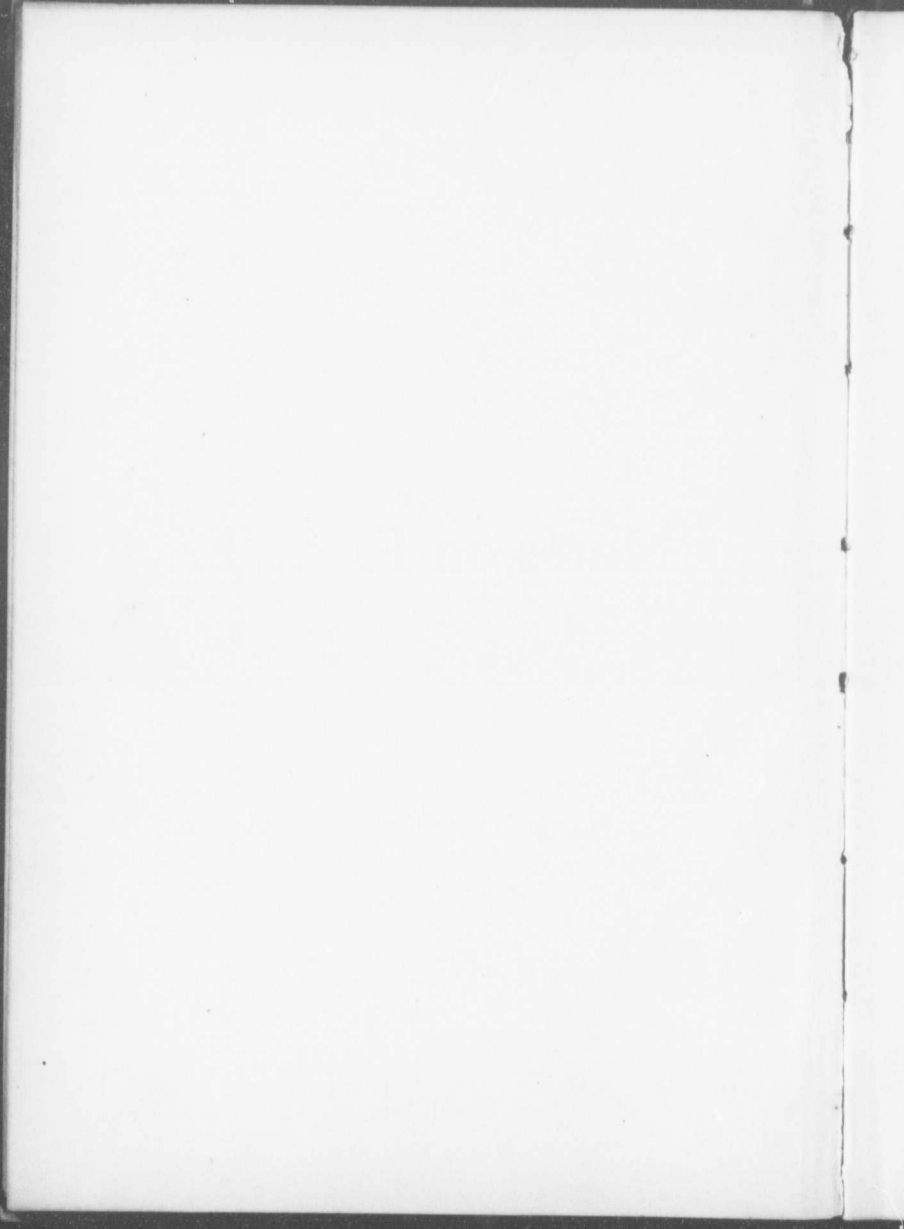


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NOTES ON
F. A. T.
COMPILED BY
OFFICERS 34TH BATTERY
C.E.F.

DDN 746517

Notes on F. A. T.



684

Notes on
Field Artillery Training

COMPILED BY THE
OFFICERS OF THE 34TH BATTERY,
C.F.A., C.E.F.

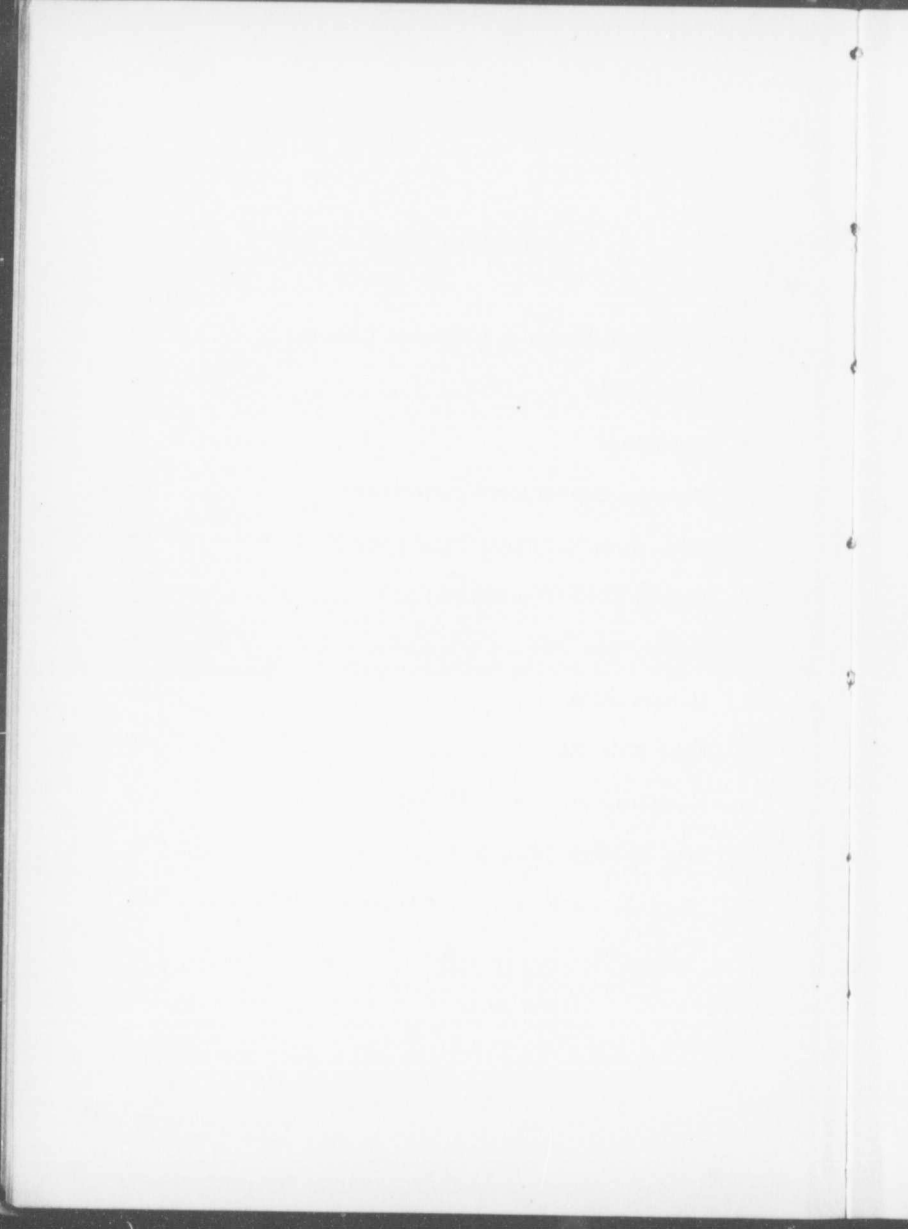
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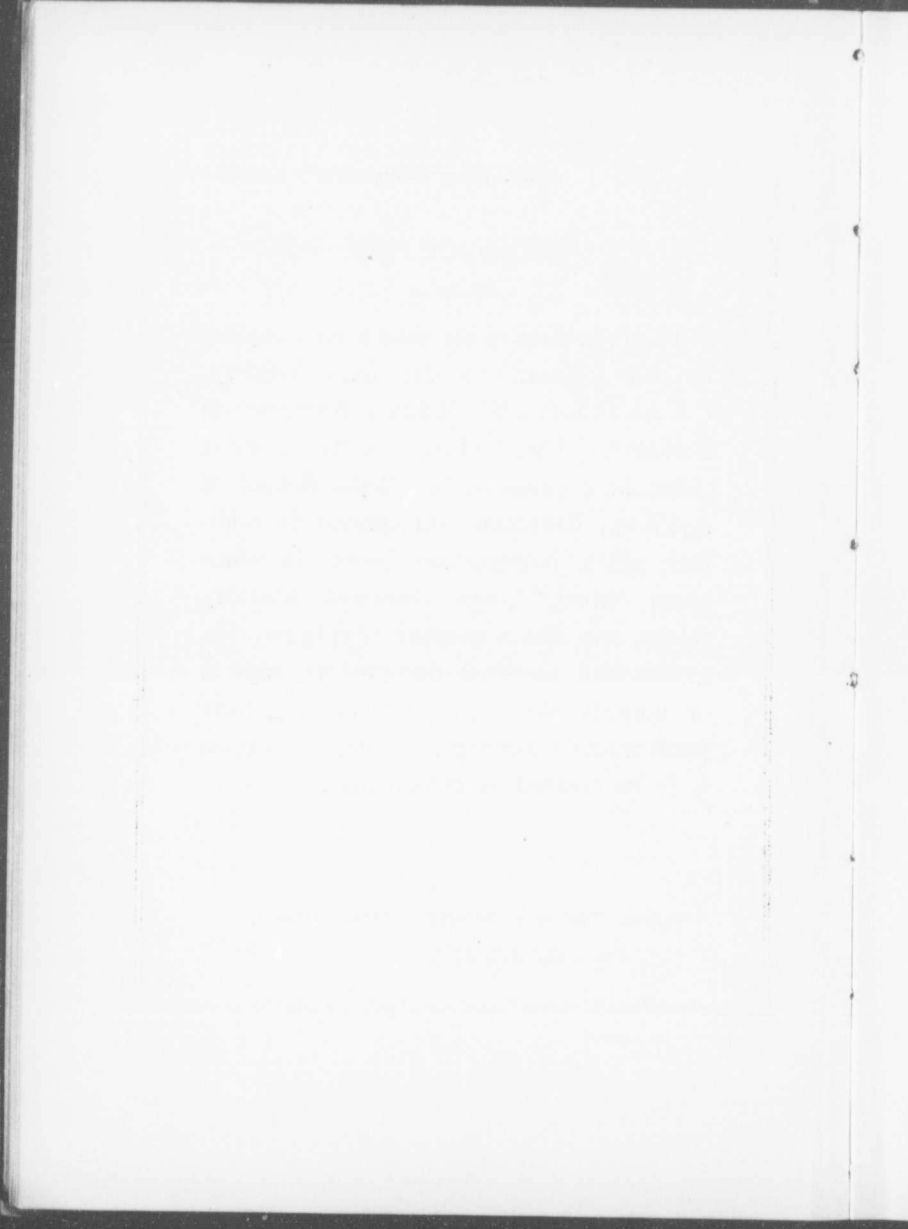
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INTRODUCTION

The following notes have been compiled by the officers of the 34th Battery, C.F.A., C.E.F. (9th Brigade Ammunition Column). They consist chiefly of notes taken at courses at the Royal School of Artillery, Kingston, but contain in addition much information taken, in some cases intact, from standard military works, and also a number of original diagrams and sketches designed to explain or amplify the text. Errors may have inadvertently occurred. The publication is to be treated as confidential.

Rideau Barracks, Kingston, Ont., Canada,
February 1st, 1916.



CHAPTER I

DISCIPLINE, DUTIES AND INTERIOR ECONOMY

References in K. R. & O. Canadian and Imperial

Discipline.

- K. R. & O. Canada, 1910, 342 to 377.
K. R. & O. Imperial, 431 to 462.
Arrest and Military Custody: Canada, 378-397. Imperial, 463-482a.
Investigation of Charges: Canada, 398-407. Imperial, 483-492.
Summary and Minor Punishments: Canada, 408-422. Imperial, 493-507.
Drunkenness: Canada, 423-426. Imperial, 508-511.
Fines for Drunkenness: Canada, 427-429. Imperial, 513.
Conduct Sheets: Canada, 1505-1512. Imperial, 1919-1922; 1924-1926.
Guard Reports: Canada, 1509-1510 and 378 and 735. Imperial, 463, 950, 954, 1923.
Disposal of Prisoners: Canada, 505-551. Imperial, 600-665.
Courts of Inquiry, Committees and Boards: Canada, 552-576. Imperial, 666-678.

Duties and Interior Economy:

- Duties of Subaltern: Canada, 68 and 70. Imperial, 114.
Responsibility for Public Money and Stores: Canada, 63. Imperial, 112 and 908-912.
Organization of a Battery: Lecture on Battery Organization and War Estimate of Canadian Militia: Imperial, 913-915.
Roster of Duties: Canada, 709. Imperial, 923-933.
Daily routine of Duties: Canada, 719-725. Imperial, 934-940.
Guards and Picquets: Canada, 726-739 and 408. Imperial, 493(V) and 941-954.
Honours and Salutes: Canada, 1370-1430. Imperial, 1775-1822.
Duties in aid of Civil Power: Canada, 740-756. Imperial, 955-975.
Enlistment: Canada, 242-255. No Imperial.
Officers' Messes: Canada, 837-923. Imperial, 1130-1167.
Sergeants' Messes: Canada, 924-939. Imperial, 1168-1172.
Men's Messing and Cooking: Canada, 940-943. Imperial, 1173-1179.

System of Keeping Battery Books, Accounts and Returns: Same as in ordinary business: cash books, check books and ledger.

Dress of Officers and Men: Canada, 1288. Imperial, 1688.

REFERENCES IN M. M. L.

- Crimes and Punishments: A. A., ss. 4-44.
 Redress of Wrongs: A. A., ss. 42-43.
 Powers of C.O.: A. A., s. 46.
- Familiarize yourself with the following points, especially with the references in K. R. & O. and M. M. L.
1. Powers of a commanding officer.
 2. Powers of O.C. of a detachment.
 3. Definitions and differences between various crimes that may come before an O.C. Battery, before taken to C.O.
 4. What is maximum amount of detention a commanding officer can award?
 5. To what award is an officer below the rank of a field officer limited?
 6. What award can a subaltern make?
 7. Has a soldier the right to elect after accepting award of C.O.
 8. When may extra guards and picquets be awarded?
 9. Can a N.C.O. below rank of sergeant be severely reprimanded?
 10. Can a N.C.O. be fined for drunkenness?
 11. Can a private be tried by C.M. for a simple drunk?
 12. What must accompany every commitment to a cure prison or a detention barracks?
 13. Has a C.O. power to alter record in record book after punishment has been completed?
 14. Definition of military discipline.
 15. Composition and power of Court Martial.
 16. Definition of and difference between Court of Inquiry and Board of Officers.
 17. How to make a summary of evidence.
 18. In the case of Court of Inquiry re injury to Militaires, does the Court give any opinion as to whether the man was to blame or not?
 19. Procedure when a soldier is brought up on a crime.
 20. Dismissal of charge.
 21. Regulations regarding defaulters using canteens.
 22. Instructions regarding venereal disease.
 23. Forfeiture of pay.
 24. What to do in case of a military disturbance outside barracks.

25. Who calls on Militia in case of riots, who is responsible for reading riot act, and who gives order to fire on rioters?

26. Duties of Section Commander and Nos. 1:—Orderly Officer, Orderly Sergeant, Sergeant Major.

27. Procedure when a man—

Reports sick;

Asks for an advance of pay;

Asks for extension of leave;

Asks for pass at unauthorized times; e.g., when the

O.C. Battery is away.

28. Procedure when an officer on leave is asked by men for passes or advance pay.

29. How a soldier is paid at home and on active service; how and to whom to make a requisition for cash, quittance rolls.

30. Crying down credit.

31. Method of supplying troops with food, forage, ammunition and stores in peace and war.

32. Procedure when a man requires new kit.

(a) Free issue.

(b) On payment.

(c) Where the payments appear on the Battery paylist.

33. How to keep a section store-book, and the procedure on handing over any stores or handing over completely.

34. How to take over a section from another officer.

35. Correspondence: to write and address official letter.

36. Forms: parade state, and regimental daily orders, parts I and II.

37. How to report sick; restrictions of an officer on the sick list; what to do when sick on leave.

38. Compliments to be paid to senior officers:

(a) When in command of men;

(b) When off duty.

39. How is a roster of duty prepared in the case of officers and privates?

40. What is expected of an officer who has been five years in the active Militia? (Cf. K. R. & O., Imp., 114).

TERMS OF ENLISTMENT IN CANADIAN MILITIA (K. R. & O. Can.)

Qualifications of recruits: medically fit; British Subjects; age, 18-45 years; minimum height, 5' 4"; minimum chest measurement, 34".

Period of enlistment: 3 years.

Men discharged (1) as unfit for further service, (2) for misconduct, (3) for bad character, (4) from regular army, Royal Marines, Royal Navy, Royal Navy Reserve, Territorial Force, Canadian Permanent Force, Royal North West Mounted Police, Royal Irish Constabulary,—cannot be enlisted.

Men who have previously served in bodies noted above must produce discharge papers.

Boys of good character, 14-18 years, may be enlisted as bandsmen, drummers, buglers, or trumpeters, but not without consent of parent or guardian.

OFFICIAL LETTER

From Prov. Lieut. W. S. Black,
201st Battery, C.F.A.

To The Gunnery Instructor,
Royal School of Artillery, H. & F.

Kingston, Ont.
April 1st, 1915.

Sir,

I have the honour to request that I may be granted leave from 12 noon on Monday, the 3rd inst., to reveille, the 6th inst., on urgent private affairs.

My address while on leave will be: c/o Ritz-Carlton Hotel, Montreal, P.Q.

I have the honour to be,

Sir,

Your obedient servant,

W. S. Black, Lieut.
201st Battery, C.F.A.

Leave

Prov. Lieut. W. S. Black,
201st Battery, C.F.A.

DEFINITIONS AND NOTES

Discipline:

A willing, prompt and implicit obedience of all ranks to superior authority charged with responsibility is the substance of true military discipline.

Courtesy is indispensable to discipline. Commanding officers should not only bear this in mind but they should

inculcate the principles into those in their command. Whenever it becomes necessary to check carelessness or neglect of duty, admonition or reproof (unless occasion demands public example) should be conveyed privately when practicable.

Commanding Officer:

The C.O. is the officer whose duty it is under the provisions of His Majesty's regulations, or, in the absence of such provisions, under the custom of the Service, to deal with a charge against a person, that is, to dispose of it on his authority. The term C.O. also, so far as relates to the summary award of any punishments of offences, being punishments which under the provisions of His Majesty's regulations an officer commanding a company, troop or battery is authorized to award, and so far as relates to a summary finding in a case of absence without leave, includes the officer commanding a company, troop or battery.

An officer commanding a detachment away from a station is invested with the same powers as a C.O. If that officer is below the rank of a Major his powers for punishment may be restricted, but he still has the power to give full punishment. If he does so he must report the same at once to the officer who restricted his authority.

ARRESTS.

There are two kinds of arrests, close and open. If **arrest** only is mentioned, it means close arrest, as when a man is placed under guard, picquet, patrol, escort or military police. The Commander of the guard cannot refuse to take a man into custody.

Open Arrest.

When a man is confined to barracks or camp until his case is tried; that is for minor offences.

Close Arrest.

When a man is placed in close arrest he should be accompanied by a charge report: if not, such report must be made and rendered as soon as possible.

Charge Report.

A charge report is a printed form, containing the name of the offence for which the man is placed under arrest, the date, man's name, the name of the person making the charge and the names of the witnesses.

Guard Report.

A guard report must contain the names of the men in close arrest.

In case of an Officer (Close Arrest).

Close arrest in the case of an Officer means confinement to his quarters; he is not to leave them except to take such exercises as the O.C. considers necessary.

In case of an Officer (Open Arrest).

He must not leave barracks or camp; the limits of his restricted space may be enlarged on the sanction of the O.C. He is not allowed to use his mess or any regimental institute and in cases of both Close and Open Arrest he is not to wear his sword, sash, belt or spurs. He may be directed to proceed from one station to another or may be permitted to leave his station for special purposes as decided by the O.C.

Release of an Officer.

The Officer who caused another officer to be placed under close arrest cannot release said officer without sanction of the highest authority to whom the case may have been referred, except when it is evident that the arrest has been made through error.

Release of N.C.O. and Privates.

The Adjutant is the only officer authorized to release a N.C.O. or a private.

Circumstances under which an Officer can be placed under arrest.

An Officer cannot be arrested on suspicion only. An officer who has been placed under close arrest and released cannot appeal to a Court Martial.

In the case of a N.C.O. or W.O. (Close Arrest).

In this case the N.C.O. or W.O. is confined to his quarters under the charge of another N.C.O. picket, patrol or sentry. When a N.C.O. is under close arrest, whether in the detention room or not, his name must appear on the Guard Report.

Soldier Placed Under Close Arrest.

In this case the soldier must be searched and deprived of all articles which he has in his possession. When arrested for drunkenness, he is also deprived of boots and cap, and

if possible placed apart from other prisoners and visited every two hours by a N.C.O. of the Guard and an escort to ascertain his condition.

A Bombardier under three years' service cannot place a man under close arrest without first obtaining the sanction of a senior N.C.O. He may act in an emergency and afterwards report it.

When a man is placed in close arrest, a written report should accompany the escort by whom he is taken to the guard room.

If no report appears against a soldier after he has been in close arrest for 24 hours, it is the duty of the Guard Commander to report same. After 48 hours, if no charge report is forthcoming, he is released by the O.C.

Desertion.

If a soldier confesses desertion, it is not necessary to place him under close arrest. Enquires should first be made and then if the circumstances warrant it he may be placed in close arrest.

A soldier under arrest when appearing before his O.C. must first be deprived of his cap or anything that can be used as a missile. A man in **close arrest** must not wear his spurs.

A soldier in close arrest confined to quarters is not required to fulfil any duties other than those which may be necessary to relieve him of any cash, stores or accounts of which he may have charge or be responsible for, or for the purpose of exercise. A prisoner in close arrest will bear arms in the line of march or in detention barracks for educational purposes by order of the O.C. The privilege of the mess or of any regimental institute is also forbidden.

Investigation of charges.

Investigation shall always be carried out before the Captain, who hears the evidence in the case in the presence of the prisoner, and if he does not deal with it, but decides to refer it to the O.C., he will not express an opinion as to guilt or innocence. The prisoner will be accompanied before the O.C. by the Captain so that he may speak for him or against him, as the case may be. The prisoner has the right to cross examine witnesses.

SUMMARY OF EVIDENCE IN THE CASE OF No. B42, Private Alfred Smith, 21st Battalion, a soldier of the Canadian Expeditionary forces.

No. 516, Sergeant G. E. Brown, "A" Co.,
21st Battalion, being duly warned, states:
At (Place) Kingston,
On (Date) May 1st, 1915,

I was

.....
(Signed) G. E. Brown, Sergeant.
(Witness' evidence is read over to him and
he signs it with rank.)

Having got all evidence down, the company, &c., commander must make the change as per examples in M.M.L., 660-676, Illustration of Charges. See sample charge sheet:

CHARGE SHEET

The accused, No. B42, Private Alfred (in full) Smith, 21st Battalion, a soldier of the Canadian Expeditionary Force, is charged with:

1st Charge: Shamefully casting away his arms in the presence of the enemy, in that he at Barriefield when on picquet duty shamefully cast away his rifle and ran away.

2nd Charge: Conduct to the prejudice of good order and military discipline in that he at Barriefield on May 1st displayed a white flag to the enemy without order from his superior officer.

Kingston, Colonel Com. 21st Battalion.
May 2nd, 1915.

To be tried by D. C. M., A. R. Booze, Brig-Gen., D.O.C., Winnipeg, May 5th, 1915.

Accused when all charges are read is asked to answer on each charge, "Guilty" or "Not Guilty."

SUMMARY AND MINOR PUNISHMENTS**Summary:**

An O.C. may inflict the following summary punishments subject to the soldier's right to be tried by D.C.M., and when an O.C. is going to award summary punishment, it is his duty to ask the private if he wishes to be tried by Court Martial. Whichever way he decides a soldier may change his decision within 24 hours. The punishments are as follows:—

28 days detention; but more than seven days cannot be awarded by an officer below the rank of field officer except in cases of absence without leave exceeding 7 days, the days of detention in such cases to be extended to the same number of days as the days of absence, not exceeding 21 days altogether.

Forfeiture of Pay:

A soldier loses a day's pay for six hours' continuous absence. In the case of absence without leave the O.C. will inform the soldiers of the number of days pay he forfeits.

Fines for Drunkenness.

