes by the banks.

NEW ZEALAND.—Same as Great Britain. Notes and coins are issued locally.*

NIGERIA.—The West African florin (2s.). Notes and coins are issued by the West African Currency Board.

PALESTINE.—The Palestine pound = 1,000 mils = £1 sterling.

SHANGHAI.—Silver dollar is the currency, but the tael is the money of account. Notes and coins are issued locally.*

SIERRA LEONE.—Same as Nigeria.

SOUTH AFRICA.—Same as Great Britain. Notes and coins are issued by the Government.*

ST. HELENA.—Same as Great Britain. Both British and South African currency are legal tender.

STRAITS SETTLEMENTS.—The Straits Settlements dollar = 100 cents = 2s. 4d. Notes and coins are issued by the Government.

SUDAN.—Same as Egypt.

TANGANYIKA.—Same as Kenya.

TIENTSIN.—Silver dollar. Notes and coins are issued locally.*

UGANDA.—Same as Kenya.

* The rates of exchange vary.

APPENDIX VII

LIST OF AUTHORITIES TO WHOM INDENTS SHOULD BE ADDRESSED BY UNITS REQUIRING FOOD, STORES, ETC.

Requirements	Where to Apply	
	If on L. of C.	If with Field Troops
Ammunition	Nearest Ordnance Ammunition Depot	O.C. Amn. Company.
S.A.A.	"	O.C. Amn. Company.
Arms	Nearest Ordnance Depot	D.A.D.O.S. of Div., Corps or G.H.Q. troops.
Camp Equipment ..	"	"
Clothing	"	"
Disinfectants ..	Nearest Supply Depot	Supply Officer.
Equipment	Nearest Ordnance Depot	D.A.D.O.S. of Div., Corps or G.H.Q. troops.
Engineer Stores ..	Nearest Dump	C.R.E.
Explosives	Nearest Ordnance Ammunition Depot	O.C. Amn. Company.
Forage	Nearest Supply Depot	Supply Officer.
Fuel	"	"
Harness	Nearest Ordnance Depot	D.A.D.O.S. of Div., Corps or G.H.Q. troops.
Horses or Mules ..	Nearest Remount Depot	D. of Remounts or his representative.
Light (Candles, Oil *) ..	Nearest Supply Depot	Supply Officer.
Medical Comforts ..	"	"
Medical Stores ..	Nearest Hospital	A.D.M.S. "
Maps	General Staff	General Staff.
Men	A.G.'s Branch	A.G.'s Staff.
Money	Nearest Cash Office	Field Cashier.
Necessaries	Nearest Ordnance Depot	D.A.D.O.S. of Div., Corps or G.H.Q. troops.
Oil (for lubricating M.T. and A.F.Vs.)	Nearest Supply Depot	Supply officer.
Other lubricating oils ..	Nearest Ordnance Depot	D.A.D.O.S. of Div., Corps or G.H.Q. troops.
Ordnance Stores ..	"	"
Petrol	Nearest Supply Depot	Supply Officer.
Picketing Gear ..	Nearest Ordnance Depot	D.A.D.O.S. of Div., Corps or G.H.Q. troops.
Rations	Nearest Supply Depot	Supply Officer.
Saddlery	Nearest Ordnance Depot	D.A.D.O.S. of Div., Corps or G.H.Q. troops.
Signalling Gear (except Oil)	"	"
Soap	"	"
Stationery	Stationery Depot A.P. and S.S.	(If no Ordnance Officer available, Supply Officer.) Stationery Depot A.P. and S.S.
Tools	Nearest Ordnance Depot	D.A.D.O.S. of Div., Corps or G.H.Q. troops.
Veterinary Stores ..	R.A.V.C.	Veterinary Officer i/c of Unit, or nearest Veterinary Officer.
<i>R.A.S.C. stores, spare parts and materials for repair of M.T. vehicles.</i>		
R.A.S.C. Companies ..	Direct on M.T.S.D. ..	Direct on M.T.S.D.
Other Units with vehicles of R.A.S.C. responsibility	R.A.S.C. Company to which affiliated	R.A.S.C. Company to which affiliated.

* Includes oil and wick for signalling.

APPENDIX VIII

SHORTENED FORM OF SERVICE FOR THE
BURIAL OF THE DEAD

I AM the resurrection and the life, saith the Lord; he that believeth in me, though he were dead, yet shall he live; and whosoever liveth and believeth in me shall never die. *St. John xi. 25, 26.*

Psalm 23

Dominus regit me

The Lord is my shepherd; therefore can I lack nothing.

He shall feed me in a green pasture; and lead me forth beside the waters of comfort.

He shall convert my soul: and bring me forth in the paths of righteousness, for His Name's sake.

Yea, though I walk through the valley of the shadow of death, I will fear no evil; for thou art with me; thy rod and thy staff comfort me.

Thou shalt prepare a table before me against them that trouble me; thou hast anointed my head with oil, and my cup shall be full.