A commanding officer may, in case of an offence of drunkenness, order the offender to pay a fine not exceeding \$6.00, either in addition to or without other punishment, and the amount of the fine in each case shall be according to the following scale:

(a) For the first offence of drunkenness during a soldier's service, there shall be no fine.

(b) For the second offence, fine shall be \$2.00.

(c) For the third and every subsequent offence, the fine shall be \$3.00; but if the third or any subsequent offence occurs within six months of the last preceding offence, the fine shall be \$5.00 and if within three months, \$6.00.

Time during which a soldier is absent from duty by reason of imprisonment, detention or absence without leave is not to be reckoned within the above periods.

(d) A soldier should not be fined for drunkenness when unpaid fines amount to \$10.00.

Minor Punishments.

An O.C. can award the following punishments, soldiers having no right to appeal:—

1. Confinement to barracks not exceeding 14 days.

2. Extra guards or picquets for irregularities on duty; in case of a N.C.O. severe reprimand, "reprimand and admoni-

tion." More than seven days' punishment will not be awarded in addition for minor offences.

Detention up to seven days is awarded in hours, over that in days. Time commences from date of award. When an award includes detention and a minor punishment, the latter will begin at the termination of the former. When detention exceeds seven days, a minor punishment must not be given in addition.

A single award of punishment does not exceed 14 days except in case of absence without leave.

When soldiers are undergoing detention from award, further punishment commences from date of award, but must not exceed 28 days in all.

When a soldier is to be tried by Court Martial for drunkenness on duty when it is more than his fourth offence in twelve months or when his fines exceed \$10.00 on duty or active service, the charge is called "on duty."

N.C.O.s cannot be awarded punishment of detention (except in the case of a corporal who may have been reprimanded and admonished), unless it is for the purpose of making an example.

What is C.B.?

When a man is sentenced to any number of days C.B., he is to remain in barracks when he will be required to answer to his name at uncertain times and will perform all fatigue duties with a view to relieving well conducted soldiers. All fatigue work is reserved for defaulters. When there is not enough fatigues to keep the men fully occupied, the O.C. may order them to attend fatigue drill, but not after completing ten days' punishment. Punishment drill or fatigue drill is never to be more than one hour's duration at any one time. It will consist of marching only, and not of instructions and will not be carried on during Sunday. The ordinary pace of quick time will not be exceeded except during very cold weather when it may be done for short periods. In the case of a mounted unit defaulters' drill cannot be carried out more than two hours a day and in infantry and dismountable corps for more than four hours a day.

General Court Martial.

The President must be a field officer, a colonel if possible. There are five members besides the president. The length of service of the members must be not less than three years. Its power is death and all lesser sentences. It is convened by warrant of the King or general officer commanding.

District Court Martial.

Its president is to be a field officer. A Captain may preside when a field officer is not available. The length of service of the members must be not less than two years; the number of members is three, including the President. Powers of punishment are two years with hard labor and all lesser sentences. It is convened by the general officer or other officer having a warrant to convene a Court Martial.

Field General Court Martial.

A G. C. M. may be ordered, convened and completed in a half hour. As it is used only when troops are in the field, it is solely within the jurisdiction of the O.C.

N.C.O.'s to the rank of corporal cannot be tried by any court under D.C.M., except when a D.C.M. cannot be assembled.

Procedure for holding C.M.

The man to be tried by C.M. is taken before his O.C. A summary of evidence is taken by an officer who is not likely to sit in the Court. It is usually the Adjutant, as he attends all O.C.'s as prosecutor.

The summary of evidence is taken in writing before the accused and afterwards attached to the charge sheet for signature. It can be taken on oath or not, as the accused desires, and he is at liberty to question or cross-question any of the witnesses whose depositions appear in the summary of evidence. The man must be examined by a Medical Officer and the Medical Officer's certificate attached to the charge sheet. He is to be examined medically on the morning of each day.

Example:—A man attempts to strike a N.C.O. It is the Adjutant's duty to see under which clause of the Army Act that offence would come. Viz:—Contempt of Military Discipline. All this appears on the charge sheet. The fact that a C.M. is to sit appears on Daily Orders. The man to be tried by C.M. is medically examined to make sure that he is fit to appear before a C.M. and, especially, that he is in possession of all his mental faculties. The accused is given a written copy of the charge against him, this copy being furnished by the Adjutant. The O.C. sits at the appointed time and the Adjutant must be present when the sentence is given. Proceedings of Courts Martial are kept secret by those present. Prisoner is allowed to make any statement relative to the case for which he is being tried. After he has been sentenced he is taken to the guard room. A record of the whole

proceedings is forwarded to the D.O.S., who confirms them, or he may remit some part of the sentence. The prisoner is then read out before all ranks, but a N.C.O. is not read out unless for the purpose of example, and even then not before anybody below his own rank. All papers in connection with the case are then forwarded to the Judge Advocate at Headquarters.

A man sentenced by an O.C. does his punishment in most cases in a Military Prison, but often after being sentenced and read out, a man does his time in a Civil Jail under Civil authorities.

Defaulters.

Defaulters are excluded from the Canteen except during one hour each day, said hour to be set by the O.C.

Men in Hospital.

Men in hospital, except those on light duty, are excluded from the canteen unless they can produce a certificate from the M.O. permitting them to use it.

Men on Pass.

It is the duty of all officers, W.O.s and N.C.O.s to report all irregularities or misdemeanors of a soldier on pass or furlough to the man's O.C., whether the man belongs to his own corps or not.

DUTIES AND INTERIOR ECONOMY

Commanding Officer.

An O.C. is responsible for the maintenance of discipline, efficiency and proper system in the unit under his command. He should possess a thorough and practical knowledge of Military Law and of all rules and military regulations. He should encourage by example the energetic discharge of duty. He shall endeavor to maintain a good understanding in all ranks and prevent disputes. He shall discountenance any disposition in his officers to gambling, drinking or extravagance, and whenever any serious cases arise requiring his intervention, he is to record the manner in which they are disposed of, and submit the same at the next inspection of his command. He shall pay particular attention to the health of his troops and the preservation of same. He shall take measures to ensure proper sanitation to be in effect. This last comes under the immediate supervision of the Medical Officer, who supervises everything in this connection, and he incurs grave responsibility if this matter is neglected.

O.C.s are held responsible for public equipment and stores of whatever description in their charge, and they supervise and control all duties performed by those under their command. They are also responsible for all issue and receipt of supplies, also that an officer be detailed daily for the duty of inspecting rations both as to their quantity and quality, to ensure that both horses and men receive that to which they are entitled. Whenever armed parties are called out for any unusual duties it is the duty of the O.C. to make sure that all officers are acquainted with all orders. The O.C. must see that all orders and information issued are published for the information of all ranks in Daily Orders, if this information concerns the unit under his command.

The O.C. is responsible for the proper application of all funds.

The O.C. is responsible that his officers are thoroughly instructed in all professional duties and prepared for promotion. He shall bring to the notice of the inspecting officer any officer who may show special proficiency in the discharge of his duty.

The O.C. will see that a definite system or chain of responsibility extends from the lowest to the highest grade.

Adjutants.

An Adjutant is an officer appointed to act as the O.C.'s staff officer in the execution of the O.C.'s duties in training and administering the Battery. He should be of superior intelligence and strength of character, energetic, capable of hard work, and a good horseman. His duties are to draft for the O.C.'s approval and promulgate regimental orders; take charge of all books and documents in the Orderly Room, be responsible that they are properly kept in accordance with the Regulations, and that no unauthorized persons have access to them. He shall supervise the daily routine of administration. He shall supervise the manner in which N.C.O.s perform their duties and exercise special supervision over Orderly Room clerks, drummers and trumpeters. He shall inspect all guard parties and detachments detailed for duty, giving in all cases the O.C.'s instructions as to the duties to be performed.

He shall supervise the Duty Roster. He shall examine and check all returns before submitting them for the information or signature of the O.C. He shall see that all books of reference are kept in the Orderly Room and kept posted to date as to all charges.

Quartermaster.

The Quartermaster is responsible to his Commanding Officer for the cleanliness of the camp, quarters, or barracks. He attends to the billeting of the men and to the laying out of the camp, and superintends the loading and conveyance of the baggage of his corps when on the march. He also receives all forage, rations, and stores of every description belonging to the corps, and issues them according to Regulations. He is also responsible for the proper keeping of the quartermaster's books.

Section Commander.

A Section Commander is responsible to the Captain for his section and everything connected with it: discipline, equipment, cleanliness, efficiency, stable economy, etc. He must have a squad book containing all the useful information he can gather about his section—nominal roll of men with notes as to their character, age, service, abilities, fitness for promotion, etc.; list of horses with their numbers, sufficient description to distinguish them, notes as to their characteristics, capabilities, place in team, etc. He should inspect the quarters of his men and attend stables every day.

Battery Sergeant Major.

The B.S.M. is the connecting link between the O.C. and the N.C.O.s and men, and assists the O.C. in everything concerning the duties and discipline of the battery. He should be an example in every way—a good instructor, full of energy and vim, and a firm disciplinarian. He should make himself personally acquainted with the abilities of the N.C.O.s and men. He attends all parades, supervises the work of the Battery Orderly, and in general the work of the other N.C.O.s.

Battery Orderly.

He is detailed weekly. He attends all parades, attends the Orderly Officer on his rounds, calls the roll at lights out, collects reports from Nos. 1, and reports to the Battery Sergeant Major; makes out the morning states, sick and prisoners' reports, and takes them with the passes to the Battery Sgt. Major at 8 a.m. daily.

He shall give a list of defaulters, men attending hospital or convalescent, to the N.C.O. on guard, Regimental Military Police and Canteen Orderly. He shall parade the sick and offenders for medical inspection and bring them before the

Batt. Sgt. Mjr. He shall report all men admitted to or discharged from hospital, absent without leave, or proceeding on leave, to the Battery Q.M.S.

He shall post all orders in the appointed place, and warn all N.C.O.'s and men for such special duties, fatigues and parades as may be required. He shall march offenders to the Orderly Room at office hour, deliver passes to the N.C.O. of the guard with a list of men on pass.

He shall not leave the barracks during his term of duty. The handing over of his duties to the relieving Orderly is done under supervision of the Battery Sgt. Major, who must see that the new Battery Orderly's book is entered up to date.

Quartermaster Sergeant.

The Q.M.S. is the immediate assistant of the Quartermaster, being responsible for stores, harness, clothing and accoutrements in the Battery stores. He compiles pay sheets, daily ration indents, etc. He must render monthly returns. All his duties are in connection with the interior economy of the Battery.

Sub-section Sergeant (No. 1).

The No. 1 of a sub-section is immediately responsible to the Section Commander that the arms, accoutrements, appointments, guns, horses, stable kits, men's kits and necessities, and everything under his charge are complete and in the best possible order. He should keep a squad book for his subsection containing the same information as the Section Commander's book.

Nos. 1 are responsible that the beds, kits, etc., are put up in proper manner; that the men change their underclothing at least once a week; that their hair is cut according to regulation; that they are clean in person; and that no bad language is used in either rooms or stables. They must make themselves acquainted with the character and abilities of their N.C.O.s and men, and take every opportunity of instructing the young N.C.O.s and men in their duties. They must be particular that they on no account associate or drink with the men, as such conduct tends to weaken their authority.

Nos. 1 are responsible that the arms, accoutrements, clothing and bedding of every man going into Hospital, Prison, or in any way becoming non-effective, are immediately taken account of and turned into stores.

Orderly Officer.

The Orderly Officer is on duty from reveille to reveille, and must not leave barracks during his tour of duty. He takes all parades, including stables; inspects rations for both men and horses, both as to quantity and quality; inspects all parts of the barracks or camp (including guard room with prisoners) for cleanliness, etc., where necessary inquiring if all is correct, and if there are any complaints; inspects and mounts the guard and stable picquet; inspects the guard and sentries once by day and once by night; inspects the stables or horse lines once by night; receives the Tattoo Report and hands it to O.C. together with his own report before 9 o'clock next morning. In case the Adjutant is temporarily absent the O.C. is acting Adjutant.

DRESS

O.C.s are forbidden to authorize any deviation from the sealed pattern of dress, clothing, equipment and badges. The dress and appearance of soldiers should always be such as to create respect for his military service. A soldier shall not leave his barracks or camp unless he is properly dressed and shall not smoke on the street when on duty.

Forage caps shall be worn evenly on the head and the hair shall be kept short. The chin and the underlip shall be shaved but not the upper lip, and if whiskers are worn they shall be of moderate length.

Equipment must be worn over the great coat. Officers shall always appear in great coats when men parade in them.

O.C.'s may allow great coats to be worn when necessary. Glasses may be worn by all ranks on or off duty.

ADDITIONAL NOTES FROM N.C.O. COURSE

1. What are the rules with regards to saluting officers?

Warrant O.s, N.C.O.s and men shall salute all commissioned officers whom they know to be such whether dressed in uniform or not.

2. How do individual troops act when passing a column of troops on march?

They shall salute the commanding officer and also the colours if uncased.

3. What are the rules as to addressing a Warrant Officer?

N.C.O.s and men shall address W.O. as they would officers, but do not salute them.

4. Are soldiers forbidden to take part in political meetings?

Yes. They are forbidden to institute or take part in any meeting, demonstration or discourse in barracks, quarters, camp or vicinity, and under no circumstances, wherever they may be held, are they to attend in uniform.

5. Is gambling forbidden?

Yes, strictly so, even with matches, buttons, etc., which go to represent money.

6. How should an N.C.O. act when he has occasion to confine a soldier?

He should invariably obtain the assistance of two or more privates to conduct the offender to the guard room, and should not, except in unavoidable circumstances, personally come in contact with the prisoner.

7. Does a soldier remove his headdress in Civil Court?

Yes, when the Judge or Magistrate is present, except when on duty, under arms or in escort.

8. Does seniority or qualifications alone entitle N.C.O.s to right of promotion.

Seniority alone can never give a N.C.O. right of promotion. When a N.C.O. is discovered to have become careless, negligent, or indifferent in the discharge of his duty, whatever his rank or service, it may be taken away, and he can expect no preference.

9. Do guards present arms to armed parties?

Not unless they are armed corps. To other parties, they stand with sloped arms.

10. Define an Armed Corps.

1. A Regiment of Cavalry.
2. A Battery of Artillery with guns.
3. A Brigade of Artillery without guns.
4. Garrison Artillery of not less than two companies.
5. A Battalion of Infantry with or without its colours.

EXTRACTS FROM "WHAT EVERY SOLDIER OUGHT TO KNOW."

The object to be aimed at in the training of a soldier is to make him, in mind and body, a better man than his adversary on the field of battle. **Fitness for war** is the only thing that counts, and every soldier should school himself to keep this constantly in his mind. **His first duty is to acquire a soldierly spirit.** This will help him to bear fatigue, privation, and danger cheerfully, will give him confidence in himself, his officers,

and his comrades, and will produce such a high degree of courage and disregard for self that, in the day of battle, he will use his brains and his weapons coolly and to the best advantage. The soldier must learn to be proud of his profession and particularly so of his own regiment or corps.

On enlistment every soldier swears to bear true allegiance to His Majesty the King, and to obey the lawful commands of the officers set over him. This is not an empty form, but a solemn oath, which can never be broken or forgotten without disgrace. By taking the oath of allegiance, a man binds himself, of his own free will, to submit to military discipline.

Discipline is the living force which turns a crowd of men into an army. It is absolutely necessary for the efficiency, safety, and comfort of all ranks. The essence of discipline is instant and cheerful obedience, not only to commands given by word of mouth, but to all rules and regulations duly issued by proper authority. Soldiers will be held personally responsible that they make themselves acquainted with such orders and details of duty as are posted in quarters.

True discipline consists not only in obedience to military law, but in the formation of a habit of mind which is best described as the soldierly spirit.

The manner in which a soldier should proceed to obtain redress for any grievance under which he considers himself to be suffering is laid down in the Army Act and, briefly stated, is as follows: If any soldier thinks himself wronged in any matter by any officer (other than his captain) or by any soldier, he may complain thereof to his captain, and if he thinks himself wronged by his captain . . . he may complain thereof to his commanding officer, and if he thinks himself wronged by his commanding officer . . . he may complain thereof to the prescribed general officer. . . . Should a soldier wish to bring a complaint to the notice of an officer he should do it personally and not in writing. A soldier desirous of addressing an officer must always be accompanied by a non-commissioned officer.

Anonymous complaints and "round robins" are strictly prohibited.

When a soldier is unwell and wishes to go to hospital at any other than the usual time, he reports his wish to the orderly sergeant of his company, who sees that the man is taken to hospital.

Soldiers must salute all commissioned officers whom they know to be such, whether in uniform or not. The compliment of the salute is due, not to the individual officer, but to the chain of command which he represents. Saluting may seem

of small military importance, but experience has proved that the maintenance of discipline demands the observance of this rule. The badges of rank of commissioned officers are as follows:

2nd Lieut., a star; Lieutenant, two stars; Captain, three stars; Major, a crown; Lt.-Colonel, a crown and a star; Colonel, a crown and two stars; Major-General, crossed sword and baton with a star; General, the same with crown and star; Field-Marshal, crossed batons in a wreath with one crown.

All persons belonging to or employed by the Army are required to give every assistance to the Military Police. Provost and Assistant Provost Marshals wear a badge marked P.M. or A.P.M. on the left arm; Military Policemen a badge marked M.P. on the left arm.

A soldier on furlough who requires medical aid should apply to the nearest military station. Only in cases of emergency or when a soldier unfit to travel resides at a distance from a military hospital may he apply to a civil practitioner.

The second most important point in the education of the soldier is **the training of his body.**

Fitness includes strength, activity both of mind and muscle, and good health. Every soldier must possess these three qualities or he will not be able to resist fatigue and privation. Strength and activity will be developed by the courses of physical training and drill prescribed for the Army, but the preservation of health depends mainly on the soldier himself.

Given the knowledge as to what is right, every man must stand or fall by his own actions.

The best method of improving the wind is progressive running work in the open air. Smoking on the march is bad for the heart and injures the wind. It is a good plan to raise the feet when resting during a halt.

Health and Disease. A sick man is not only a rifle lost to the firing line, but an actual encumbrance requiring special food, housing and transport. It is a fact that the risks which are run on active service are almost always greater from disease than from the enemy's bullets. The cure of disease is the business of the medical officers, but its prevention is largely within the power of the individual soldier, and the study of sanitation and the preservation of health is incumbent on all ranks.

To avoid chills, which often lead to serious trouble, care should be taken to keep the loins as dry as possible, and men should remember that damp cold is far more dangerous than dry cold. It is better to keep up the circulation of the blood by stamping the feet and swinging the arms than to take

alcohol, which diminishes the power of the body to resist cold. Don't sit on anything damp if you can help it.

To prevent frost-bite, wash the feet with soap and then smear them over with oil or some greasy substance. Tight boots, breeches, and putties impede the circulation and should be avoided. As soon as a man feels that he is frost-bitten he should rub the part at once until the colour returns (using snow for the purpose if possible). On no account should he warm the part near the fire.

A hungry man suffers from cold more than a full one. On service each man carries an emergency ration for use in extreme necessity; this must never be touched unless no other ration of any kind is available: and then only by order of a commander.

DIGGING-IN

Entrenching tools must be kept sharp and clean and firm in their sockets. The pickaxe should be worked from front to rear, not sideways. Lift the pick well above the head with both hands. The helve should slide easily through the hand nearest the pick head, and full advantage should be taken of the weight of the tool. In using the shovel the thigh should be employed to assist in thrusting it under the earth which has been loosened by the pick. Throw the earth without a jerk, the hand nearest the blade sliding freely up the handle.

To afford protection against rifle fire, earth should be at least $3\frac{1}{2}$ feet thick, that is to say about the length of the service rifle.

SCOUTING SENTRIES, AND NIGHT WORK

Every soldier ought to have **initiative**, that is to say, the power to act for himself when the necessity arises. This quality is absolutely necessary when he is employed on scouting. The scout fights with his head rather than with his hands. He will often have to work alone at night, and his responsibilities are greater than those of a man in the ranks. His sight and hearing must be keen, his head cool, and he must be able to put two and two together. Power to see in the dark improves with practice, and listening can also be practiced with advantage. A sheet of paper shaped like a funnel makes a useful ear-trumpet.

Before starting out on scouting duty make sure that you understand your orders and repeat them over to yourself in your own words to fix them in your memory. Try to find out all you can over and above your orders, and report anything that you think may be important.

A scout should make a habit of observing the points of the compass. This knowledge will generally enable him to travel in the right direction; without it he may fall into the hands of the enemy or wander round in a circle. The following points should be remembered:

In marching on a star don't choose one too low on the horizon. In spring and autumn the sun rises in the East and sets in the West. In summer it rises north of East and sets north of West. In winter it rises south of East and sets south of West. In Europe the sun is always South at mid-day. When facing North the East is on your right hand. The moon also travels from East to West rising about one hour later each day. The Pole Star is very nearly due North at all times of the year. To find the Pole Star first look for the Great Bear. This constellation consists of seven visible stars, five of these stars are in a curved line, the other two point in another direction. Follow this direction with your eye and the first star you come to is the Pole Star. In Northern Europe the Pole Star is never low on the horizon. The printing on an Ordnance Map reads from West to East and consequently the side margins (from top to bottom) point from North to South. The proportion between a map and the country which it represents is known as "the Scale" of the map. Thus if a map is drawn on the scale of an inch to a mile it simply means that each **inch** of paper corresponds to **one mile** of country. Similarly the half-inch scale means that each **half-inch** of paper corresponds to **one mile** of country.

A halfpenny is just one inch across, therefore on a map drawn at a scale of one inch to a mile the distance between two places the width of a halfpenny apart would be exactly one mile, and so on all over the map.

A kilometre is a little less than two-thirds of a mile. That is to say, 3 kilometres are equal to about 2 miles.

The direction of the wind should be noted. This precaution will often assist a man in finding his way. To test the direction of a slight breeze, lick the inside of the wrist and hold it above the head.

To find your way back over the same path in the dark, pieces of paper pinned to the ground with bits of stick at regular intervals may prove a useful guide.

When scouting be careful to avoid exaggerating the strength of the enemy. This is a common fault.

200 Infantry in fours. }
 20 Cavalry at a walk } pass a given point
 5 Artillery Guns or Wagons at a walk... } in one minute.
 Cavalry raises a high light cloud of dust.

Infantry and vehicles a lower, denser cloud.

Motor-cars a thick, high, and continuous cloud.

Objects are more easily discernible when the moon is behind the scout than when it is in front of him.

A scout may stand when there is a background behind him and lie down when there is not. It is easier to hear sounds on soft ground when standing, on hard ground when lying flat. Scouts only use their rifles in self-defence. In sending written messages, the place, time, and date of dispatch should be clearly stated, and the name, rank, and regiment of the sender signed in the right-hand bottom corner. Names of places and persons will be written in block capitals, e.g. **LONDON**, and should be spelt exactly as given on the map. Words which have no exact meaning, such as big, small, before, behind, dusk, dawn, &c., must not be used. The right and left banks of a river are those so situated when the observer is looking **down stream**. If captured a scout should refuse to give any information beyond stating his rank and name. By the laws of war he cannot be punished for this refusal.

SENTRIES

Sentries are look-out men posted to give timely notice of the movements or approach of an enemy. The first duty of a sentry is to see without being seen. He must not move about, nor should he lie down unless ordered to do so. Anything approaching drowsiness must be resisted with the greatest determination. A sentry who sleeps on his post commits a capital military crime, which is punishable on active service by death and at other times by imprisonment.

Darkness is the situation most favourable to vivid imagination. Sentries should therefore be on their guard not to give way to the impulse of the moment and must exercise the greatest self-control. Individual firing into the dark at snipers is forbidden. A sentry will immediately warn his group of the approach of any person or party. To make the voice carry, place the hands each side of the mouth, palms inwards. Do not throw back the head, but direct the voice to a point on the ground halfway between yourself and the man with whom you wish to communicate.

A sentry ought to know these nine points:

- (1) The direction of the enemy.
- (2) The extent of the front he has to watch.
- (3) The number of his post.
- (4) The situation of the sentries on his right and left.
- (5) The number and situation of his picquet and the best way to it.

- (6) The situation of any detached or examining post.
- (7) The names of villages, rivers, &c., in view and the places to which the roads and railways lead.
- (8) Whether any scouts or patrols are likely to return near his post.
- (9) The countersign.

A soldier may not take off any article of clothing or accoutrement whilst on guard or sentry.

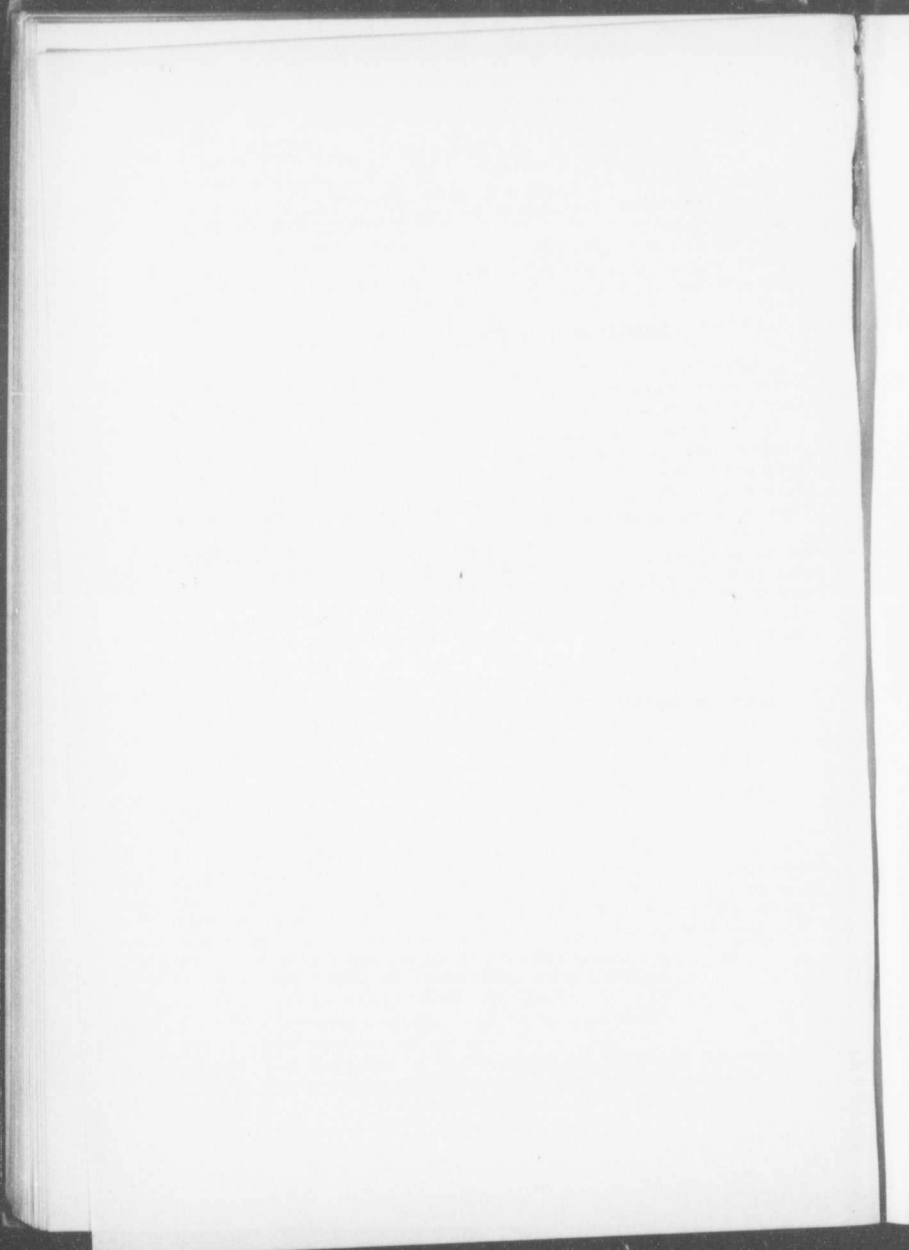
LORD KITCHENER'S MESSAGE

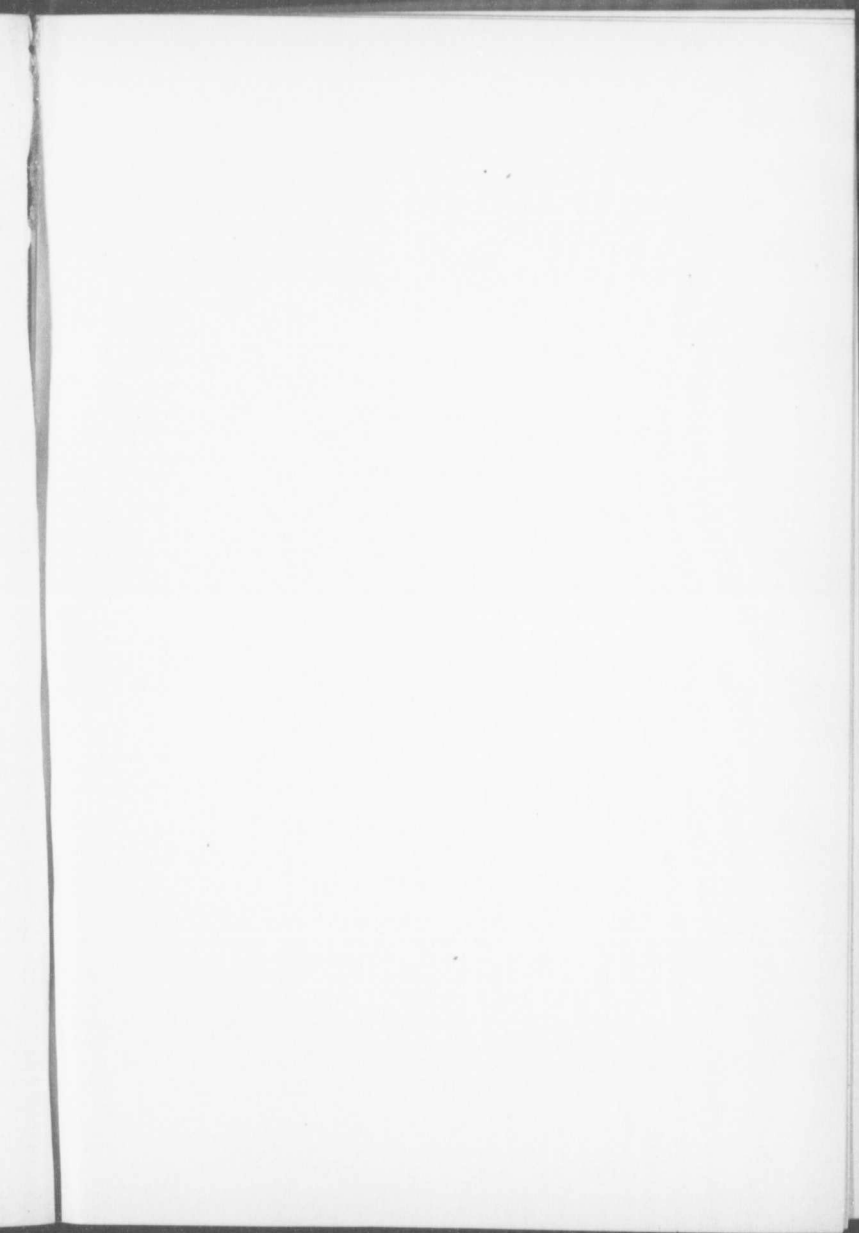
Finally, as a general guide to conduct you cannot do better than learn by heart the message which Lord Kitchener sent to the men of the Expeditionary Force:

"Be invariably courteous, considerate, and kind. Never do anything likely to injure or destroy property, and always look upon looting as a disgraceful act. You are sure to meet with a welcome and to be trusted; your conduct must justify that welcome and that trust.

Your duty cannot be done unless your health is sound. So keep constantly on your guard against any excesses. In this new experience you may find temptations both in wine and women. You must entirely resist both temptations, and, while treating all women with perfect courtesy, you should avoid any intimacy.

Do your duty bravely,
Fear God,
Honour the King."











CHAPTER II

AMMUNITION.

SERVICE EXPLOSIVES

Are divided into TWO classes:

CLASS 1: PROPELLANTS,

1. Cordite.
2. Cordite, M.D.
3. Ballistite.
4. Gunpowder.

CLASS 2: DISRUPTIVES,

1. Guncotton.
2. Lyddite in high E. shell.
3. Dynamite.
4. Gelignite.
5. Blasting Gelatine.
6. Fulminate of Mercury.
7. Tri-nitro-Tolnene.
8. Gun Powder.
9. Nitro Glycerine.

The rate of burning of explosives is determined by two things: 1st, pressure; 2nd, area of surface exposed.

Q. What is the difference between explosion and detonation?

A. Explosion is a rapid rate of combustion from outside inwards, as in cordite. Detonation is instantaneous combustion throughout the mass, as in lyddite.






GUNPOWDER

Is a mechanical mixture of:

	(Explosive)	(Fuel)	(Igniter)
	SALTPETRE	CHARCOAL	SULPHUR
Black G.P.	75%	15%	10%
Brown G.P.	79%	18%	3%
Sulphurless G.P.	70%	30%	

All powder contains between .8 and 1.5 moisture.

All gunpowders are made in different shapes, thus:

- 1st.  Prism, ½" diam., 1" depth.
- 2nd.  Pebble, ½" cubes.
- 3rd.  Mealed.
- 4th.  L.G. and F.G.
- 5th.  Mixture of Pebble and F.G.

CHARACTERISTICS AND PROPERTIES OF GUN POWDER:

1. It ignites between 440 and 600 Fahrenheit.
2. It ignites by blow or friction.
3. It stands any climate well.
4. It is damaged by contact with damp or water.
5. It is damaged by contact with metal.

USE OF GUN POWDER:

1. As blank charges.
2. As igniter of cordite cartridges.
3. As bursting charge of shell.
4. In fuses and tubes.
5. In quickmatch and in cap composition.
6. For blasting purposes.

Q. Why is G.P. used as a bursting charge in shrapnel?

A. To enable the B.C. to observe by the smoke the effect of the burst of shrapnel.

CLASSIFICATION:

1. Service powder as igniter for cordite cartridges.
2. Blanks.
3. For filling shell.

PACKING:

The prism in zinc-lined covers known as: "Cases Pdr. 100 lbs."

All others in barrels, 100 lbs. each, known as whole barrels, and also 10 lb. bags, which are placed in metal lined case in barrels.

STORAGE:

Two kinds, according as to whether wet or dry pdr.:

	Group:	Div.:
Dry	1	1B
Wet	II	II

GUNCOTTON:

Consists of best cotton waste steeped in a solution of nitric and sulphuric acids in a proportion of one to three in weight, pressed and cut into slabs.

WET G.C.

Contains 17% moisture.

DRY G.C.

Contains 1.5 to 2% moisture.

PROPERTIES OF WET G.C.:

1. No smoke.
2. Will not explode with 15% water.
3. Will not explode if a rifle bullet fired through it.
4. Can be cut to any shape by saw or file.
5. More powerful than when dry.
6. Can be detonated when compressed.

PROPERTIES OF DRY G.C.:

1. No smoke.
2. It ignites at average temp. of 340 deg. Fahr.
3. Easily fired by percussion.
4. Can be detonated by 5 gr. fulminate of mercury. The smallest service detonator contains 18 gr., called No. 8; the highest 43 gr., called No. 13 electric.

USES OF DRY G.C.:

1. Disruptive purposes.
2. Manufacture of cordite.
3. Priming of some cartridges.
4. Priming wet G.C. slabs.

WET G.C.:

Slabs are used in the field by artillery and called: "G.C. Slab Wet Field, 15 oz."

These slabs weigh 15 oz. and are 6 inches x 3 inches x 1 3/8 inches thickness, with one perforation for the primer. Each slab is in hermetically sealed copper-tinned case.

The primer is called "gun cotton primer dry field 1 oz." It weighs 1 oz. Dimensions, 1.35 to 1.15 in. in diameter by 1.25 in. long, with one perforation for the detonator. The primer is conical in form.

STORAGE:

	Group	Div.
Dry	I	II
Wet	III	I

CORDITE PROPERTIES:

1. Smokeless.
2. Not affected by damp.
3. No solid residue after charge.
4. Freezes at temperature of 45 degrees.
5. It decomposes.

COMPARISON AS BETWEEN CORDITE AND CORDITE M.D. IN GUN:

CORDITE:

1. It has a higher muzzle velocity.
2. Greater erosion or scouring of bore.

CORDITE M.D.:

1. Slower to ignite.
2. 15% greater charge needed for same result.
3. Rifling will last 3 times as long.

ADVANTAGES AND DISADVANTAGES OF CORDITE OVER GUNPOWDER:

ADVANTAGES:

1. It is smokeless.
2. Less chamber capacity needed.
3. A lighter charge is required.
4. Recoil of gun is less violent.
5. Not affected by damp.

DISADVANTAGES:

1. Difficult to ignite.
2. A bright flash at muzzle, necessitating at least 13 ft. cover.
3. Its liability to decompose.

Q. How are cordite charges ignited?

A. Cordite, being a slow burning composition, always requires an igniter of some other explosive. Cordite M.D. charges are ignited by gunpowder placed in a primer which is screwed into the cartridge case.

The Cordite M.D. charge for 18 pdr. Q.F. is made up of cordite M.D. size 8, in a double bundle. The inner sticks are 9.75" in length and are tied in two places by silk braid. The outer sticks are 10.374" in length and are tied in three places by silk braid. The weight of the charge is 1 lb. 6 15/16 oz. It is placed in the cartridge case with the inner sticks resting upon the primer, the outer sticks fitting down over the boss of the case and the upper ends against the shell.

Q. What is the smokeless explosive used in the service? Give proportions of cordite and cordite M.D.

A. Cordite is the smokeless explosive used in the service and consists of 58 parts nitro glycerine, 37 parts gun cotton and 5 parts vaseline or mineral jelly. Cordite M.D. (modified) consists of 30 parts nitro glycerine, 65 parts gun-cotton, and 5 parts mineral jelly.

- Q. How is cordite designated?
 A. Cordite is designated by diameter of its cord in hundredths of an inch and not by its length, as cordite M.D. size 8, 1, G, 8-100" in diam.
- Q. How is cordite affected by temperature?
 A. The higher the temperature the greater the muzzle velocity. At 45° the nitro-glycerine freezes. If thawed suddenly it works out on top and is dangerous to handle until it has been absorbed again.
- Q. What is cordite M.D.T.?
 A. Cordite Modified Tubular. This gives air space to assist combustion. Used in larger naval guns.
- Q. What is cordite M.D.S.?
 A. Cordite Modified Sliced.

INDENTATION:

"Cordite M.D., size 8, length 10". Give external diameter first always.

LYDDITE:

Is picric acid brought to a dense state by fusion. It is poured into the shell, where it solidifies. A cavity is left in the shell for an explosive of picric powder or T.N.T. (Tri-Nitro-Tolnene).

PICRIC POWDER:

Is a mixture of 43 parts of ammonium picrate and 57 parts sulphur; it is used as an explosive for lyddite shells and in bulk is packed in powder barrels, and in waterproof bags; the barrels being marked with a blue band around the bulge and stencilled on top, "to be used for Picric Powder only."

QUICKMATCH:

Consists of hemp boiled in a solution of gum and mealed powder, and then dusted over with mealed powder before drying. It burns in the open at the rate of one yard in thirteen seconds.

SLOW MATCH:

Cotton hemp rope, boiled in a solution of wood ashes and saltpetre; burns at rate of 1 yard in 8 hours.

FUSE INSTANTANEOUS:

Consists of two or more strands of quickmatch, enclosed in a tube of waterproof tape around which cotton is twisted, the whole being contained in a gutta percha covering. The gutta

percha covering is braided with yellow worsted and varnished red on outside. This readily distinguishes it from the safety fuse by its color in day time and its spiral winding by night. It burns at the rate of 30 yards per second. It can be easily ignited by port fire but is unsafe to hold it in hand when lighting it, as may be done with safety fuse. It is used in 100 yd. lengths on a tin reel, packed in zinc box.

PORT FIRE:

Consists of a tube 16 inches long made of rolled brown paper. It is filled with port fire composition and a primer of gunpowder with fuse inserted in upper end. It burns about 15 minutes.

SAFETY FUSE, No. 9, MARK II:

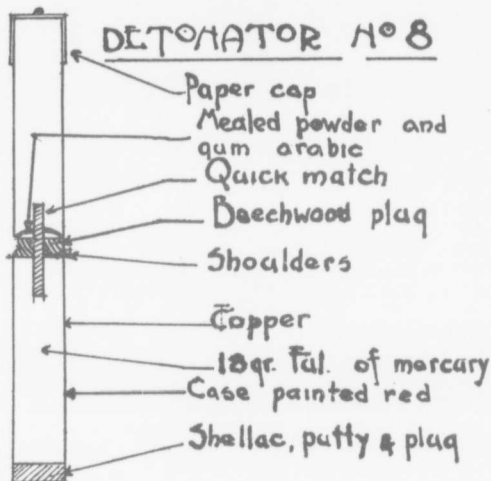
Consists of a train of F.G. powder enclosed in jute yarn contained in a tube of gutta percha covered by waterproof tape. It is easily ignited by a port fire but not always by a lighted piece of paper. To prepare the fuse the gutta percha must be cut obliquely and the powder laid bare at end which is to be ignited. The end which is inserted in the number 8 detonator is cut square and pressed in end of detonator as far as it will go; then the top of copper tube is pinched in to hold the fuse in place. Colour—black; it is issued in tin cylinders containing 8 fathoms. It is distinguished in the dark by its smooth surface.

DETONATOR No. 8, MARK V.:

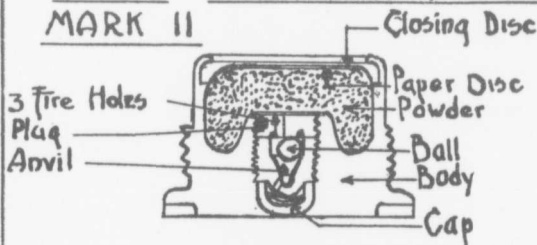
Consists of a tube 3" long. Lower portion of tin is filled with 18 grs. fulminate of mercury, and is closed at the bottom by a plug of shellaced putty. The upper portion of copper is left empty for the reception of safety or instantaneous fuse, and is closed by a paper cap. In the centre is a beechwood plug, running through centre of which is a piece of Q. Match to convey the flash from the fuse to the fulminate of mercury. On centre OUTSIDE is a brass band having 2 projections to prevent it being forced too far into the guncotton primer. It is painted red and issued in tin cylinders of 25 each. It is used for hasty demolitions in the field.

Q. Describe the detonator, electric No. 13.

A. It consists of an ebonite head, a brass socket and a tin tube. The socket and the tube are filled with 43 grains of fulminate of mercury and the tube is closed with shellaced putty. Two insulated wires are soldered to two flat copper poles passed through the head. The poles are connected together by an iridio platinum bridge surrounded with a tuft of guncotton yarn.



PRIMER PERCUSSION QF CART. 1
MARK II



ACTION OF No. 13 DETONATOR:

The two wires are connected to a field service exploder. On pushing down handle of the F.S.E. a current flows through one wire, through a copper pole piece across bridge and back through other pole and wire to F.S.E. The current fuses the platinum bridge which in turn ignites the G.C. yarn and detonates the fulminate of mercury. It is used for field and siege operations.

ADVANTAGES AND DISADVANTAGES OF FIXED AMMUNITION:

(Cartridge case and shell attached)

ADVANTAGES:

1. More rapid rate of fire.
2. Cartridge case prevents escape of gas (an obturator).
3. No danger of double loading.
4. No premature firing caused by heated chamber.
5. Unloading easily.

DISADVANTAGES:

1. Increase of weight and magazine space.
 2. Case is liable to split and damage the gun.
 3. In case of missfire breech must be opened. In old patterns of B.L. guns a fresh tube can be placed.
- Q. Upon what does effect of individual shrapnel depend?
- A. 1. Number of bullets.
 2. Energy of bullets on impact.
 3. Spread of bullets.
 4. Size of target.
 5. Angle of descent.

USES OF PERCUSSION AND TIME SHRAPNEL:

PERCUSSION:

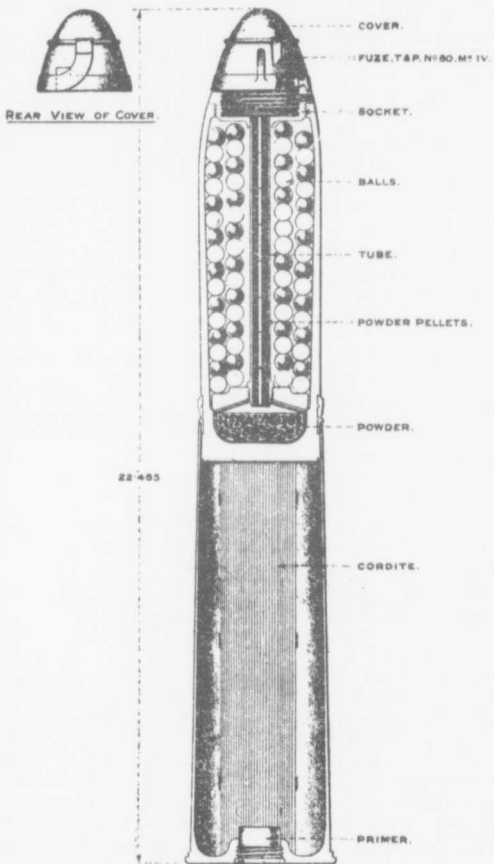
1. Ranging.
2. Troops behind ordinary buildings or against buildings themselves.
3. Direct hits on guns.

TIME:

1. Living targets without overhead cover.
2. Aircraft, balloons.
3. Ranging.

CARTRIDGE, Q.F. 18 PR SHRAPNEL, MARK I.

SCALE - 1/3.



A COMPLETE ROUND OF AMMUNITION CONSISTS OF:

1. Fuze cover.
2. Fuze.
3. Shell.
4. Cartridge case.
5. Percussion primer.
6. Cartridge clip (to fit over case to protect primer).
7. Charge.

The Clip Safety Fuze, T. & P. No. 80, is made of steel, horseshoe shaped, and fits around fuze No. 80 and retaining it at safety. The clip has a slot in it to fit over the setting pin, and a tongue piece fitting into the fixing slot, while the ends have projections which fit under the edge of the body of the fuze.

The parts of T. & P. Fuze, No. 80, are:

Outside:

1. Cap with set screw.
2. Upper and lower composition ring.
3. Gas escape discs.
4. Two aluminium pins.
5. Felt washer.
6. Flange, graduated from 0-22, reading in tenths.
7. Leather washer.
8. Body.
9. Base plug, threaded to screw into body of the fuze.

Inside Upper:

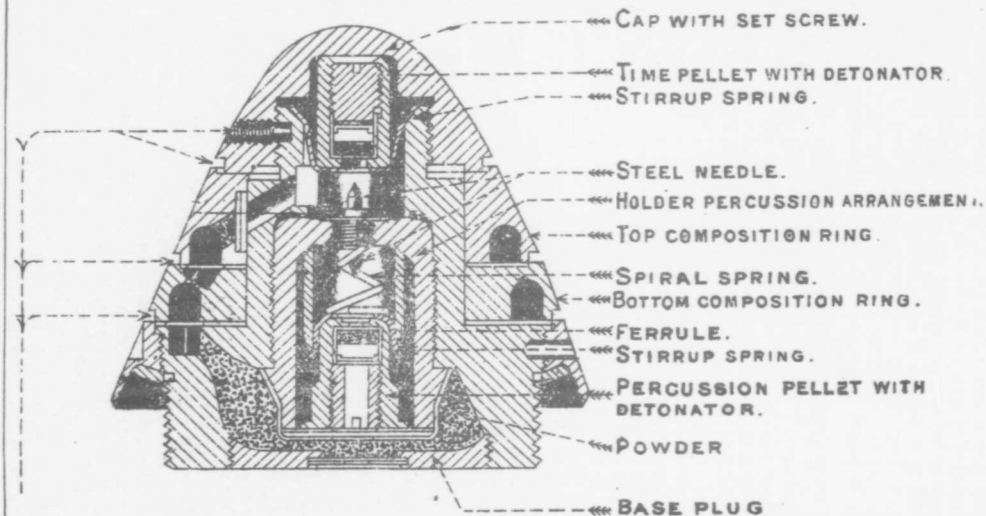
1. Time pellet with detonating cap.
2. Time stirrup spring.

Inside lower:

1. Cone with double pointed needle.
2. Holder percussion arrangement.
3. Ferrule.
4. Creep spring (spiral).
5. Percussion pellet with detonating cap.
6. Percussion stirrup spring.
7. Blowing charge.

The time action of fuze is as follows: On the shock of discharge the time pellet sets back, straightening out the time stirrup spring, and allowing the time pellet to fall upon the upper point of the needle and explode the detonator. The flash passes from the pellet to the upper time ring and burns to the right or clockwise until it comes opposite the graduation marked on the lower time ring. It then ignites the lower time ring, burning around in the opposite direction until it comes to the flash hole in the body of fuze. From there to the blowing charge in the base of fuze; thence down the 8 powder pellets to the bursting charge of shell.