But thy loving-kindness and mercy shall follow me all the days of my life: and I will dwell in the house of the Lord for ever.

MAN that is born of woman hath but a short time to live, and is full of misery. He cometh up, and is cut down, like a flower; he fleeth as it were a shadow, and never continueth in one stay.

In the midst of life we are in death: of whom may we seek for succour, but of thee, O Lord, who for our sins art justly displeased?

Yet, O Lord God most holy, O Lord most mighty, O holy and most merciful Saviour, deliver us not into the bitter pains of eternal death.

Thou knowest, Lord, the secrets of our hearts; shut not thy merciful ears to our prayer; but spare us, Lord most holy, O God most mighty, O holy and merciful Saviour, thou most worthy Judge eternal, suffer us not, at our last hour, for any pains of death, to fall from thee.

¶ Then, while the earth shall be cast upon the Body by some standing by, he who conducts the burial service shall say,

FORASMUCH AS OUR BROTHER HATH DEPARTED THIS LIFE WE THEREFORE COMMIT HIS BODY TO THE GROUND; EARTH TO EARTH, ASHES TO ASHES, DUST TO DUST; IN SURE AND CERTAIN HOPE OF THE RESURRECTION TO ETERNAL LIFE, THROUGH OUR LORD JESUS CHRIST; WHO SHALL CHANGE OUR VILE BODY, THAT IT MAY BE LIKE UNTO HIS GLORIOUS BODY, ACCORDING TO THE MIGHTY WORKING, WHEREBY HE IS ABLE TO SUBDUCE ALL THINGS TO HIMSELF.

I HEARD A VOICE FROM HEAVEN, SAYING UNTO ME, WRITE, FROM HENCEFORTH BLESSED ARE THE DEAD WHICH DIE IN THE LORD: EVEN SO SAITH THE SPIRIT; FOR THEY REST FROM THEIR LABOURS.

OUR FATHER, WHICH ART IN HEAVEN, HALLOWED BE THY NAME. GIVE KINGDOM COME. THY WILL BE DONE, IN EARTH AS IT IS IN HEAVEN. GIVE US THIS DAY OUR DAILY BREAD. AND FORGIVE US OUR TRESPASSES, AS WE FORGIVE THEM THAT TRESPASS AGAINST US. AND LEAD US NOT INTO TEMPTATION; BUT DELIVER US FROM EVIL. AMEN.

Prayers

(i) O God, in whose embrace all creatures live, we beseech Thee for him (or them) whose every need Thou knowest.

Vouchsafe him (them) light and rest, peace and refreshment, joy and consolation in the ample folds of Thy great love; through Jesus Christ our Lord. Amen.

(ii) O Lord, support us all the day long of this troublous life, until the shades lengthen and the evening comes, and the busy world is hushed, the fever of life is over, and our work is done. Then, Lord, in Thy mercy grant us safe lodging, a holy rest and peace at the last, through Jesus Christ our Lord. Amen.

THE GRACE OF OUR LORD JESUS CHRIST, AND THE LOVE OF GOD, AND THE FELLOWSHIP OF THE HOLY GHOST, BE WITH US ALL EVERMORE. Amen.

(In the case of Roman Catholics, the form of service prescribed in the Roman Catholic Prayer Book should be used.)

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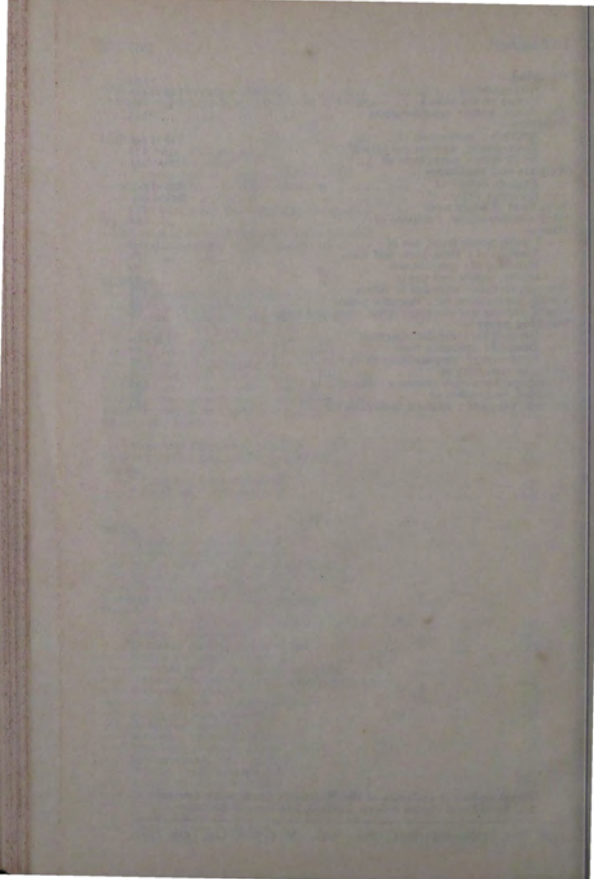
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