FUZE, TIME AND PERCUSSION, N°80, MARK IV.



AMMUNITION.

The percussion action of T. & P. fuze is as follows: On the shock of discharge the ferrule sets back and straightens out the percussion stirrup spring, allowing the ferrule to fall down over the percussion pellet. On graze the percussion pellet moves forward, overcoming the creep spring, and strikes the lower needle, which explodes it, the flash passing to the blowing charge in base of fuze and down to the bursting charge of shell.

THE SHRAPNEL SHELL 18 Pdr. Q.F.:

Consists of a forged steel body; close to the base a groove is formed and waved in its centre into which is pressed the copper driving band. Inside the body and in the base is a sheet iron tin cup; this is filled with 1¾ oz. of R.F.G. 2 (fine grained) powder. Above the tin cup and resting upon the shoulder is a strong steel disc perforated in its centre and threaded to receive a metal central pipe. In this metal pipe are 8 pressed powder pellets perforated in the centre, total weight ¾ oz. Around the metal pipe are mixed metal bullets; Mark I 364, Mark II 375, Mark III 375, Mark IV 348, Mark V 351 (41 bullets to one lb.). Around the bullets is poured rosin to keep them compact. The shell may be brought to weight by dropping in small buckshot. The upper part of the body is threaded to receive a brass ring which is retained in position by a set screw. Attached to the ring is a small brass disc perforated in centre to engage with the central pipe. The ring is tapped in the interior to fit the field service gauge and takes T. & P. fuze No. 80 (time and percussion) or a fuze hole and plug. The weight of the shell is 18 lbs., fuzed 18 lbs. 10¼ ozs. The total weight of the round is 22½ lbs. approximately. The walls or body of shell on outside are painted lead colour.

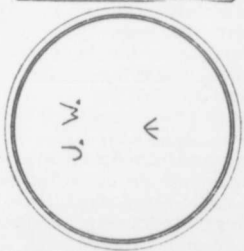
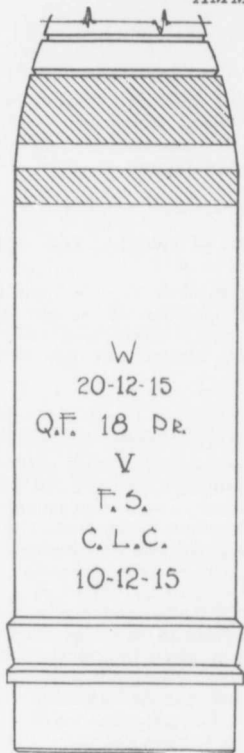
DIFFERENCE BETWEEN MARK I, II, AND III SHRAPNEL SHELLS:

Mark I: Head struck from radius of 1½ diam. Walls are thinner in lower part than M. II. The tin cup containing bursting charge is of different shape. It contains 364 bullets. The shell is painted black.

Mark II: Mark II differs from M. III in having a slightly narrower driving band. The shell is secured in case by the latter being indented in four places into a cannellure turned on the shell, the cannellures being filled with Pettman's cement.

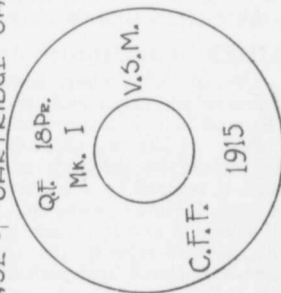
Mark III: Head struck from radius of 2 diam and fitted with 2 inch brass fuze socket. Shell contains 375 bullets, 41 per lb. The copper driving band is fitted in two waving ribs. The shell is secured in the case by the latter being pressed into the groove of the driving band. The shell is painted lead colour.

— MARKS ON SHELL —



MARKS STAMPED ON BASE OF CARTRIDGE CASE.

MARKS STAMPED ON BASE OF CARTRIDGE CASE.



MARKINGS, STAMPINGS AND STENCILLINGS OF 18 PDR. SHELL:

On the side of shell:

One inch red band on nose of shell denoting shrapnel, one-half inch red band below to denote filled, monogram of filling station, nature of gun, mark of shell, material used in shell, manufacturer's initials and date of manufacture

On the base of shell:

Inspector's initials and government mark (broad arrow).

MARKINGS, STAMPINGS AND STENCILLINGS OF 18 PDR. CASE:

Stamped on base: Nature of gun, mark of case, manufacturer's initials and date of manufacture, filling station and number of times filled. Stencilled on base: name, size, and lot number of charge, monogram of filling station and date of filling or re-filling.

THE CARTRIDGE CASE

Of 18 pr. Q.F. is made of solid drawn brass. It tapers toward the front, and is flanged in rear to engage with extractor in the gun. It has a hole in the base which is recessed and screw threaded to receive a percussion primer. The cartridge case is dull or darker to make it as inconspicuous as possible. Five service rounds or eleven blank rounds is the life of the case.

PRIMER PERCUSSION MARK II.

Consists of a metal body screw threaded externally for a portion of its length to fit the primer hole in cartridge case. It is flanged in rear to prevent it being screwed too far into base of shell. It has two recesses in rear to receive the key primer. The interior of the body is bored and recessed to take a cap which is secured by a screwed plug. The plug has an anvil at one end, the other being bored out to form a sealing chamber, and contains a soft copper ball to seal the escape of gas after firing, and so relieves the pressure on the cap. The sealing chamber is closed by a perforated screw plug. The body is filled with R.F.G. powder and the mouth is closed by a brass disc having six radial slits.

THE CLIP CARTRIDGE

13 and 18 pr. is made of brass, cross-shaped to form four arms, which form clips to engage the rim of the cartridge case; one of the clips is painted red and is slightly longer than the others. The clip has a canvas loop for withdrawing the ammunition from the limber.

LYDDITE SHELL:

Some lyddite shells are used in the 18 Pr. Q.F. The walls of the shell, especially the base, are made much stronger than shrapnel to prevent explosion in the bore, and to produce stronger explosion on impact. They are painted yellow, but otherwise marked the same as shrapnel. Percussion fuzes are always used with lyddite.

STAR SHELL, MARK I, FOR 18 Pr. Q.F.

This is used for illumination. It contains a small bursting charge, and ten stars in two tiers of five, separated by a perforated iron disc. The metal central tube has twelve fire holes through which the flash passes from the bursting charge to the stars. The shell is painted black, with red band when filled, and a white star on the side. It gives illumination for 10 to 20 seconds.

FUZE TIME 15 SECONDS, No. 25 is used in conjunction with star shell. It is much like Fuze T. & P. No. 80, but has only one time ring and no percussion arrangement.

CAUSES OF PREMATURES AND BLINDS:

Prematures due to fault in shell.

1. Grit in powder (causes friction).
2. Rusty tin cup (friction—tin cup should be lacquered).

Prematures due to fuze:

1. Incorrect fuze setting.
2. Weak, broken, or missing creep spring.
3. Faulty fuze composition or construction.

Blinds due to shell:

1. Damp bursting charge.
2. Omission of bursting charge or powder pellets.

Blinds due to fuze:

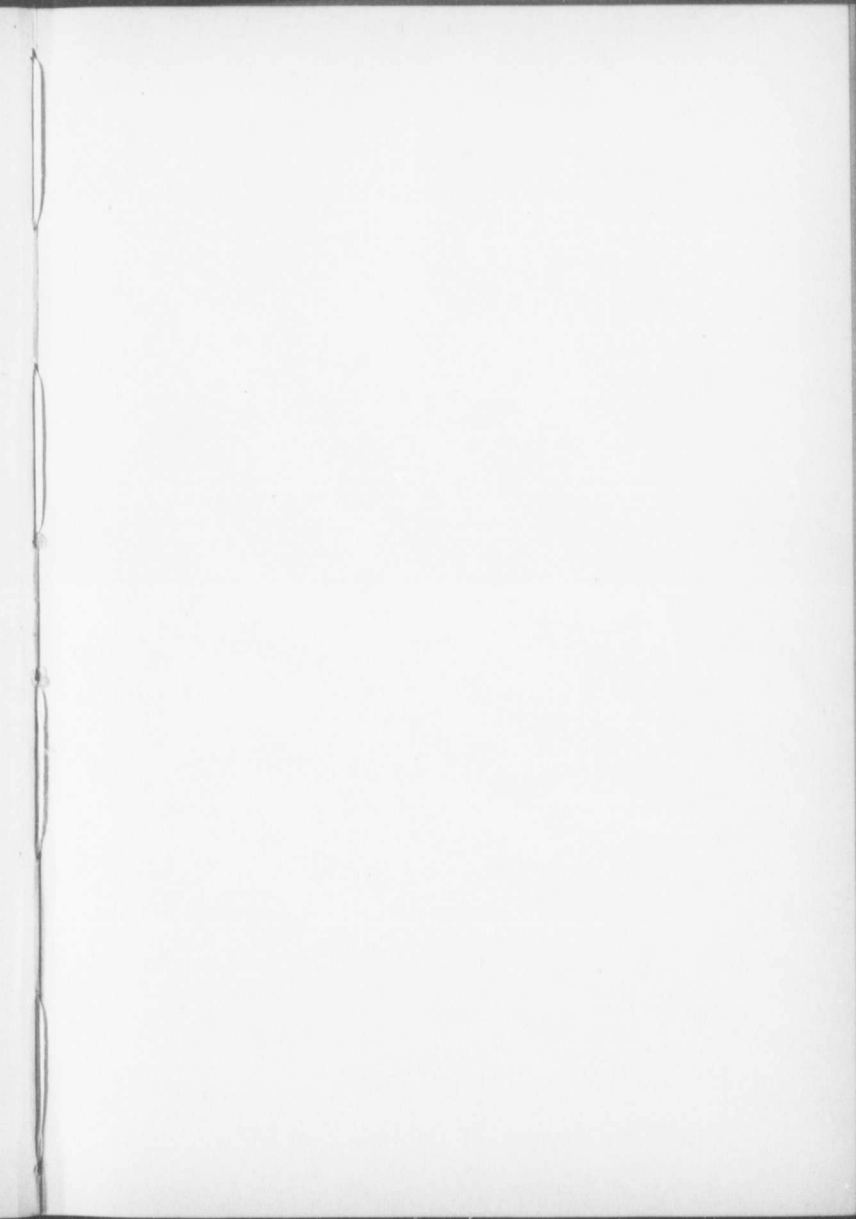
1. Defective fuze.
2. Insufficient angle of descent.
3. Firing in marshy ground.

- Q. What are the objects of the following: Tin cup, driving band, central pipe, bursting charge?
- A. The tin cup is used as a container for the bursting charge for shrapnel; the driving band to give shell rotation; the central pipe to contain the 8 pressed powder pellets, and for means of conveying the flash from fuze, through the pellets to bursting charge. Bursting charge is to release bullets from the rosin and force contents of the shell out.
- Q. What care should be exercised in the preservation and handling of ammunition?

- A. When fuze it should be seen that fuze cover is placed on and that the clip is placed on over the primer. Loose primers should be tightened up; when piling, they should not be placed higher than two tiers; the fuze should never be placed resting on the ground, nor should shell be held by the clip. From time to time shell should be lubricated with linseed oil but care should be taken that none is placed on fuze or primer.
- Q. What care should be exercised in receiving fuzes and packing them in limbers and wagons?
- A. 1. On receiving fuzes from stores it should be ascertained that all fuzes drawn are of the same batch No. or as nearly so as possible.
2. In fuzing shell all fuzes should be set at safety, and care should be exercised to place all fuzes of the same batch in the same section in order to obtain uniformity of burst, because an old fuze will burn longer than a new one, and covers should be placed on the fuze to prevent deterioration.
- Q. State how gas is sealed in 18 and 13 pdr. Q.F.
- A. By means of the cartridge cone expanding at its front and the metal ball in the primer being forced to the rear.

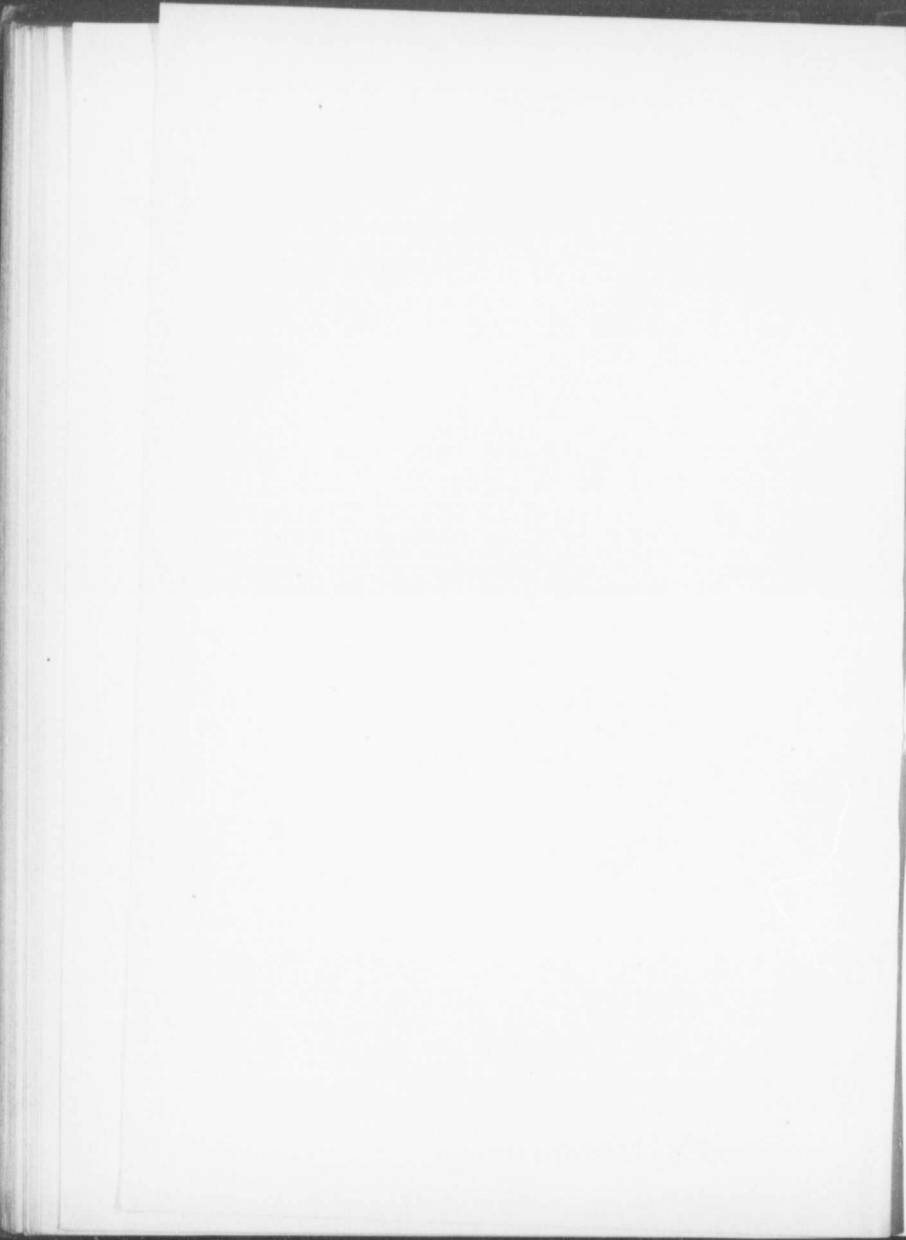
HOW TO DESTROY A GUN:

Place a shell in the breech of gun without the cartridge case, then place guncotton in chamber with primer and fuse attached. Stuff chamber full of sods and tamp well down. Light the fuse, and run like—(deleted by censor). Two slabs of guncotton are required for a 3-inch gun, and the charge must be doubled for each additional inch in diameter of bore.









CHAPTER III

EQUIPMENT.

- Q. Describe 13 and 18 pr. Q.F. Guns Mark II.
- A. The gun is of steel and wire construction and consists of an "A" tube, several layers of wire extending from the breech to a position slightly in front of the chamber, a jacket and breech ring. The breech ring is provided with an interrupted screw thread for the breech screw. Ribs project from either side of the jacket for almost its whole length, and slide in grooves cut in the cradle. Weight of 13 pr., 6 cwt. Weight of 18 pr., 9 cwt. The rifling is about $80\frac{1}{4}$ inches long (13 pr., 56 inches), and consists of 18 grooves of the polygroove plain section. The twist of rifling is uniform, one turn in 30 calibres. The calibre of the gun is 3.3 inches (13 pr. 3.0 inches). The gun is designed for percussion firing, uses fixed ammunition, and obduration is obtained by the expansion of the brass cartridge case. Muzzle velocity is 1,610 feet per second (13 pr., 1,590).
- Q. Name the principal parts of the breech mechanism.
- A. Breech screw, catch retaining breech screw open, carrier with hinge bolt, lever breech mechanism with hinge bolt, catch retaining lever breech mechanism closed, firing lever, striker, striker guide block, main spring, guide for main spring, rebound block, firing pin, tripping piece, safety catch, extractor with hinge bolt, and trigger.
- Q. Give the action of breech mechanism.
- A. The handle of the breech is grasped by the left hand, which releases the catch from its recess in the carrier. On moving the lever from the left to right, its bevel teeth engage with those of the breech screw and cause the latter to be revolved through one-fourth of a circle clear of the threads in the breech ring. It is brought to a stop by the lug on the lever bearing against the rear face of the screw; during this movement the featherways on the breech screw move away from the feathers on the striker, and thus prevent the striker from going forward until the screw is again turned to the locked position. Further movement of the lever causes the breech screw and carrier to swing together to the loading position. As the carrier leaves the breech ring, the catch retaining breech screw open is forced forward by its spring into the slot in the rear end of breech screw,

preventing the latter from turning when clear of the breech ring. Toward the end of this movement the cam on the carrier engaging with the extractor forces the outer lug of the extractor to the front, and the inner arm to the rear. The movement of the latter is at first slow and powerful, thus unseating the cartridge case; afterwards a quicker movement ejects the case.

Q. Describe the breech screw.

A. The breech screw is of steel, wedge shaped, the largest diameter being toward front. having two plain portions necessitating $\frac{1}{4}$ of a turn to close breech, and two threaded portions. In rear is a continuous left handed thread for attaching it to the carrier. It is recessed through the centre to take the striker, and in front of this recess are two shoulders against which bears the rebound block, while in rear are three featherways which form the safety arrangement, one corresponding to a feather on the right side of striker, and the others to projections on the guide for main spring only when the breech is properly closed. Four bevel teeth are formed on bottom of screw in rear, to engage with similar teeth on lever breech mechanism. On the rear face is a recess in which fits the catch retaining when the breech is open.

Q. Describe the catch retaining breech screw open.

A. The catch retaining breech screw open is a hollow steel cylinder placed in a recess in the carrier and kept pressed forward by a spiral spring placed inside it. It has a shoulder which engages in a recess in the breech screw and locks it to carrier when breech is open. When the breech is closed the catch is pressed back into its recess as it meets the breech ring and the breech screw is free to revolve in the carrier.

Q. Describe the carrier.

A. The carrier is of steel, hinged to the lugs on the right side of gun. On the front face is a recess provided with screw threads to attach it to breech screw, and a small recess to take the catch retaining. On the rear face are two small lugs between which are fixed the striker guide block and lever breech mechanism, both being held in position by the hinge pin of lever. In the lower lug is cut a slot for the reception of the catch retaining lever breech mechanism when in the closed position. On the right side of carrier hinge an eccentric groove is cut to actuate the extractor, while on the upper side a lubricating hole is provided, closed by a brass plunger and retaining nut. It has two gas escape channels which come between the bevel teeth of the breech screw so that any escape of gas is downward.

- Q. Describe the lever breech mechanism.
- A. The lever breech mechanism is of steel, and is hinged to lug on rear face of carrier. It is provided with bevel teeth for turning the breech screw, and a lug which, coming in contact with rear face of breech screw after unlocking, causes the breech fittings to swing to the loading position.
- Q. Describe the catch retaining lever breech mechanism.
- A. The catch retaining lever breech mechanism is pivotted to lever and kept up to its work by a strong flat spring. Its inner end engages a recess in carrier when in locked position.
- Q. Describe the firing lever.
- A. The firing lever is a bar of steel rotating between the carrier and the long arm of the striker guide block. It has on the outer end an arm to gear with the trigger, and on inner end two cams, a large and small. The small one gears with the tripping piece, and the large bears against the head of the guide for main spring.
- Q. Describe striker guide block.
- A. The striker guide block is a block of steel and is secured between the lugs on rear face of carrier by hinge pin. Its front face bears against rear end of guide for main spring and holds it in place. On the left side is a hollowed out projection which forms a seating for the firing lever of the breech mechanism. A slot is cut to receive the rear ends of the striker and guide for main spring, and on the right side is a flat projection cut away at centre to take the axis pin of safety catch.
- Q. Describe the safety catch.
- A. The safety catch is pivotted to striker guide block by an axis pin. Its inner end engages a recess in the striker and secures it when travelling, the outer end being roughened top and bottom to form a grip.
- Q. Describe the Extractor.
- A. The extractor is of steel and is pivotted by a hinge bolt in front of carrier hinge. On its inner end are two arms which clip or engage with the rim of cartridge case. On outer end is formed a lug which is actuated by eccentric groove of carriage hinge. This groove is so shaped as to give at first a slow powerful movement to the extractor which presses the cartridge case out of its seating, followed by a quick movement which throws it clear of the breech.
- Q. Describe the firing pin.
- A. The firing pin is of steel and fits into an undercut groove in front end of striker. A lug on upper surface prevents it from working loose.

Q. Describe the trigger.

A. Part I of trigger is a spindle of steel having at its outer end an arm which gears with the firing lever of carriage when the gun is fired. It fits into the left side of the breech and is secured by a split pin. Over the spindle fits a milled bush containing a torsional spring to keep it up to its work, one end of the spring engaging the bush and the other the trigger. On top of the bush is a feather which fits into the featherway in the gun and prevents it turning. Attached to spindle by a feather and featherway is a collar on the left face of which is a broad featherway into which fits a feather on the bush, which limits its movement. Attached to the inner end of spindle by a feather and featherway is the trigger arm called part II which projects to the rear and gears with the firing lever of the breech mechanism.

Q. Name the parts of the striker.

A. The striker consists of the following principal parts: Striker, firing pin, rebound block with securing pin, main spring, guide for main spring and tripping piece with flat spring.

Q. Describe the striker.

A. The striker is circular in section in front and fits through centre of carrier and breech screw, and is held in position by striker guide block which also prevents its turning. The striker is slotted crossways about $\frac{1}{4}$ inch from its front end to take the rebound block which is allowed a free fore and aft movement. In rear of the slotted portion the diameter is slightly increased and on this portion three gas escape channels are formed, while internally it is recessed to take the front end of main spring. Behind the circular portion the striker is rectangular, and has on its upper edge a flat steel spring which keeps the tripping piece up to its work. A feather is formed on its right side, which will only allow the striker to move forward when the breech is properly closed. In this feather a slot is cut for safety catch to engage in when the mechanism is at safe. On the left side is a stud which forms the axis of the tripping piece, and in front of this is cut a shoulder to provide a rest for the tripping piece and limit its movement. On the right side is cut a slot for the stud on the guide for the main spring.

Q. Describe the rebound block.

A. The rebound block is a rectangular piece of steel and projects on either side of the striker. It bears against the shoulders in the front end of breech screw recess in Mark 1 breech screw, and against shoulders on bush firing hole in

Mark 11 breech screw. It is held in position by a securing pin, the latter being kept in position by firing pin.

Q. Describe the main spring.

A. The main spring is a strong steel spiral spring arranged between front and rear ends of striker and guide for main spring, front end being against the rebound block.

Q. Describe the guide for main spring.

A. The guide for main spring is a hollow cylindrical piece of steel and forms a case for rear end of main spring. A hole is bored through centre as a gas escape hole. The rear of guide is enlarged to form a bearing for larger cam of firing lever, and there are two projections, which in the closed position of mechanism come opposite recesses in the breech screw, thus forming a safety arrangement by preventing the gun being fired until the breech is properly closed. Again in rear the guide is prolonged to pass through the slot in the striker guide block. On the right hand side is a stud which bears in a slot in the striker, limiting the motion of the guide and connecting the two together.

Q. Describe the tripping piece.

A. The tripping piece is a block of steel and is pivoted to a stud on the left side of the striker in rear and kept up to its work by a flat steel spring. It has a shoulder for the smaller cam of the firing lever to engage with to draw the striker back to the cocked position.

Q. What is the action of the firing mechanism on firing?

A. On drawing firing lever of carriage to rear, trigger is caused to revolve. Its inner arm in turn causes firing lever of breech mechanism to revolve. As firing lever revolves the small cam engages with the tripping piece and forces the striker back, compressing the main spring, from the front; at the same time the large cam engages with the guide for main spring, and compresses the spring from rear. The striker moves to rear until the small cam slips past the tripping piece, when by the expansion of the spring, the striker flies violently to the front. The rebound block is stopped by coming in contact with the shoulders of the firing hole bush, but the striker by its speed overrides the rebound block, the firing pin strikes the cap of the cartridge and so fires the gun.

Q. Describe the rebound action.

A. As the gun recoils, the trigger moves clear of the firing lever of the carriage, and is caused to resume its normal position by its spring. The main spring forces back the guide for main spring, causing the firing lever of mechanism to resume its normal position. When the stud

on the guide for main spring reaches the end of its slot, it forces back the striker, withdrawing the firing pin inside the breech screw, the main spring and stud together completing the rebound action.

Q. Name the parts of the 13 and 18 pr. Q.F. carriage.

A. Spade, trail, axletree, wheels, carriage body, cradle, hydraulic buffer and running out springs, shield, sights, elevating gear, traversing gear, ranging gear, brake gear, clamping gear.

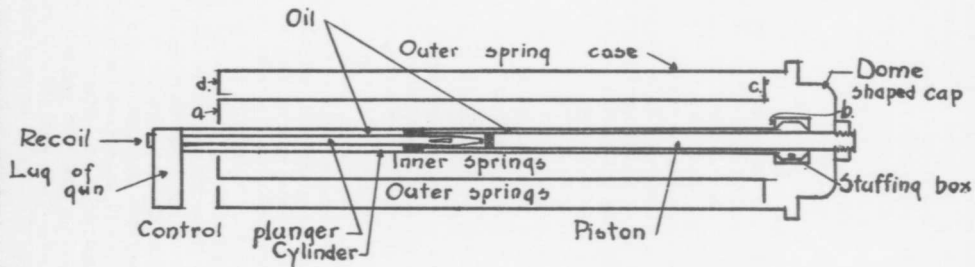
Q. Describe the cradle.

A. The cradle is a bronze casting, in one piece, recessed on the underside to receive the gun. Grooves are formed on either side of the recess for the guides of gun to recoil in. Collars are formed on upper side, front and rear, threaded inside to take the outer spring case. A dome-shaped cap which closes the outer spring case in front forms the means of attachment of piston rod to carriage. Trunnions are cast on either side to fit the trunnion bearings on carriage body and are kept in position by sliding cap squares; the axis of trunnions lies at the angle of $1.30'$ to the horizontal when the carriage is on level ground, that being arrived at by left trunnion bearing being about $\frac{1}{2}$ inch lower than right. The left trunnion is screw threaded axially to receive a steel arm to which the rocking bar sight is pivoted and secured by a nut. A projection is formed on left side in rear to take the oscillating bearing of the upper elevating gear, and in front of this there is a hole to take the bearings of the spindle of range gear. The left side of cradle is also prepared to take the guide bracket of the arc of range gear, also a shield for gunlayer's arm. The right side of the cradle is cored and threaded to take the bearings of spindle of upper elevating gear. A clutch is formed underneath the cradle to engage with a clutch on the carriage body when in the travelling position.

Q. Describe the hydraulic buffer.

A. The buffer cylinder is of forged steel. To the rear end is screwed and soldered a "connecting piece," screw threaded on outside to take a collar and securing nut, by which the buffer is secured to the lug on the gun and on the inside screw threaded to take the control plunger. The control plunger is of steel and screws into the rear of the buffer cylinder, the threads having a notch cut through them to allow air to escape while the buffer is being filled, when the plunger is unscrewed two turns. The front end of plunger is tapered to enter a hole in piston rod, two flats being cut on it to allow the oil to escape when the gun runs

DIAGRAM SHOWING ACTION OF _____
_____ HYDRAULIC BUFFER & RUNNINGOUT SPRINGS.



up after firing. The rear end of the plunger is recessed and screw-threaded to take the "apparatus adjusting running out springs." On top of the cylinder in rear is a filling hole, closed by a plug with chain and copper washer. Ten tapered grooves, deeper toward the rear, are cut inside the cylinder, to regulate the pressure throughout recoil. The front end of cylinder is closed by means of a manganese bronze stuffing box, screwed in with a woodite washer to make a tight joint. Through the stuffing box passes the piston rod, and the oil is prevented from escaping by a mutton suet asbestos ring and two cup shaped metal rings, the whole being pressed tightly together by a metal packing gland screwed into the stuffing box; around the stuffing box and gland are cut a number of slots into one of which fits a spring stud. This prevents either from unscrewing. The piston rod is of steel, hollowed for a greater portion of its length. The rear end of this hollow is made use of as a recess for the control plunger and that part not occupied by the plunger is closed by a screwed plug. The front end is screw-threaded to take the nut, by means of which it is attached to the dome shaped cap of the outer spring case. On the rear end is screwed and soldered a metal piston.

Removal of Springs from Buffer.

Put on the brakes, elevate gun, empty buffer cylinder; depress gun, secure lower elevating handwheel with strap. Remove the outer securing nut and screw the "apparatus adjusting running out springs" into the end of the control plunger, being careful to have the flat of the screw on top, in order to keep the filling hole on top. Run the lock nut on and take the compression of the spring on to the apparatus. Remove the castellated nut and dome shaped cap, being careful that no one is in front of the buffer. Place trestle under the front to take the springs as they come out. Loosen the inner securing nut and ease off on the apparatus, and allow the springs to come slowly to the front. The order in which they come out is as follows: buffer cylinder, inner springs, inner spring case, outer springs.

Q. Describe the running out springs.

A. The running out springs surround the buffer cylinder and consist of two sets, inner and outer, each containing four springs, separated by manganese bronze parting plates. The springs are contained in two spring cases, inner and outer, the outer being screwed into the collars of the cradle and prevented from unscrewing by a set screw, which also acts as a sight for rough laying. The

inner spring case fits loosely inside the outer spring case. These springs are held in initial compression as follows: The outer set of springs bears against a turned-in flange formed inside the outer spring case at rear, and a flange turned out from the inner spring case in front. The inner set of springs bears against a turned-in flange inside the inner spring case in rear, and against a turned-out flange on the outside of buffer cylinder in front. Steel washers are placed in front and rear of each set of springs.

Q. Describe the action of buffer and springs.

A. On firing, the gun recoils to the rear through the cradle, drawing with it the buffer cylinder and compressing the two sets of springs between their respective flanges. The oil, which before firing was in front of piston, has to press to rear around the piston, the clearance afforded by the grooves being such as to offer the required hydraulic resistance. When the energy of recoil is absorbed the springs re-assert themselves and return the gun to the firing position. The control plunger displaces the oil in the recess of piston rod, bringing gun quietly to rest, the oil escaping over the flats.

Q. Describe the trail.

A. The trail is a steel tube of uniform thickness throughout its length. It is fixed to the axle-tree by means of a double loop bracket. At front end is riveted a steel flange for the support of the shield. On right side and in front is a stud and pawl bracket to support lower shield. Inside trail is a receptacle for cleaners, etc. This is closed by a door fitted with hasp and turnbuckle. Below the traversing bracket of the carriage body is riveted a traversing slide; in rear of this is a bracket to take the pivots of the brake arms and rear ends of the tensile stays. In rear is a locking band, and at the extreme end is riveted the trail eye. The eye is of forged steel and has a hard steel surface welded in to take the wear of the limber hook. A steel bracket of angle section is riveted to the trail and trail eye for the attachment of the spade. The spade is of nickel steel strengthened by angular steel pieces riveted underneath and is secured to the trail brackets by rivets. On top of spade are two lifting handles, and on top of trail a bracket for the traversing lever.

Q. Describe the axle-tree and how it is attached to carriage body.

A. The axle-tree is a hollow steel forging with 2nd class C pattern arms. At the centre it is square in section where it passes through the top of double loop bracket and axle-tree bearing of carriage body. The axle-tree is secured to body

by a tapered pin. At the shoulders the axle-tree is circular in section and attached to these shoulders by feathers and featherways are axle-tree brackets. These brackets are flanged and have stays riveted to them for the support of the shield, and to them the front ends of the tensile stays are attached. The outer end of each bracket is recessed to receive an L-shaped leather washer kept in position by a steel washer secured by set screws. The inner end of pipe box passes into the recess and so prevents any dirt or dust getting into the pipe box. The axle-tree flanges are fitted to the carriage body outside the axle-tree bearings, and are secured by tapered pins. Loops are formed on front of flanges to take the pivot of the crank levers of the brake.

- Q. Describe the wheel, second class "C", No. 45, Mark III.
 A. It consists of the following parts: Pipe box, nave, spokes, fellos, and tire. The pipe box is of phosphor bronze and is shaped internally to fit the axle-tree arms; inside are two hollows for grease, with grooves connecting them for lubricating purposes. The exterior is prepared with projections to engage the inner flange of the nave. The outer end is screw-threaded for the reception of nut, pipe box, and dust cap. The nut is kept from working loose by a ratchet and steel spring catch. The dust cap is secured to the nut by a split keep pin, and encloses the adjusting collar with lynch pin and the end of the axle-tree arm. The drag washer is free to revolve round the nut, and is kept in position by the dust cap.

The nave consists of two flanges of corrugated steel, connected by twelve bolts, bolted alternately through the feet of spokes. The inner flange has a steel strengthening ring, the outer flange a bronze centering ring.

There are 12 spokes of oak, 6 dished and 6 straight, bolted between flanges of nave, and slit-tongued into fellos. The fellos are of sawn ash, 6 in number, connected by wooden dowels and further secured by the 3 inch x $\frac{5}{8}$ inch mild steel tire, rounded at edges, shrunk on and bolted to each felloe.

The wheel is 4' 8" in diam. and weighs 200 lbs.

- Q. Describe the traversing gear.
 A. It consists of a hand wheel, steel actuating screw, manganese bronze link nut, and a steel cross head. The hand wheel is attached to the left end of the actuating screw by a nut and pin. The actuating screw works in the link nut, the nut being pivoted to the traversing bracket of the carriage body. The screw and nut are both contained in the cross

head which is pivoted to the slide bracket on the trail. The right end of the cross head is threaded to take a steel cap inside which is placed cotton packing to keep the nut clean; the left end is bushed with manganese bronze, internally, and externally is threaded to take a steel check nut and a manganese bronze cap. The screw is kept from moving horizontally by a collar formed on it, the inner surface of which bears against a manganese bronze bush in end of crosshead and the outer against the inside of cap crosshead. A brass scale graduated to 4 deg. right and left is attached to body of carriage and is read by a pointer on crosshead.

Action of traversing gear: When the handwheel is turned the actuating screw is revolved and forces the link nut in and out, thus moving the carriage body with gun, cradle and sights. The actuating screw is unable to move to right or left by virtue of the steel push collar being held between the cap crosshead and crosshead.

Q. Describe independent system of traverse.

A. Just below the trunnions bearings are two manganese bronze bearing brackets let into side of carriage body. These brackets are curved both on their inner and outer edges, the arcs being struck from the centre of the axle-tree. The brackets are elongated across their width to allow a traversing movement, the axle-tree being used as a stop for the 4° rt and 4° lt. The brackets move in a guide track formed on the inside by the outer edges of the top of the double looped bracket and on the outside by the inner edges of the axle-tree flanges; all these curved bearing edges are struck from the centre of the axle-tree. At the rear and underneath part of the carriage body there is a M.B. arc bracket which slides over a steel guide track on a bracket on the trail. Both the M.B. bracket and steel guide are undercut to prevent the rear of the carriage body from jumping when the gun is fired.

Q. Describe the brake gear.

A. It can be used as a firing or travelling brake, and consists of: Two brake arms with shoes and blocks, two connecting rods, two crank levers, actuating nut and screw.

The brake arms are pivoted at their inner ends to bracket on trail and provided at their outer ends with cast iron brake blocks which act on tires of wheels. Two cranked levers are pivoted to the axle-tree flanges outside the carriage body, and are joined by a connecting rod, on left end of which are placed a number of disc springs No. 62 to equalize the pressure on both shoes. The right

arm of the right cranked lever is forked and carries a nut through which passes the actuating screw. The rear end of screw is pivoted to outer end of right brake arm and is provided with two handles so brake can be put on from front or rear. The arm of the left cranked lever is attached to outer end of left brake arm by a connecting rod fitted with an eccentric releasing lever, which enables brake to be quickly taken off when required in action.

Q. Describe the elevating gear.

A. Upper gear: consists of a hand wheel on the outer end of a cross spindle which works in a bearing on the cradle and has on its inner end a bevelled pinion. The latter engages with teeth formed on the exterior of a spool-shaped steel nut carried in a M.B. bush or oscillating box, which is free to oscillate in a steel bracket carried on the cradle. The oscillating box is recessed to receive the nut and elevating screw. The screw has its upper portion threaded to fit the nut, and two featherways in the screw engage feathers in the oscillating box. A stop and a dust excluder are fitted to the top of the screw and secured by nut and keep pin.

Action of Upper Elevating Gear. When the hand wheel is turned the nut travels along the screw and moves cradle with gun in vertical plane. The angular movement is recorded by the range gear.

The Lower Elevating Gear is similar to the upper elevating gear. The oscillating box with nut is held in a steel bracket riveted to the carriage body. The lower end of elevating screw is protected by a dust tube supported by a band. On the centre of the elevating screw is formed a projecting arm to which is bolted the lower end of a link; the upper end of the link is fastened to a steel sight bracket, the outer end of which is connected to rocking bar sight and the inner end to the steel arc of the range gear.

The elevating screw itself is prevented from turning by the featherways along its length engaging feathers in the manganese bronze oscillating boxes.

Action of Lower Elevating Gear. On turning lower hand wheel the lower elevating nut works the elevating screw up or down, thereby moving the cradle and sights simultaneously.

Q. Describe the independent line of sight.

A. This is secured by having the elevating gear divided into two parts. On turning the lower elevating hand wheel, the elevating screw moves up or down, taking with it the cradle gun and sights, and thus moving the gun through

the angle of sight due to the gun being above or below the level of the target. On turning the upper elevating hand wheel, the upper elevating *nut* moves up or down, taking with it the cradle and gun only, and thus moving the gun through the angle of elevation necessary on account of gravity. When once the angle of sight has been adjusted, it is maintained by the sights independently of any subsequent elevation due to range that may be given to the gun.

Q. Describe the range gear.

A. The range gear consists of the following parts: Cross spindle with spur pinion, adjustable M.B. bush, clock spring, spring barrel with core, drum-shaped spring case, aluminium yard and degree scale ring, jamming plate and two woodite washers. The range gear is actuated by the toothed steel arc (riveted to the inner edge of the sight bracket) which moves in a curved M.B. arc on the cradle. Gearing with the arc is the small spur pinion formed on left end of the horizontal spindle which carries on its outer end the yard and degree scale ring, read by a pointer fixed to the cradle.

Action of Range Gear. When upper right hand wheel of elevating gear is worked the toothed arc remains stationary while the spur pinion, working up or down the toothed steel arc, rotates the gear, thereby registering the range.

Q. Describe the clamping gear.

A. The clamping gear consists of two bearings which support the cross spindle. The spindle is provided with two clutches which engage projections on cradle and lock, the latter to carriage body while travelling. The clutches are put in and out of gear by a handle secured on right hand of spindle outside carriage bracket. Care should be taken that the handle of clutch spindle is always against the stops when not in place at extreme elevation.

Q. Describe the shield.

A. The shield is of flanged bullet proof steel plate. It is in two portions, upper and lower. The upper portion is bolted to axle-tree brackets, and trail and the lower is hinged to the upper. In action the lower portion hangs vertically, but when travelling it folds up under the trail and is secured by a pawl with handle and securing pin. On top of shield are two straight edges which indicate to the No. 1 at the traversing lever the country which can be covered by the traversing gear. Various fittings are attached to the shield for carrying small stores.

Q. Describe the rocking bar sight.

A. The rocking bar sight consists principally of a rocking bar and a sight bar. The rocking bar is pivoted horizontally at the front end to an arm on the left trunnion of the cradle. A bracket is riveted to the underside at the rear end to carry a sight clinometer. An open square socket is formed in the bracket for the reception of a similar shaped projection on the arc bracket of the range gear, by which the reciprocating motion of the elevating screw is conveyed to the bar. The rear end is provided with a crosshead with a traversing screw with milled heads, and a nut which enables 5 degrees of deflection right or left to be given to the sight bar. Degrees of deflection are marked on a scale plate, and minutes in multiples of 5 on a ring fixed to each of the milled heads of the traversing screw.

The sight bar is pivoted vertically about the centre to a socket with an adjustable bush in the rocking bar. The rear end of the bar is fixed to the traversing nut. The nut on the deflection screw is in two parts, having a spring inserted to keep the halves apart; the object of this arrangement is to take up backlash in the deflection gear due to the wear of the screw. Two holders with caps secured by spring clamps are fitted to the bar to carry a "Telescope, sighting No. 4." The rear holder is fitted with a notched leaf hind sight, and the front end of the bar with an adjustable acorn-pointed fore sight. A cap is provided for the protection of the sight. The rocking bar sight is removable, being attached to the trunnion arm by a securing key with a chain.

Q. Describe the sight clinometer.

A. This is used for giving the angle of sight and reads 20 deg. elevation and 20 deg. depression, with micrometer heads giving divisions of 5 minutes. It consists of two principal parts, a cradle and spirit level.

Q. Describe the telescope sighting No. 4.

A. The sight is known as the telescope sighting No. 4. It is of ordinary erecting type, having a field of view of $5\frac{1}{2}$ degs., with a magnifying power of $5\frac{1}{2}$ diameters. It is provided with an object glass, eyepiece and a diaphragm carrying a laying pointer. The object glass is fixed at infinite focus to suit all objects over 400 yards distant. The eyepiece is provided with a milled focussing collar for focussing the eyepiece, and a scale reading from 0-7. Outside the body are two metal collars which fit into the bearings on the sight bar; on the rear collar is a stud which fits into a recess and ensures the pointer being vertical. To focus the

telescope, screw the eyepiece in or out until the pointer stands out clearly, when the object will stand out clearly. At the same time the number on the collar should be noted for future reference. In Mark II telescope, the diaphragm carrying the laying pointer is adjustable. In Mark I corrections are made by object glass being adjustable.

Q. Describe Field Clinometer, Mark III.

A. It consists of a segmental frame of gun metal, nickel plated. The arc is graduated from 0 to 44. To angle of frame an arm is pivoted with gears by means of a spring connection with a toothed rack on inner surface of arc. Each tooth represents one degree. The pivoted arm is graduated in minutes up to 60 and is furnished with a slider carrying an adjustable spirit level, the slider being engraved with an index mark for reading scale on arm; by this means readings up to 25 degrees can be obtained.

Q. Describe how you would use the field clinometer, Mark III.

A. To use the clinometer up to angles of 45 degrees, place the arm to the number of degrees on arc, and on slider to number of minutes required. Place clinometer on gun (seeing that surface is clean) on its longer surface with arc toward rear. For angles of depression proceed in same way but turn the arc towards the muzzle.

Q. Describe Indicator Fuse, Mark III.

A. The fuse indicator consists of a base plate, a slide, a reader, and a slide clamp with stop screws. *The base plate* is made of delta metal and is about $3\frac{1}{2}$ inches long. The *upper portion* of base plate is graduated with a yard scale reading from 1600 yards-6200 yards in divisions of 25 graduated from left to right. *The lower portion of base plate* is graduated with a corrector scale reading from 0-200 in division of twos reading from right to left. Corrector 150 is normal and is enclosed in an oval and marked in red. The slide is graduated with a fuse scale reading from 4.3-22 in 10ths from left to right. The slide can be clamped in any position by the clamp. The yard and fuse scales are read by the reader, the fuses read being those to the left of pointer. There are stops on inside of base plate to prevent the slider coming out. The base plate is grooved in centre to receive the slide, which is kept from coming out by the stop screws. Attached to the reader is a small spring which can be adjusted by a screw to take up any play in the reader due to wear.

Theory: The linear spaces of the yard scale are graduated in proportion to the logarithms of the times of flight.

The linear spaces of the fuse scale are also graduated in proportion to the log. of the time of flight. When the graduation 150 on the corrector scale is opposite the arrow on the slide the length of fuse opposite each range is that which will give an effective point of burst at that range under normal conditions, which are:—barometer 30 inches, temperature 60°F., no wind. Any corrector setting found suitable with any particular range will be approximately correct for all ranges under similar conditions.

- Q. State how you would fill the buffer.
- A. Place gun at extreme depression, remove filling hole plug and unscrew controlling plunger two turns and fill cylinder. When filled, replace filling hole plug and tighten up controlling plunger. The buffer holds about $4\frac{1}{2}$ pints with the 18 pr. and $3\frac{1}{2}$ pts. with the 13 pr. Remove 1-10th of pint with special syringe. Before firing blank the buffer must be full.
- Q. State what liquids can be used for filling buffers.
- A. Mineral oil or any heavy lubricating oil which is not inflammable—glycerine, soapy water, soda and water, pure water. If water is used the buffer should be taken apart and dried thoroughly to prevent rusting. Liquids for winter use are methylated spirits, distilled water, mineral water, mineral oil, or soda and water.
- Q. Explain how the buffer is emptied.
- A. Elevate gun to full extent, slacken filling hole plug, remove control plunger and receive liquid in some suitable receptacle; or it may be emptied from front of buffer by slackening the stuffing box.
- Q. How would you adjust leak in front of buffer?
- A. Elevate gun to some extent, remove dome-shaped cap and piston rod nut. Tighten up packing gland with spanner 121. Replace dome-shaped cap and piston rod nut.
- Q. How would you repack gland?
- A. 1. Remove gland and place the M.B. collar over end of piston rod. 2. Remove stuffing box and rings packing. 3. Force out packing and supporting rings. 4. Replace stuffing box, seeing that the retaining stud engages in its slot. 5. Replace inner supporting ring, flange inwards, and put in packing. 6. Replace outer supporting ring, and the gland; see that retaining studs engage one of the slots.
- Q. What tools are supplied for filling and stripping the buffer?
- A. Funnel, syringe, spanner, apparatus adjusting running out springs, collar and plug, tool packing gland, tool withdrawing packing.
- Q. How is the breech closed?

- A. The gun having been loaded, breech is closed by a reverse movement of lever breech mechanism. As lever is moved toward the left, the breech screw and carrier are swung together until former enters the breech ring and carrier bears against the face of breech ring. By this movement the cartridge case is pressed into the chamber, carrying the extractor with it, and the catch retaining breech screw is forced into recess in carrier, leaving screw free to revolve. At same time, the firing lever of mechanism engages the trigger in the gun. The further movement of lever now causes the bevel teeth of lever to act upon those of breech screw and revolves it through one-fourth of a circle, bringing the featherways in screw opposite feathers on striker. The lever is now in the closed position and is there retained by its catch entering recess in carrier.
- Q. What are the safety arrangements in the breech mechanism?
- A. The gun cannot be fired until breech is properly closed because the projections of the guide for main spring are in contact with breech screw and the feather on right side of the striker is not opposite the featherway in screw.
- Q. How do you gauge the protrusion of the striker?
- A. To gauge protrusion, open breech, press the catch retaining breech screw and turn the screw to the locked position in carrier, remove the hinge bolt and lever breech mechanism, take out firing mechanism, remove guide for main spring with main spring, replace striker body with firing pin, press it forward as far as it will go, apply the gauge to front face of breech screw. The amount of protrusion must be not less than 0.09 inch nor greater than 0.11 inch.
- Q. When is a gun fired by means of a lanyard?
- A. When the firing lever of carriage will not work, or when firing the first round on very hard ground.
- Q. How would you remove the breech fittings?
- A. Open breech, remove split pin and hinge bolt of lever breech mechanism, striker guide block with striker; press in catch retaining breech screw, unscrew breech screw from carrier, remove split pin and hinge bolt with carrier; also split pin and hinge bolt with extractor.
- Q. Explain why guns fail to return to the firing position.
- A.
1. Weak or broken spring.
 2. Packing gland being too tight, or dirt in the control plunger recess.
 3. Want of cleaning or lubricating of gun wings or grooves of cradle, or on account of their being burred.
 4. Bending of gun wings.
 5. Too much oil in buffer.

6. Broken inner spring case.

- Q. Name the principal parts of the limber carriage.
- A. It consists of a steel frame, limber hook and key, platform board, foot board, axle-tree, wheels 45 C, 2 swingletrees, pole bar supporting, fittings for draught and ammunition box. The limber for the wagon is similarly constructed.
- Q. Name the principal parts of the ammunition wagon.
- A. Steel frame, perch with perch eye, platform board, foot board, axle-tree, wheels 45 C., brake, ammunition box in 3 parts.
- Q. Give the number of rounds of ammunition carried with gun limber, wagon limber and bodies.
- A. 24 in each gun limber, 38 in each wagon limber, and 38 in each wagon body.
- Q. What are the causes of breech jamming?
- A. 1, loose primer; 2, burred driving band; 3, burred breech screw or ring; 4, dented cartridge case; 5, want of oil; 6, grit in screw threads; 7, weak or broken main spring; 8, jammed rebound block; 9, broken torsional spring in trigger; 10, stud on back of guide for main spring worn; 11, layer may unconsciously press firing lever and when breech is closed part 2 of trigger gets burred up.
- Q. What precautions should be taken in case of breech jams?
- A. See that striker is flush with the end of striker guide block before force is used to open breech. In case striker is not flush, remove the L.B.M. and striker complete. Replace L.B.M. and hinge bolt and swing breech screw and carrier into loading position. Examine the various breech fittings and exchange damaged parts. Replace striker.
- Q. Where are the following parts carried?
- A. Spare striker—in case on shield.
 Claw hammer—in tool case, rear of shield.
 Packing rings—tray, small stores.
 Spade—right tensile stay.
 Dial sight—on right side of shield.
 Piasaka cleavers—in front end of trail.
 Spanner No. 93—in case, side of ammunition box, 1 per subsection.
 Field clino—on rear of shield.
 Adjusting collar—tray small stores, one per subsection.
 Spare pole bar—on platform board, 1 per subsection.
 Swingletree—on platform board.
 Spare pole—under perch, 1 per subsection.
 Drag washer—under footboard, near side.
 Filling hole plug—tray small stores.
 Gauge striker protrusion—leather case on shield.
 Firing pins—in case on shield.

Catch retaining breech screw open—in case on shield.

Apparatus adjusting running out springs—on platform board, 1 per battery, A subsection.

Firing hole bush—tray of wagon box.

Q. How would you disable your gun?

A. 1, Put a hole in the hydraulic buffer with pick or bullet. 2, Remove breech mechanism. 3, Burr the breech screw, ring or elevating screw. 4, Smash *all* the sights.

Q. How is play taken up in feet of spokes?

A. With spanner No. 93; tighten up nut pipe box, thus squeezing flanges together. Then tighten up nave bolts little by little in rotation.

Q. How is play taken up in the pipe box?

A. Turn the adjusting collar and put lynch pin in a shallower groove.

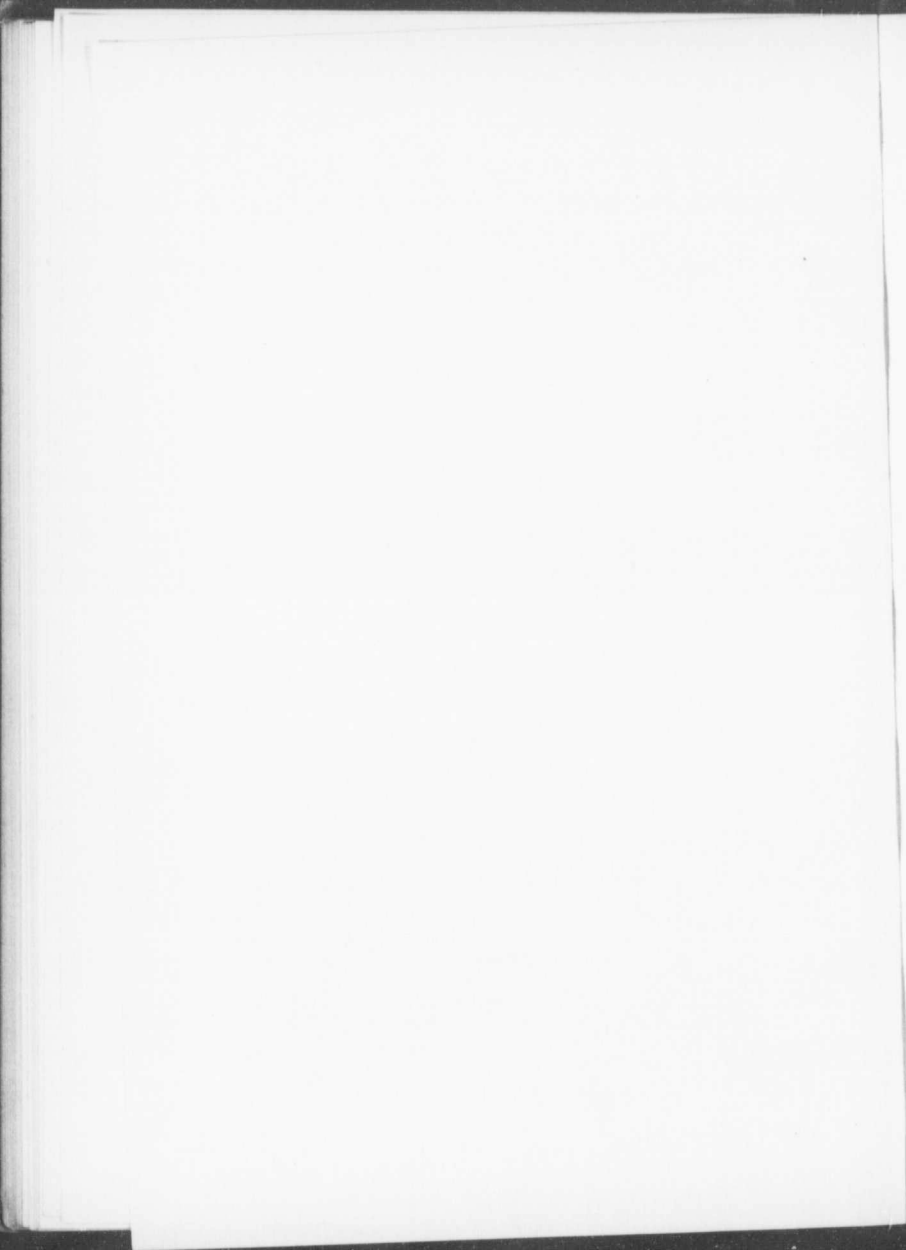
Q. How is a broken spoke replaced?

A. Remove dust cap, loosen nut pipe box and nave bolts. Remove damaged section of spoke at nave by taking the bolt out and withdrawing it. Saw the outer section off at the fellos or cut a V-shaped notch in spoke and drive it out. Replace with spare spoke which is flush at the outer end, not having the tongue which fits in the groove in the felloe.









CHAPTER IV

GUNNERY.

GUNNERY

Is the science of directing a projectile so that it will strike a certain object.

RANGE

Is the distance to the second intersection of the trajectory with the line of sight, or is the distance from gun to target.

TERMS APPLIED TO RANGES:

	Rifle yards	Field Artillery yards	Heavy Artillery yards
Distant	2800-2000	6500-5000	10000-6500
Long	2000-1400	5000-4000	6500-5000
Effective	1400- 600	4000-2500	5000-2500
Close	600-under	2500-under	2500-under

An 18 Pr. Q.F. gun is sighted to 6,200 yards. A rough rule to find the time of flight of an 18 Pr. Q.F. shell is to multiply the number of thousand yards of range by 3. Result is time of flight in seconds. This is fairly accurate for ranges over 3000 yards.

RANGE FINDING

Is measurement of distance in yards to target by mechanical means, i.e., use of instruments.

TRAJECTORY

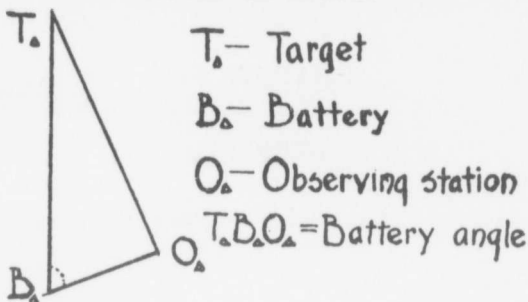
Is the curve described by shell in flight from gun to first point of impact.

LINE OF FIRE:

Line joining muzzle of gun to target.

BATTERY ANGLE

Is the angle formed at the battery by imaginary lines drawn from the battery to target and to observing station thus: TBO.



DANGEROUS SPACE

Is horizontal distance in which trajectory would catch a given vertical target.

DRIFT

Is the constant lateral deflection or deviation of the shell, due to the rotation imparted by the rifling in the bore.

The 18 pr. has a right hand twist which gives right hand drift.

The drift in the 18 pr. Q.F. is counteracted by having the axis of the left trunnion one-half inch lower than the right.

In learning angles, and lines forming angles, which are met with in practice, it is of assistance to remember the letters D. A. S. H. and the sentence Just Put Down Each Question Separately, in connection with the diagram on page 71.

D. Departure: The line of departure is a tangent to the trajectory as the shell leaves the muzzle.

A. Axis of the gun, is an imaginary line passing down the centre of the bore.

S. Line of sight, is a straight line passing through the sights of the telescope to the target.

H. Horizontal plane, is a tangent to the earth, and could be represented as a lake.

The following sentence will be found useful in helping to remember the angles formed at the gun, "Just Put Down Each Question Separately."

Just - Jump.

Put - Projection.

Down - Departure.

Each - Elevation.

Question - Quadrant angle or angle of quadrant elevation.

Separately - Angle of sight.

Angle of Descent: The angle which the trajectory makes with the line of sight at the point of their second intersection.

Angle of Incidence: The angle which the trajectory makes with the normal to the surface struck.

Angle of Arrival: The angle which the trajectory makes with the horizontal.

Windage is called the escape of gas from the rear. The copper driving band on the 18 pr. assists in preventing windage, the grooves being filled by the copper driving band.

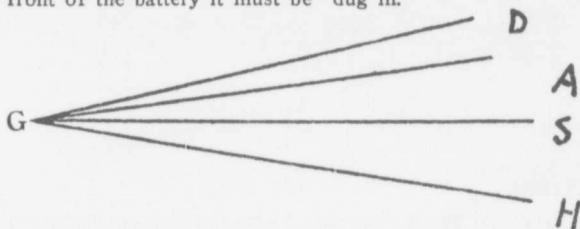
Aiming Point is some conspicuous object from which lines of fire can be obtained and on which the guns lay from round to round.

An Ideal Aiming Point is one in prolongation of the line of guns, or at an infinite distance in front or rear, and must be at least as far away as the target.

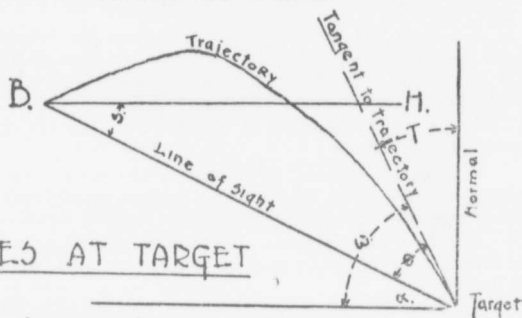
An Auxiliary A. P. is one selected by the gun layer after he has line of fire. He uses this A.A.P. to lay on from round to round. It should be as far away as possible, preferably in front.

A Reference Point is a well defined object selected by the battery commander to describe targets or objects from an aiming point and must not be confused with latter.

A good Observation Station is one as close to the battery as possible, where it can be controlled by voice. It must not be in the danger angle or even likely to be, should a switch be ordered. It should be to windward of the battery with a clear view of the target, and as much more of the enemy's country as possible. If in front of the battery it must be "dug in."



- J—Jump=angle DGA.
- P—Angle of projection=DGS.
- D—Angle of departure=DGH.
- E—Angle of elevation=AGS.
- Q—Quadrant angle=AGH.
- S—Angle of sight=SGH.



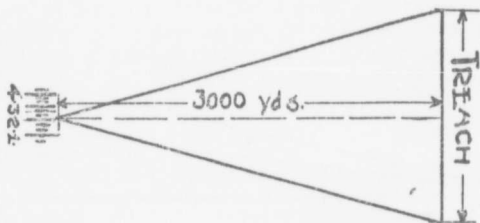
ANGLES AT TARGET

α . = θ = Angle of sight.

θ . = Angle of decent i.e. angle between line of decent & line of sight at point of second intersection.

ω . = Angle of arrival.

T = Angle of incidence



CALIBRE:

Calibre of gun is diameter of bore in inches, *measured across the lands.*

CENTREING:

A shell should be so centred that it should rotate on its longer axis, which should coincide with the axis of the gun at the moment the shell leaves the bore. If the shell is not properly centred it will be unsteady and noisy in flight.

VELOCITY:

Muzzle velocity is speed of projectile in feet per second on leaving muzzle. M.V. of 18 Pr.=1610 ft. per second.

REMAINING VELOCITY

Is velocity of projectile at any point in its path.

STRIKING VELOCITY

Is velocity of shell on impact.

There are 375 bullets in M. II and III 18 Pr. shrapnel shell. The bullets weigh 41 to the pound and must have a striking energy of 60 ft. pounds to be effective or a striking velocity of 400 ft. per sec.

$$\text{Energy} = \frac{W}{2G} \frac{V^2}{41 \times 64} \text{ or } \frac{V^2}{41 \times 64} = 60 \text{ whence } V=400.$$

RIFLING

In 18 Pr. is polygroove, and uniform, 1 complete twist in 30 calibres. Rifling is used to increase the accuracy of fire and thus enables the use of an elongated projectile.

BALLISTIC COEFFICIENT:

$$C = \frac{W}{nd^2}$$

C —is ballistic coefficient of gun.

W —is weight in lbs. of projectile.

N —is a factor=KST (kappa, sigma, tau).

d —is diameter in inches.

K —is factor depending on shape of head.

S —is coefficient of steadiness and is taken as 1, unless otherwise stated.

T —is coefficient of tenuity, depending on barometer and daily factors, incl. temperature.

FORCE OF GRAVITY:

$\frac{1}{2} gt^2$ =dist. fallen in certain time.

$\frac{1}{2} 32 1 = 16'$ 1 sec.

$\frac{1}{2} 32 4 = 64'$ 2 sec.

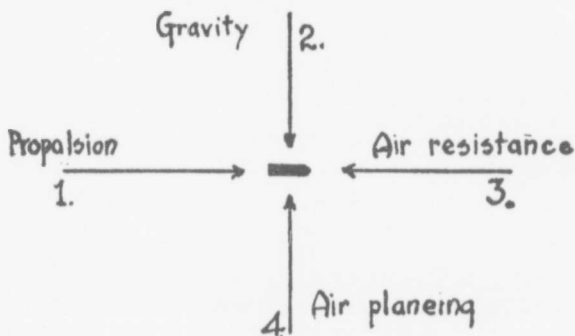
$\frac{1}{2} 32 9 = 144'$ 3 sec.

$\frac{1}{2} 32 100 = 1,600'$ 10 sec.

$\frac{1}{2} 32 400 = 6,400'$ 20 sec.

Forces acting on a shell in flight are:

1. Propulsion.
2. Gravity.
3. Resistance of Air.
4. Air Planeing.



Planeing is due to the resistance of the air to revolving motion—air cushioning.

It acts against G and sometimes reduces it from 32.2 to 26.

NATURE OF ARTILLERY FIRE:


There are five natures of artillery fire:

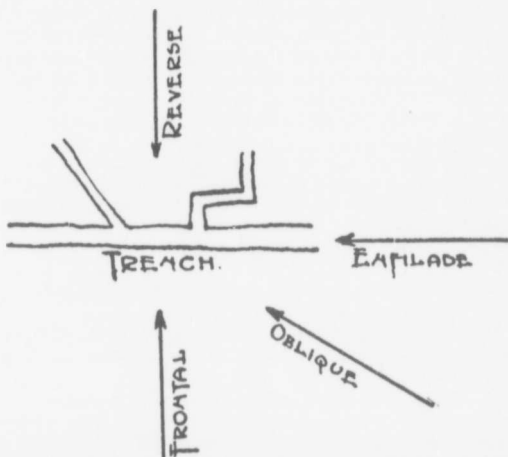
1. High angle, in which angle of elevation exceeds 25° .

2. Enfilade: 

3. Frontal: 

4. Oblique: 

5. Reverse: 



Note: These are the *natures* of fire, not the *kinds* of fire).

GIVING ELEVATIONS

Is described as tilting gun so as to allow for the curve of trajectory or to fire the shell as much above the target as the shell would fall below if it had been fired on the level.

LINE OF FIRE

Is the *straight line* joining muzzle and target.

LAYING:

A gun is said to be laid when by elevating and traversing its axis, it is made to point in the required direction.

Elevating is always done by mechanism, traversing is done partly by mechanism and partly by hand.

There are two important factors in good laying: **ACCURACY** and **RAPIDITY**.

Direct laying can only be employed when the target is visible over or through the sights.

The elevating mechanism of the 18-pounder Q.F. is so designed that after the sights have been directed on the target, the axis of the gun can be moved independently of the sights, and inclined in a vertical direction at any angle to the line of sight, which remains directed on the target. So, once the sights are laid on the target, any elevation can be given for range, without having to relay the gun.

The angle at which the axis of the gun is inclined to the line of sight, and the range due to it, is shown on the range indicator on the right side of the gun and is known as elevation.

DIRECT LAYING:

Laying through or over the sights on the target is called Direct Laying.

The advantage of Direct laying is that when the gun is laid, the correct angle of sight is automatically included, and complications will not arise in determining the corrector settings or the length of fuze.

The disadvantages of direct laying are:

1. Personal error of the layer.
2. Difficulties due to light and distance (such as shimmering, due to heat waves, etc.).
3. When telescope sight is used, we have the disadvantage of slowness, over-laying and difficulty in picking up target on account of the small field of view.

When laying with open sights, in order to obtain uniform results one method should be strictly adhered to. The service method of laying a gun is to direct it so that the centre of the imaginary line joining the two highest points of the notch of the hind sight, the point of the fore sight, and the target, are in a line.

The gun should be approximately laid before looking over the sight, and the laying should then be completed by depressing the gun and sights onto the target so as to avoid any error due to play of the elevating gear.

The distance of the eye from the sight should be the same from round to round.

When laying direct, *the sight clinometer should be set level at the earliest opportunity.* This enables the laying for elevation to be checked, or a change from direct to indirect laying to be made, should the target become obscured from any cause.

F.A.T. says direct laying should be used at medium ranges (up to 3,500 yards), and against moving targets; but we are told in "Notes from the Front" that indirect laying is the usual method used.

INDIRECT LAYING:

Indirect laying is the normal method employed in the field. It can be used whether the target is visible over the sights or not. If for some reason it is necessary to change from direct to indirect laying, the order "Indirect" must be given, and the layer must immediately pick up an auxiliary aiming point to lay on for direction.

In indirect laying you lay on the target by means of aiming points, auxiliary marks or the target itself, for direction; and you get elevation from the clinometer.

To get the proper elevation, the sight clinometer is set at the angle of sight given (this is often taken from a map). Then the range ordered is put on the drum of the range gear, and the gun is elevated and then depressed until the bubble is level.

With a field clinometer, which is not adjustable, the angle of sight is added to the elevation, due to the range, and the bubble levelled.

The angle of sight plus the angle of elevation equals the quadrant angle and when put on the field clinometer is known as quadrant elevation.

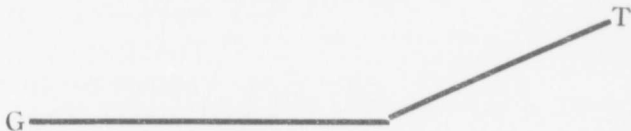
The advantages of indirect laying are:

1. The personal error of the layer is eliminated.
2. Light and distance do not affect accuracy.

The disadvantages are in not being able to deal with fleeting opportunities, and in the fact that if the angle of sight has not been accurately measured and allowed for, the range shown on the drum will not be the true range, and complications will arise in determining the corrector setting or length of fuze.

If the angle of sight is over-estimated, you get a long corrector, and if under-estimated a short corrector.

To take the example given in F.A.T., page 175, let the range from G to T (gun to target) be 3,900 yards;



suppose the true angle of sight is— $2^{\circ} 45'$ elev.

suppose the angle ordered— 2° elev.

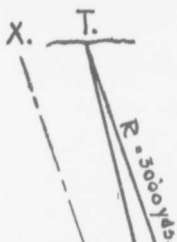
Now, if we put 2° elevation on the gun by means of the sight clinometer, and 3,900 yards on the range drum, we will be short of the target, and we must increase the range so as to compensate for the $45'$ elevation, which was incorrectly omitted, i.e., our range would be 3,900 yards plus $45'$, which would show up on the range drum as 4,150 yards.

The battery commander, being unaware of the incorrect angle of sight, will have the fuzes set for 4,150 yards, with the corrector ordered, and all grazes may be expected. The fuze required was, of course, 3,900 yards. Therefore, the corrector setting obtained will not be a true one for the day, nor will the range be true.

Great care must therefore be taken in reading angle of sight.

ANGLE OF DISPLACEMENT OR DISPLACEMENT ANGLE :

When the battery leader is unable to place his director in or quite near to the line of guns, a correction known as single displacement becomes necessary to compensate for difference in the angles between the aiming point and the target, measured at the director and the battery respectively.



The correction is given to all guns in such a way as to bring the lines of fire towards the director.

T —Target

D —Director or observation station.

B —Battery.

P —Aiming point.

BD—Base, 300 yards.

BT

or

DT—Equal range—equal 3,000 yards.

NOTE —
DIAGRAM IS
DRAWN TO SCALE



Battery commander observes or measures angle PDT: but if he sends down this angle (which in this case is $64^{\circ} 30'$) to battery, they will sight on P, and turn this angle; then their line of fire will be along the line BX, i.e., X will be as much to the left of target as B is to the left of D. They must therefore turn an extra amount to come on the target.

The guns must be turned through at an additional angle, XBT, which equals BTD. Note carefully that this correction or displacement angle is always given to the guns so as to bring the lines of fire towards the director or observation station. If the observation station were on the left of B, the displacement angle would have to be deducted from TDP. This is important, but can easily be seen by making sketch similar to the one above. *A handy rule to remember is: when O.S. is on same side as aiming point, deduct displacement; when on the opposite side, add.*

There are a number of simple rules for finding the displacement angle. Some are more or less approximate, but are sufficiently accurate for the purpose. The simplest, and the one most used, for calculating the displacement angle, is:

$$D = 6/10 \times \frac{\text{Base in yards.}}{\text{Range in hundreds of yards.}}$$

OR

$$D = 60 \times \frac{\text{Base in yards.}}{\text{Range in yards.}}$$

D = Displacement angle.

6/10 = fraction derived from the Gunner's Rule.

Base = Distance from battery to observation station.

Range = Distance from O.S. to target.

This rule is obtained from what is known as the "gunner's rule."

GUNNER'S RULE:

One inch at every hundred yards subtends at angle equal to one minute, and so on in proportion.

i.e., One inch at thirty-six hundred inches subtends 1 min.

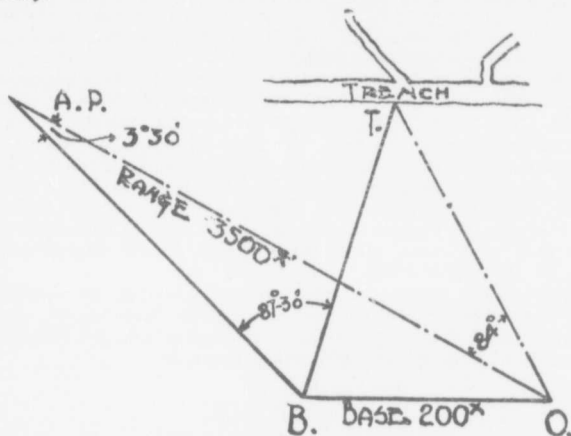
One inch at one inch subtends 3,600 mins.

B inches at R inches subtends $\frac{3600 \times B}{R}$ min.

i.e., Base (B) at Range (R) subtends $\frac{60 \times B}{R}$ degrees.

Example: Suppose our base is 200 yards, the range, 3,500 yards, and the angle at the observing station between the aiming

point and the target is 84 degrees. The observing station is on the right of the battery and the aiming point on the left of the battery.



Then displacement angle is $\frac{6/10 \times 200}{35} = 3^\circ 30'$.

Then if the battery lays on the aiming point, the angle that must be turned through in order to reach the target is $84^\circ +$ plus $3^\circ 30' = 87^\circ 30'$.

If the observing station and the aiming point had been on the same side of line joining the battery to target, the proper angle would have been $80^\circ 30'$.

Another rule for displacement:

- At 2000 yards, 3° per 100' base.
- At 3000 yards, 2° per 100' base.
- At 4000 yards, $1^\circ 30'$ per 100' base.
- At 5000 yards, $1^\circ 10'$ per 100' base.
- At 6000 yards, 1° per 100' base.

DOUBLE DISPLACEMENT:

When the observing station is some distance from the battery, the switch angle, measured to a new target, will usually differ from that required at the guns. This difference is known as "Double Displacement." There are several methods of working this out, but the usual one is to switch over one gun

through the estimated angle to the new target, correct its line by observation of fire, and when line is correct, to order parallel lines to that gun.



GUNNER'S RULE:

To deduce the "Gunner's Rule" and an exact rule for displacement angle, requires a slight knowledge of trigonometry.

A radian is the angle subtended at the centre of a circle, by an arc equal in length to the radius. The angle at the centre of the circle in the above sketch is a radian. A radian is $57^{\circ} 20'$ (approx.), i.e., the whole circle is 360° .

The whole circumference is $2\pi R$.

Therefore if $2\pi R$ subtends 360° ,

$$\begin{aligned} \text{then } R \text{ subtends } \frac{360^{\circ}}{2\pi} &= \frac{360}{6.28} \\ &= 57.3^{\circ} \\ &= 3438' \end{aligned}$$

If 100 yards (3,600 in.) subtends 3,438' at 100 yards,

then 1 inch subtends $\frac{3438}{3600}$ at 100 yards.

This fraction practically equals one minute.

So we get the "Gunner's Rule": 1 inch subtends 1 min. at 100 yards.

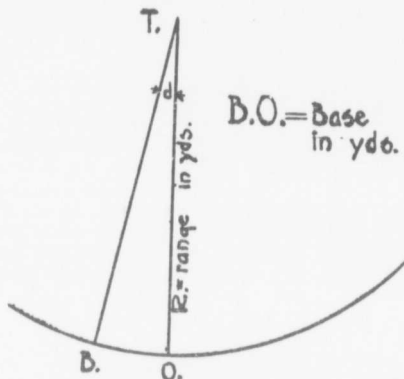
The gunner's and the 6-10 rule, are accurate enough up to 6° .

Now in circles of very large radius, a small chord may be taken as equal to the arc which it subtends, as in the figure on the next page.

So, if 3438 min. subtends an arc or chord equal to the radius, we can interpolate:

3438 min. subtends	R yards
1 min. subtends	$\frac{R}{3438}$
D min. subtends	$\frac{R \times D}{3438}$ yards

or Reducing this to feet, we get $\frac{R \times D}{1146}$ ft.



On the diagram on this page,

R = radius = range.

D = displacement angle.

BO = Base, or is the chord or arc subtended by angle "D" at centre.

Therefore

$$\text{Base} = \frac{R \times D}{3438} \text{ yds.}$$

$$\text{Displacement angle ("D")} = \frac{\text{Base} \times 3438}{\text{Range}}$$

Thus, to take the same example as we had before, where base is 200 yards and range 3,500 yards, we get "D" equal

$$\frac{200 \times 3438}{3500} = 196.5' = 3^\circ 16'.$$

RULE FOR CORRECTION FOR DIFFERENCE IN LEVEL WHEELS:

Multiply the difference in level of wheels in inches, or degrees, by number of degrees found on the rim of the range drum corresponding to the range at which you intend to fire. *This will give you the deflection in minutes to be put on the sight towards side of the HIGHER WHEEL.*

CAUSES AFFECTING THE ACCURACY OF SHOOTING:

1. Varying effect of charge.
 - (a) Incorrect weighing.
 - (b) Variation of strength of cordite.
 - (c) Variation of state of atmosphere.
 - (d) Variation in space occupied by the cartridge in bore (loading density).
2. Force and direction of wind.
3. Trail not being properly supported.

The effect of an individual shrapnel depends upon:

1. Number of bullets.
2. Energy of bullets on impact.
3. The spread of the bullets.
4. Size of target.
5. Curve of trajectory or the angle of descent.

FUZE INDICATOR:

The object of the fuze indicator is to give the correct fuze setting for effective point of burst at any range when once the instrument has been adjusted for one range.

Deflection to be allowed for targets moving across line of fire: At the walk, 20'; at the trot, 40' at the gallop, 1°.

Deflection to be allowed for wind blowing across the line of fire:

- Wind very strong—15' per thousand yards range.
 Strong—10' per thousand yards range.
 Fresh—7' per thousand yards in range.
 Moderate—5' per thousand yards in range.

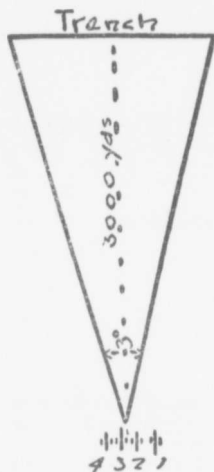
Concentration or distribution of fire:

At 2000 yards, 60 yards measure.....	1 deg. 45'
3000 " "	1 deg. 10'
4000 " "	50'
5000. " "	40'
6000 " "	35'

The following table shows the approximate difference in corrector settings necessary to effect an alteration in height of burst at various ranges:—

To raise height 10 minutes.

2,000 corrector.....	11
3,000	7
4,000	5
5,000	4
6,000..... .	3



At 3,000 yards range, a battery (frontage 60 yards), will cover $1^{\circ} 10'$. Suppose our target is a trench which subtends 3° at battery.

In order to cover our target it will be necessary to distribute our fire 3° less $1^{\circ} 10' = 1^{\circ} 50'$ or $110'$. The individual guns distribute $110' \div 3 = 35'$ from each other.

The order would be: All guns distribute $35'$ from number 2.

No. 2 gun straight

No. 1 gun $35'$ more right.

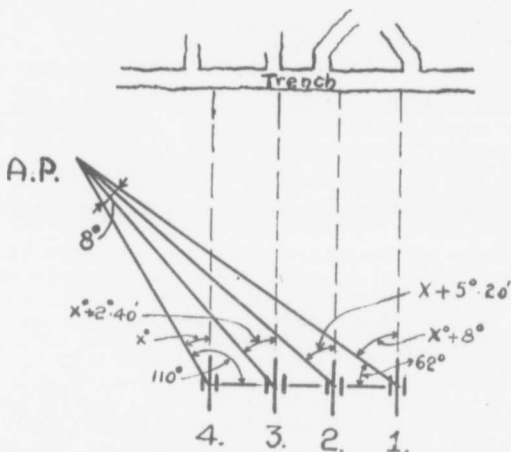
No. 3 gun $35'$ more left.

No. 4 gun $70'$ more left.

PARALLELISM

Correction for parallelism is always necessary except when an aiming point is absolutely at right angles to the guns, or when the aiming point is directly in front or rear of battery and further away than the target.

It is very important that lines of fire of the guns of a battery should be parallel when first laid out and every effort should be made to attain this object. The battery commander will then have definite lines from which to make his calculations, and should be able to switch his guns from one target to another without losing the parallel lines of fire. Parallelism is always necessary when aiming point is selected closer to the guns than the target. Rule for obtaining parallelism: After Nos. 1 and 4 guns have laid on the aiming point at the angle ordered, they will swing dial sights onto each other and give the reading of each to the S.C.; he adds them together and deducts from 180 degrees, and gets apex angle which is total amount of distribution required for the battery. Dividing this by 3 will give amount of distribution per gun. (See sketch following.)



The angle measured at No. 4 gun = 110° .

The angle measured at No. 1 gun = 62° .

Then $110^\circ + 62^\circ = 172^\circ$,

$$\begin{array}{r} 180 \text{ degrees} \\ \text{less } 172 \text{ degrees} \\ \hline \end{array}$$

8 degrees

$8^\circ \div 3 = 2^\circ 40'$. The order would be: $2^\circ 40'$ (distribution if A. P. is in front, and concentration if A.P. is in rear) from a named gun. (No. 4).

No. 4—fires straight.

No. 3— $2^\circ 40'$ more right.

No. 2— $5^\circ 20'$ more right.

No. 1— 8° more right.

This will bring all lines parallel to No. 4.

ROUGH RULE:

To find the number of minutes concentration or distribution of gun, divide the angle between the line to the aiming point and the line of guns by the number of thousands of yards to the aiming point.

CLOSE SUPPORT:

Is the term used when the guns are right up in or just behind the infantry line.

To find fuze for close support:

You take as a basis a range of 2,500 yards, and a fuze 7.5.

You then subtract .3 for every hundred yds. less, down to 200,

OR

Divide number of hundred yards in range by 4, and add 1.

For ranges of 2,000 and less, which includes cavalry attack, divide number of hundred yards in range by 4.

For cavalry attack, the order usually given is $1\frac{1}{2}$ load (say R equals 600 yards).

To ascertain the lowest elevation at which your guns would clear the crest:

Open breech, elevate or depress gun with lower elevating wheel until bubble of sight clino. is level, then elevate or depress gun with UPPER elevating wheel, until lowered part of base clears crest. No. 1 then reads off the elevation on range drum, then makes a liberal estimate of the distance to the crest and adds this to the range on the drum and reports the result to the S. C.

If an angle of sight is ordered, place angle on sight clino., elevate or depress with lower elevating wheel until the bubble is level, and then turn upper elevating wheel till bore clears lower part of crest, etc.

Q. The target is 200 ft. above battery. Range is 4,000 yds. You are 300 yds. to left flank of your guns. The target 2 degrees and 30 minutes wide. You read on your director 79 degrees. What is the angle of sight, battery angle, right or left displacement angle, the distance for each gun necessary to cover target? Your direction is low on left flank of target.

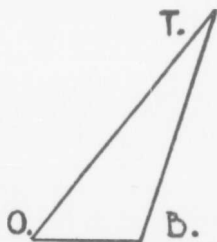
Methods of laying with 18 Pr.:

DIRECT: Open sights, direct telescope, direct dial.

INDIRECT: Dial sight.

METHODS FOR OBTAINING ANGLE OF SIGHT:

The following are methods for obtaining Angle of Sight:



$$1. \text{ A. of S.} = \frac{A^1 \times BO + A^2 \times OT}{BT}$$

where T is the target, B the battery, O the observer.

A^1 is angle of sight from B to O.

A^2 is angle of sight from O to T.

Angles of elevation are read plus.

Angles of depression as minus.

2. By means of the map and the formula $H = \frac{MR}{1146}$

H=position of target above or below battery.

M=angle of sight

R=range in yards from target to battery.

1146=factor.

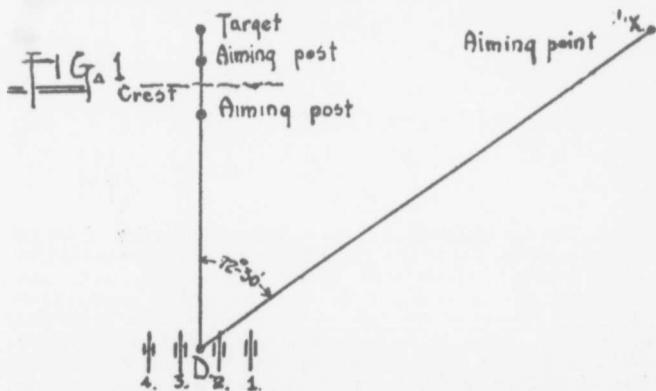
3. The angle of sight instrument.
4. The angle of sight attachment on the No. 3 director.
5. Angles of sight can be measured by laying the gun over sights on target (note when visible) and bringing clinometer level by turning the worm spindle until the bubble is level, but do not alter gun.

CAUSES FOR SHELLS BURSTING AT IRREGULAR HEIGHTS:

1. Sight being slightly out of adjustment.
2. Want of exact precision in use of glass when adjusting sights.
3. Development of increased play in equipment.
4. Bubble not being accurately centred before firing.

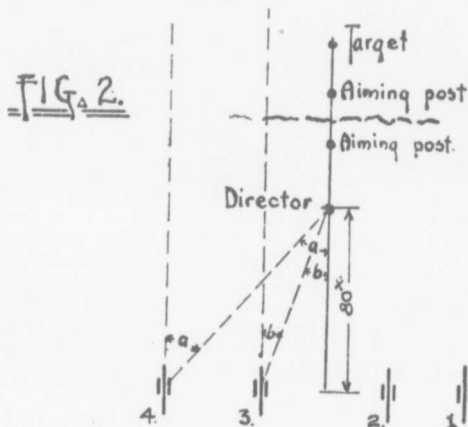
METHODS OF GIVING ANGLE TO GUNS BY MEANS OF DIRECTOR.

1. The battery leader sets up his director as near to gun platform as possible and in line with the aiming posts. Picks up an aiming post and gives lines of fire to each gun with necessary correction for parallelism.



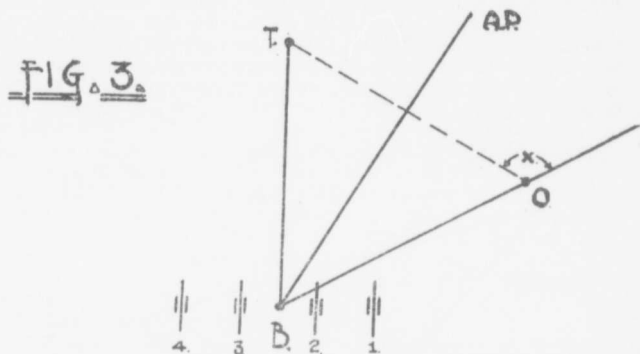
The director in battery is clamped on aiming posts at zero, swings to aiming point reading angle TDX (say $72^{\circ} 30'$). Order: Aiming point, windmill, all guns $72^{\circ} 30'$ left, 20 minutes distribution (in front) concentration (in rear) from No. 2 or 3 gun. If No. 2 has been the named gun, then No. 2 puts on $72^{\circ} 30'$ (brass) on the No. 7 dial sight, lays on the windmill. It will then be in the line of fire. As Fig. 1 shows the aiming point in front, distribution will be necessary. No. 1 gun puts on $72^{\circ} 30' - 20' = 72^{\circ} 10'$ left, lays on aiming point and brings gun in line of fire. No. 3 gun puts on $72^{\circ} 30' + 20' = 72^{\circ} 50'$ and lays on aiming point. No. 4 puts on $72^{\circ} 30' + 40' = 73^{\circ} 10'$ and lays on aiming point. See Fig. 1.

2. The battery leader 80 yards in front of guns clamps director at zero, backsight foresight in line with aiming posts. Then sights on each gun foresight, backsight giving the individual angle. The readings in front of the battery are always small.

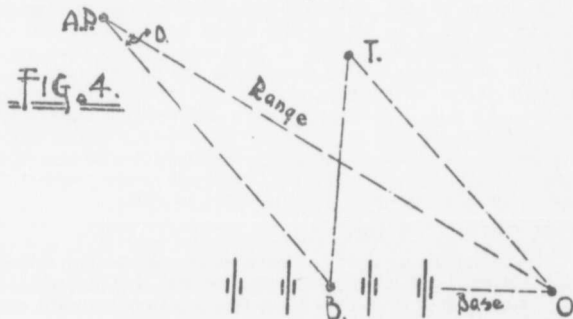


The director 80 yards. in front is clamped in the line of fire on aiming posts (the line is also obtained from an aiming point) backsight, foresight. Then walk around director and read foresight, backsight, on each gun, i.e. angle $b = b'$ angle $a = a'$. Then No. 4 gun puts on a° left, lays on the director and is in the line of fire. No. 3 puts on angle b , lays on director, and so on for No. 2 and No. 1 guns. When all the guns have obtained the line of fire they will pick up an auxiliary aiming point if the director or peg is not to be left in front. See Fig. 2.

3. Giving the lines of fire when the B. L. is 80 yards in rear is similar to No. 2 method, except, when the director is clamped on target backsight foresight, it is swung foresight backsight and the large angle read to each gun.



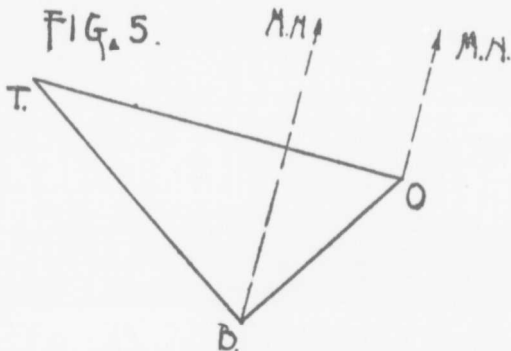
4. Laying out the lines of fire by means of two directors:
 The director at O set up at 180° sights on T and swings to B thereby measuring the exterior angle "x." The exterior angle minus the displacement angle BTO = the battery angle. The director in the battery puts on this angle, lays on O, swings to zero and is in the line of fire. The director in the battery then picks up an A.P. and gives angle ABT to all guns with distribution from No. 2 or 3 gun. See Fig. 3.



5. Laying out Lines of Fire when the B.C.'s observation station is to a flank:

When the A.P. and O are on the same side of the B.T. line the displacement angle at the A.P. is subtracted. When on the opposite side it is added.

The B.C. reads angle TOA on his director, works out his displacement angle "D" and in this case adds it to TOA. The new angle is sent down to the battery. The B.L. puts this angle on his director, lays on A.P., swings to zero and is in the line of fire. See Fig. 4.



6. Laying out Lines of Fire, getting magnetic North from compass on the No. 3 director:

Fix compass on director, nick on needle to foresight, director at O, clamps at zero, sights on target, and swings to Mag. North, reading MOT. The Mag. North being on the same side of BT as O the displacement angle at T is subtracted. Then the angle MBT is sent down. The director in the battery puts on angle ordered, sights on M. N. and swings to zero, and is in the line of fire. An A.P. is now picked up and lines of fire given to each gun. See Fig. 5.

Note: The lines of fire may be obtained from a map by means of a prismatic compass. The displacement angle is always added since the compass bearing reads to 360° .

THE OBJECT IN PREPARING FOR ACTION:

It minimizes as much as possible the pause that takes place after the guns are unlimbered until the first shot is fired.

The sequence of orders from receipt of orders until ready to open fire, (Chap. 9, F.A.T.) is:—

As soon as the B.C. receives orders to engage a certain target, he orders, "Fall Out Headquarter Party." The B. C. will then read his orders loud enough if possible to be heard by the whole battery. The officers will have maps spread out in front of them. The orders to the battery are: "I have been ordered to engage (infantry entrenched, guns concealed, etc.) in the direction of ———. The general direction of which is there" (points with his arm in direction of target). "We will come into action under cover and we are under no circumstances to expose our position. The Sergeant-Major or Jumbo, etc., will accompany me in my reconnaissance. Mr. ——— (battery leader) will lead the battery." The B. C. will now give any individual orders he may deem necessary. His final order will be, "Prepare for action, uncover ——— rounds." B.C. then rides away to locate target, then moves up and selects gun platform, selects observation station, then sends for assistant officer. The latter sets up instrument at battery. B.C. director man swings 120 degrees from battery to establish danger angle.

(a) Then takes range. Range taker takes three observations and gives mean.

(b) Sends down the battery angle.

(c) Angle of sight.

(d) Then sends down ranging, i.e., right ranging.

Nature of shell—percussion or corrector.

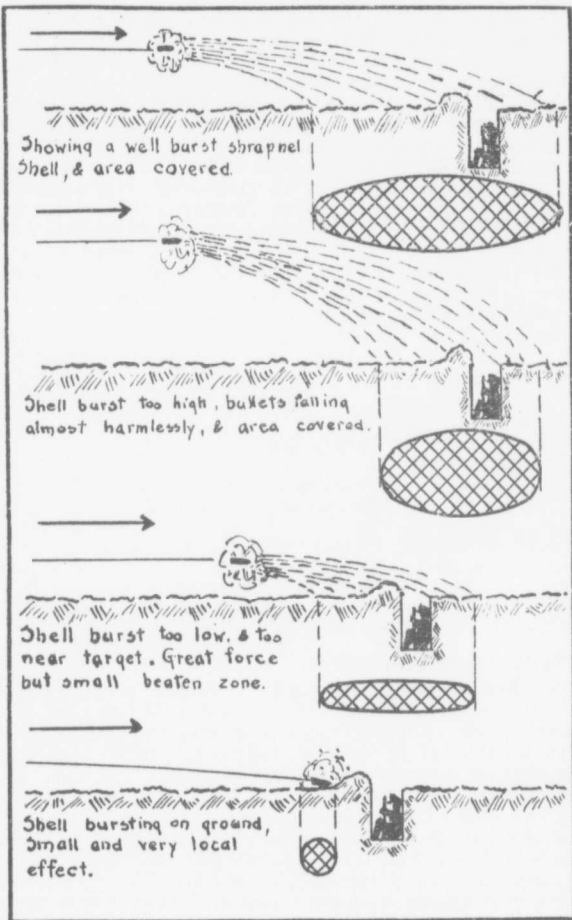
DANGER ANGLES:

In battery, when the guns form a lesser angle than 45° with the gun on their right or left. The section commander is responsible that his guns are not in the danger angle at O.S. The angle T.O.B. must be less than 120° .

SYSTEMS OF RANGING:

The British system of ranging is known as the Bracket system, i.e. enclosing the target in a series of brackets. First the long or 300 yd. bracket, then shortening this bracket to 200 yards until the 100 yd. or short bracket is reached, e.g., Right ranging, "Percussion, 39,-36, 10 seconds, fire." On this order No. 1 gun, when ready, fires at range 3900. 10 seconds later No. 2 gun fires 3600. Under ideal conditions if No. 1 gun were reported plus and No. 2 minus, then the order would be, "38-37 repeat." If the guns are again reported plus and minus, you have your target enclosed in the 100 yard bracket. To make sure of this, the short bracket is always repeated. The next order would probably be, "3750, one round battery fire 10 seconds, to correct all guns for line. The battery would now go into regular firing.

Under probably normal conditions the ranging would not be so regular. Let us repeat the ranging under the new conditions.



On receiving the same order No. 1 gun fire 3900 reported a plus. No. 2 gun fires 3600 reported a plus. The order sent down would be: Stop! (see section gun drill). Next order would be, 35-32 repeat. No. 1 gun fires and if a minus is reported you have the target in the short bracket with one extra shot. If plus is reported No. 2 fires 3200 and it now depends on this shot whether Stop will be ordered and 31-28 given, or, having enclosed the target in the long bracket, ranging continues until the short bracket is reached and proved.

METHODS OF RANGING:

1. Single gun.
2. Section (usually the section nearest the B.C.).
3. Collective (3 guns on the right).
4. All guns.

METHODS OF FIRE:

1. Battery.
2. Section.
3. Gun.

TO SEARCH AND SWEEP THE GROUND:

The traversing gear is used for sweeping and the elevating gear for searching. On the order sweep 1° you fire one shot to front as gun is set and then 1° to right and then move 1° to left of first position and fire. Each gun fires 3 rounds. See p. 342, F.A.T.

Search:

- 4100 F.A.T. 343.
4200.
4300.

Searching up and down. This is the reason for wagons not being left within less than 500 yds. of the guns.

Combining Sweeping and Searching:

- 4100—normal.
4200—1 degree right.
4300—1 degree left.

DUTIES OF No. 1, ADVANCING INTO ACTION:

The No. 1 in moving over any unknown ground should precede guns by 20 yards, and when the lines are marked the No. 1 will move forward and dismount on his gun platform, and give his horse to the centre driver.

DUTIES OF No. 1, IN ACTION:

The Nos. 1 are responsible for the entire service of guns in action, and that the difference in the level of wheels has been

allowed for. They may if necessary assist in passing orders, and if their section commanders become a casualty the senior Nos. 1 takes their place.

DUTIES OF GROUND SCOUTS:

One or two men should be trained as ground scouts in every battery. They must have good keen eyes. They should precede the battery and should not be closer to same than 200 or farther away than 500 yards. They should never expose themselves on sky-line, and should always conform to movement of battery and direct same past obstacles by signals. If they come upon any ground which is impassable they should halt battery by raising the hand and ride around to find some means of passing; if unable to do so, they face the battery and ride in t report.

DUTIES OF LOOK-OUT MEN:

Two men should be trained in the use of the telescope, and are posted by B.C. when in action. They may both be on a flank or one on either flank. Their duties are to keep B.C. posted on any new target which may present itself, and they have NOTHING to do with observation of fire.

DUTIES OF A SERGEANT-MAJOR IN ACTION:

The Sergeant-Major is:—

(1) In charge of Headquarter party and responsible for its disposition, e.g., range takers.

(2) He will pass orders when ordered to do so by B.C.

(3) When megaphone is used it will be used by Serg.-Major.

(4) He is also responsible for the placing of the B.C.'s observation wagon or limber.

(5) If B. C. should become a casualty, the Serg.-Major should be able to carry on and notify the battery that the next senior officer is required at the observation station. Serg.-Major should be able to give this officer all necessary information to enable him to carry on, such as, position and extent of target, range, corrector, aiming point, etc.

DUTIES OF SECTION COMMANDER IN ACTION (p. 309, F.A.T.):

He is responsible for the working of his section and he places himself where he can best supervise, that is, usually in rear of the wagon closest to the battery commander or officer giving out orders in the battery. He is responsible for his guns not being in danger angle. He is also responsible that the guns are laid in the direction of the target or aiming point as ordered.

During ranging it is most important that he should check up his fuze, corrector, range and angle of sight, before allowing a gun of his section to fire, as the series will often depend on the first two rounds fired by the ranging section. If a casualty occurs in his section, he will try and repair the casualty within his section, but if he cannot do so he will report the matter to the Captain of the battery, but he is not to report it to the battery commander unless it is of a permanent nature or likely to interfere in ranging. Section commanders will pass orders from one section to the other but if orders can be heard by all, these orders are acknowledged by a salute and there is no repeating orders. If battery commander makes a verbal slip it is the duty of the section commander nearest to him to draw his attention at once to it. The section commanders are also responsible that their guns clear any obstacle and should report the lowest elevation that will clear the crest immediately upon coming into action. This is important. If a gun should miss fire when firing an echelon, the section commander orders next gun to fire. After other guns have fired, he will report to the battery commander, e.g., No. 2 gun fired echelon so and so. B.C. will then know that No. 2 gun was out of sequence. A section commander will not correct for line except ordered to do so by his battery commander.

THINGS NECESSARY FOR AN ARTILLERY COMMANDER TO KNOW, FOR THE PURPOSE OF DIRECTING AND CONTROLLING THE FIRE OF HIS BATTERY:

1. To know exactly where the infantry that he is supporting is from time to time, which information is given by his advanced artillery officer.

2. What is the immediate objective of the infantry.

3. What is it that prevents it from attaining its object.

THE USES OF ADVANCED OBSERVATION POSTS ARE:

1. To watch situation generally.

2. To obtain information from infantry commander.

3. To repeat to the battery information obtained.

4. To report the shell fire of his own guns.

ENTRENCHING AND CONCEALING GUNS:

(See 238, chap. 9, F.A.T.)

The chief considerations to be borne in mind when concealing guns are:

1. A good and sufficient platform for the gun.

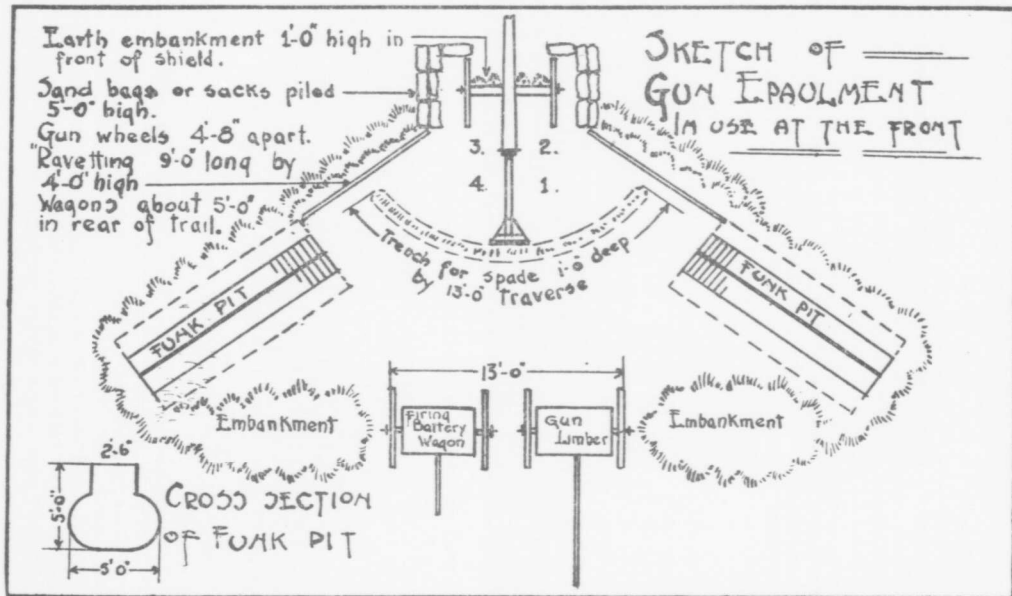
2. Cover from view.

3. Protection for the detachments as far as possible when serving guns.

4. Concealed cover when not actually serving guns.

5. Overhead protection against bad weather.

On next page is type of gun epaulement used in present war.



Cover from rear is essential so far as possible. Shield, parapet and sandbags afford some protection to Nos. 1, 2, 3 and 4, even while gun is being fired. Ammunition members are in the funk pit with ammunition and fuze indicator. The wagon, if struck, will not blow up. Holes are sometimes dug underneath the wagons to gain some head cover. The section commander must be well dug in. The emplacement will usually be at least 400 yards behind crest, and screened from overhead. The wagon and limber may be placed as desired, and additional wagons may be brought up.

SECTION CONTROL

Means a section is handed over to section commander, who will perform same duties as battery commander as regards changing elevation, corrector or ranging; the senior No. 1 taking S.C.'s place.

POSITION OF READINESS

Is one under cover, with guns limbered up—drivers dismounted and men standing easy. While waiting, the B. C. will make a reconnaissance of the locality in order to familiarize himself with the lay of the land re observation stations and platforms

PRELIMINARY POSITION

Is one close to the position that the guns will occupy when in action. It is under cover and guns are limbered up.

POSITION OF OBSERVATION

Is where the guns are in action and unlimbered; the guns pointing on some portion of the enemy's country; all ranges taken to all conspicuous objects in the vicinity, angles of sight, switch angles and certain areas of ground may be registered by firing a few rounds of percussion shrapnel—and the guns ready to open fire when a target presents itself, or when they are ordered to do so.

POSITION OF ASSEMBLY

Is one that is selected by a captain of a battery which must be as close to the battery as possible, PREFERABLY TO A FLANK, and under cover, for the purpose of the withdrawal of wagons and guns from action to reform and receive new instructions.

OPEN POSITION

Is one where target can be seen over or through sights. The guns are exposed to full view of the enemy and is therefore a very dangerous position, but moving and new targets can be dealt with very effectively.

SEMI-COVERED POSITION

Is one where the target can be seen from some position in the battery. The advantage of a semi-covered position is that there is *no dead ground* and full advantage can be taken of any advancing target. The position remains hidden until firing is actually commenced, thus gaining the advantage of surprise. This position may be controlled by voice. Guns may be run up to crest with heavy manual labor and moving targets engaged. A searching fire is very effective against this position. The only disadvantage of above position is that once guns open fire the position is given away.

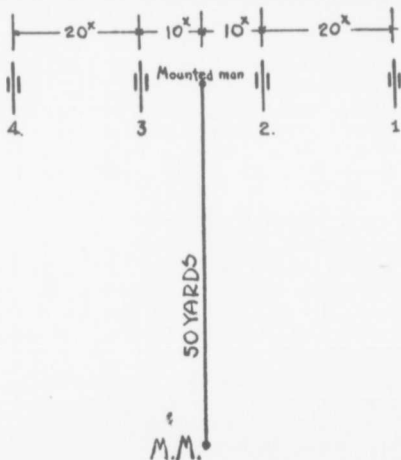
COVERED POSITION

Is one where guns are in action behind a crest, and having at least 13 ft. cover and are thus immune from the enemy's fire. The disadvantage is that full advantage cannot be taken of targets presenting themselves, owing to the large amount of dead ground and the great difficulty in controlling the battery by artificial means of communication such as buzzer, signals, etc.

METHODS OF OCCUPYING POSITIONS:

There are two methods, ordinary and special.

Ordinary Method: In the ordinary method the position for the guns is marked by two mounted men. It may be marked by the guns is marked by two mounted men. It may be marked by spot



where centre of battery will rest when in action or where flanks of battery will rest when in action, or any other method may be adopted providing that the officers of the battery understand that method.

Special Method: In the special method the B.C. chooses his position of observation. The battery is led to a preliminary position under cover and close in rear by his S.M. or S.C. The B.C. orders "Section Commanders (mounted or dismounted) one aiming post." The S.Cs. with an aiming post for each gun fall out and the B.C. points out to them the target, general alignment of the battery and position of one gun. The S.Cs. will then mark the position of all their guns with posts, if possible, (or with gun layers if the ground requires it). The S.Cs. then lead in their sections in the simplest possible method.

Two important things in an artillery attack are:

1. Communication—with infantry and F.O.O. by telephone.
2. Co-operation—with the infantry.

The system of attack: 1, blow up the parapets; 2, destroy entanglements; 3, prevent supplies coming up by shelling both night and day.

It is very important that the time schedule for bombardment is strictly followed.

A battery may require to have both wagons in action at the same time, (firing battery and first line) or to have the wagon on one side of the gun and the limber on the other, if reliance is to be placed on the vehicles to afford cover. Normally, however, cover is obtained by digging.

In the case of an accident the gun *will not* wait for the wagon but the wagon *will* wait for the gun.

The following points are to be observed in opposing an attack by the enemy:—

As soon as the enemy first advances from his trench to attack, the F.O.O. sends back to the batteries the C.Q.D. call. This call goes to all the batteries in the vicinity and they at once begin a bombardment on the enemy's first line trenches in day time and on the communication trenches at night. This bombardment must be kept up without fail until the F.O.O. sends back word that the attack has been stopped. In this connection the importance of telephonic communication is emphasized.

POINTS REQUIRING ATTENTION DURING TRAINING OF BATTERIES:

Battery Commander.

1. Reconnaissance.
2. Cover.
3. Quickness.

TYPICAL BOMBARDMENT ORDER SHEET
 USED AT THE FRONT. —

NO. BATTERY	TIME	TARGET	AMMUNITION	
			SHRAPNEL	HIGH EXPLOSIVE
1	10 am to 10:40 am.	H2—H3	nil.	80
2	10 am to 10:40 am.	H2—H6	nil	80
3	10:40 am. to 2:00 p.m.	H2—H6	20	40

4. Observation Station.
5. Communications.
6. Mark Line of Fire for Battery.
7. Employing Headquarters.
8. Use of Sergeant-Major (Battery).
9. Inform Battery of situation.
10. Correct use of Nos. 3, Director.
11. Angle of Sight.
12. Quickness in giving fresh orders.
13. Corrections for Line.
14. Knowledge of Corrector.
15. Rules for Ranging.
16. Use of Order "Stop."
17. Orders like "As you were", etc., not to be used.
18. Procedure for change of position.

Officer at Battery Position.

1. Quickness in getting ready for Battery.
2. Marking line for Battery.
3. Sub-base.

The rule to find the sub-base is:

$$6/10 \times \frac{\text{Sub-base in yds.}}{\text{Apex Angle}} = \text{Base in hundreds of yds.}$$

4. Getting line of fire for Battery.
5. Selection of aiming point.
6. Displacement and Parallelism.
7. Sending lowest elevation to clear crest and Battery Angle if necessary.
8. Position to control Battery by voice and see observing station.
9. Cover.
10. Use of Signallers.

Coming Into Action.

1. Quickness.
2. Quietness.
3. Gun Platforms and Intervals.
4. Pointing Guns in Correct Line.
5. Driving up Wagons.
6. Horses trotting away.
7. Traces.
8. Protection Limber.
9. Cover.

Section Commander.

1. Getting guns on target or in line of fire.
2. Position.

3. Cover.
4. Acknowledgment and passing of orders.
5. Checking Fuze, Angle of Sight, Range, etc.
6. Reporting necessary information.
7. Quietness.
8. Section Commanders will correct for Line when ordered.
9. "SECTION CONTROL."
10. "GENERAL CONTROL."

Captain or Q.M.S.

1. Cover.
2. Wagon Line.
3. Communication with Wagon Line.
4. Supply of Ammunition.
5. Casualties.
6. Position of Assembly.
7. Retirement.

No. 1.

1. Quickness in getting into Action.
2. Gun Platforms and Gun Intervals.
3. Necessary man-handling of Carriages.
4. Quick picking-up orders from B.C.
5. Acknowledgment of Orders.
6. Quickly to give orders to detachment.
7. Difference between "Lowest Range to Clear Crest" and "Longest Range to Fire."
8. Digging for Trail and Wheels.
9. Orders for Re-loading.
10. Correction for Level of Wheels.
11. Checking Angle of Sight and Range.
12. Rate of Fire.
13. Laying approximately for Line; use of Knuckles and Scale on Shield.
14. Traversing Levers.
15. Under Cover at "Cease Firing."
16. Getting horses before limbering up.
17. Reversing or moving to a position of Assembly.
18. Quietness.
19. General control of sub-section.

Layers.

1. Getting aiming point or target.
2. Use of Sights.
3. Angle of Sight.
4. Use of Auxiliary Aiming Points.
5. Bubble centred before "Ready."

6. Depression last.
7. Familiarity with Handwheels.
8. Use of Brake.
9. Quickness with Accuracy.
10. Quickness in re-laying and reporting "Ready."
11. Laying indirect when in open.
12. Changing from direct to indirect.
13. Switches.
14. Parallel lines to a named gun.
15. Informing No. 1 of Aiming Point.
16. Quickness in picking up B.C.'s. orders "Raise" or "Lower."
17. Missfires.
18. Replacement of Dial Sight and Carrier.
19. Use of Field Chronometer.

Loading.

1. Quick and accurate loading.
2. Opening and closing breech.
3. Quick and accurate fuze setting.
4. Two elevations.
5. No. 4 always with extra round of ammunition.
6. Calling out fuze settings.
7. Quickness in picking up B.C.'s. orders.
8. Follow up.
9. "Add" or "Drop."
10. Clips off.
11. Change of Corrector or Range.

Battery Sergeant Major.

1. Headquarters during reconnaissance.
2. Control and Communication.
3. Use of Megaphone.
4. Chain of Orderlies.
5. Use of No. 3 Director.
6. Reporting to B.C.
7. Assist B.C.
8. Recorder.

GENERAL:

1. "Stop" and Whistle.
2. "Prepare to Limber Up."
3. "Cease Firing."
4. Wagons driving up.
5. Cover.
6. Quietness.
7. Alertness.
8. Mounting men on carriages.

9. Nos. 1 with Teams on Move.
10. Right of the Road.
11. Turn-out.
12. Quickness in mounting and dismounting.
13. Brakes.
14. Whips.
15. Drivers talking.
16. Replacment of casualties.

BRIGADE ORGANIZATION

Consists of Headquarters Staff,
 4 Batteries,
 1 Ammunition Column.

HEADQUARTERS CONSISTS OF:

- 1 Lieut.-Colonel.
 - 1 Adjutant.
 - 1 Orderly officer.
 - 1 Brigade Sergeant-Major, W.O.
 - 2 Fitters (Staff Sergeants).
 - 2 Corporals.
 - 2 Bombardiers.
 - 6 Gunners.
 - 9 Drivers.
 - 1 " for vehicle.
 - 1 Clerk.
 - 2 Orderlies.
 - 7 Batmen.
-
- 36 Total.

HEADQUARTERS (attached):

- 1 R. A M. C.
 - 1 Vet. officer.
 - 5 Sergeants A.V.C.
 - 1 Armament Artificer.
 - 1 Interpreter.
 - 4 Drivers A.S.C.
-
- 49 Grand Total.
 23 Riding Horses.
 7 Draught Horses.
-
- 30 Total.

BATTERY ORGANIZATION:

A battery of field artillery consists of four guns and eight wagons, divided into two sections, right and left; two guns and four wagons to each section; one gun and two wagons to each subsection.

Each section is in charge of an officer—the section commander.

Each sub-section is in charge of a No. 1—Sergeant or other N.C.O.

FIELD BATTERY—ESTABLISHMENT:

- 1 Major or Captain.
- 3 Subalterns.
- 1 Battery Sergeant-Major
- 1 Quarter Master Sergeant.
- 5 Sergeants
- 1 Farrier Sergeant.
- 3 Shoeing Smiths.
- 2 Saddlers.
- 2 Wheelers
- 5 Corporals
- 9 Bombardiers.
- 51 Gunners.
- 38 Drivers for vehicles.
- 6 Drivers for spare horses.
- 2 Drivers, spare
- 8 Batmen.

138 Total.

- 42 Riding Horses.
- 83 Draught Horses.

125 Total.

BRIGADE AMMUNITION COLUMN—ESTABLISHMENT:

- 1 Captain.
- 3 Subalterns.
- 1 Battery Sergeant-Major.
- 1 Quarter-Master Sergeant
- 4 Sergeants.
- 1 Farrier Sergeant.
- 4 Shoeing smiths.
- 2 Saddlers.
- 2 Fitters or Wheelers.
- 4 Corporals.

5 Bombardiers } *
 31 Gunners }
 78 Drivers for vehicles.
 8 Drivers for spare horses.
 4 Drivers, spare
 4 Batmen.

153 Total.

2 Drivers A.S.C.

20 Riding Horses.
 172 Draught Horses.

192 Total.

* Includes 3 mounted bombardiers, 2 dismounted gunners trained as signallers for communications, also 18 N.C.O.'s and men as telephonists, 9 of the latter trained in the use of the buzzer.

A Tactical Unit—a brigade.

A Firing Unit—a battery.

A Battery of Field Artillery—4 guns and 8 wagons.

A Firing Battery—4 guns and 4 wagons.

No. of rounds of ammunition per gun and how they are carried:

24 rounds on gun limber.	} one subsection.
76 rounds on firing battery wagon.	
76 rounds on first line wagon.	
76 rounds in brigade ammunition column.	
126 rounds in division ammunition column.	
150 rounds in ammunition park.	
472 rounds in line of communication.	

1000

The Captain is responsible for the replacing of casualties and the supplying of ammunition for the Battery.

Limber Supply: Is the using of the ammunition of the gun limber. This is an emergency supply only.

Total weight of an 18 pr. round is 22¼ lbs.

AMMUNITION SUPPLY:

No definite routine can be formulated as best. Replenishment of ammunition is usually by carriers with coats. Captain usually signals W. N.—“Wagons Now”; 2 W. N.—“2 Wagons Now.” These are brought up by the Q. M. S., who will take back the empty wagons.

EMPLOYMENT OF ARTILLERY IN WAR:

ADVANTAGES OF USE OF 18 PDR. Q.F.:

F.R.A.P.—M.C.V.:

F. Flatness of trajectory.

R. Rapidity of fire.

A. Accuracy of fire.

P. Power to deliver effective fire from concealed positions as well as in the open.

M. Mobility.

C. Concealment due to use of cordite.

V. Decreased vulnerability on account of adoption of shields.

EFFECT:

1. Versus troops in the open, either in movement or stationary.

2. Against troops in entrenchments, in buildings or behind gun shields.

ACCURACY OF FIRE

Is a comparative term. It is said to be good when a group of projectiles fired under as nearly as possible the same conditions, fall close together.

The probable percentage of hits obtainable from an 18 Pdr. Q.F. gun firing at a target 4' 6" high x 5 wide, under experimental conditions, is:

At 2,000 yards—60 per cent.

At 2,500 yards—33 per cent.

At 3,000 yards—16 per cent.

At 3,500 yards—8½ per cent.

At 4,000 yards—5 per cent.

RULE FOR FINDING FUSE:

For a range of 2,500 yards, fuse would be 7.5 or 3 for every 1,000 yards.

USE OF FIELD HOWITZERS:

1. To attack artillery personnel protected by shields.
2. To destroy artillery material.
3. To attack defenders of entrenchments.
4. To destroy defended localities, villages, etc.
5. To support an attack up to moment of assault.

CHARACTERISTICS OF FIELD HOWITZERS:

High explosive shell and steep angle of descent, also wide field of fire.

HOWITZER FIRE

Must have good platform and observing station.

HEAVY ARTILLERY:

For special characteristics, see page 229, F.A.T.

ADVANTAGES OF HEAVY ARTILLERY:

Accuracy.

DISADVANTAGES:

1. Limited mobility, as guns travel at a walk only.
2. Difficulties of ammunition supply.

The fire of the above guns being long range, they should be used to bring enfilade and cross fire to bear on enemy's positions.

CHAPTER V

NOTES FROM THE FRONT AMPLIFYING F. A. T.

CONCEALMENT. Sec. 146, p. 231.

Concealment assumes greater importance than ever. It is not merely desirable but essential, and in modern war concealment means cover from the view of the enemy, whether on the ground or in the air. In addition to concealment when in position, the approach to the position must be also hidden from air observers. If hostile airmen are observed, guns must remain perfectly still and if possible hidden along the edge of woods, etc., where they may escape observation. During movement there may be lookout men on watch for hostile aircraft; owing to the great height at which they fly, they cannot be usually detected, but can be heard approaching. The distinguishing marks are:

German—Black maltese cross under the wings.

French—Red and blue concentric circles, under wings.

English—Red and blue concentric circles, under wings, and Union Jack.

The lookout man should therefore be placed where the sound of aeroplanes will be audible (always away from noise, etc.). It is usual, if possible, to stop firing when enemy's aeroplanes are overhead until they disappear, owing to the importance of keeping the gun positions secret, as, when they are located, the enemy does not find much difficulty in shelling them and inflicting casualties on personnel and material. Much may be done, however, to mislead the hostile air observers by the use of partially concealed emplacements and puffs to represent flash and report of guns. These, however, must be sparingly used and as a rule be under the direction of the Div. Art. Headquarters. It is quite as important to conceal completely the wagons and gun teams, as the guns themselves, and they are better if possible out of range altogether; where not possible to conceal them, their position must be changed as soon as located by an observer, if casualties are to be avoided. Even where positions are effectively hidden, it must be remembered that if the locality can be described accurately by spies, just as effective fire can be brought to bear as if the positions were plainly visible. The chief consideration then—given concealment—should be:

1. The selection of a position difficult to gather from a map.
2. The occupation of a position in such a way as to increase the difficulty of hitting any gun or emplacement, i.e., by placing guns at wide and irregular intervals, and even at varying ranges.

The enemy possess large scale maps believed to be as large as 6-inch and, as soon as guns are located by them, a severe fire is brought to bear immediately. It is on this account important to avoid always conspicuous or easily-identified points on the map. Open and semi-covered positions possess no advantage over covered positions. They would only be occupied on emergency and with the knowledge that the battery would probably be destroyed sooner or later. Positions in observation are much used, but positions of readiness are only to be considered if well concealed. Guns not required in action are better placed safe out of range.

ECONOMY OF FORCE. Sec. 147, p. 232.

The necessity for this has been shown by all reports and personal observation. The enemy's guns and observation stations are so well concealed and constantly changed that it is nearly always advisable to reserve guns to deal with later contingencies. That this is not sufficiently practised is perhaps due to peace training, but it has assumed a greater importance in war and great stress must be laid on it in training.

The labor of taking up a position and entrenching is great, whereas often it may have been completed only just before a change is found to be desirable. The bigger the calibre of the gun the more important this factor of economy. If howitzers are required for a test, four, or even two, may often be sufficient, while heavy guns should hardly ever be used in larger units than sections. The bigger the guns, the greater also the difficulty of ammunition supply; it may therefore sometimes be advisable to attach an 18 Pr. gun to heavier natures to assist in ranging and registration of a zone. It is true this introduces complications, but nevertheless it may sometimes be worth while. In modern battle fronts the extent of the ground is so great that the character of the country varies in different parts of the position. At the battle of the Aisne the British Corps were extended over a front of 15 miles or even more. On some portions only could howitzers be properly utilized while in others, field guns could do all that was required.

PROTECTION. Sec. 148, sub-para. 5.

The carrying of rifles on wagons in the Artillery seems to have been justified by their having been made use of on more than one occasion,—24 per battery.

INTERCOMMUNICATION. Sec. 149, p. 235.

Communications are perhaps the greatest difficulty units have to contend with, owing to the almost exclusive use of the telephone. Flag signalling is rare, but has been used by both Field

and Heavy Artillery on suitable occasions when there was no chance of observation by the enemy. Fourteen men per battery are required to be proficient on the buzzer and in disc signalling (Morse Code). Buzzing on the telephone is very much resorted to and is invaluable. It was perhaps not sufficiently recognized in the Artillery in peace how much training is required to keep telephone communication uninterrupted; the difference in the working of the telephones by the R. E. and the R. A. is most marked. The R. E. succeed and the R. A. to some extent fail. The necessity for an efficient telephone service cannot be too strongly impressed on the B.C.s. Men require training in speaking, which is an acquired art, as well as keeping the instruments and line in working order. Casualties among these men, who do not hesitate to go out and repair lines under the hottest fire, are bound to occur, and therefore there should be plenty under training. Every telephonist must know the Morse code and be able to use the buzzer. When laid out, the wire should be dug in, if time will permit, as frequent interruptions occur from the wire being cut. The digging in is best arranged by ploughing a furrow with an ordinary plough if available; there are many about in the fields. The lamp is useful but it also requires highly skilled signallers; megaphones are useful, and Section Commanders sometimes use them to make themselves heard above the noise of the bursting shell.

ARTILLERY IN WOODS FIGHTING. Sec. 168A, p. 259.

Most guns in the recent battle have been inside woods or just on the edge of woods. If woods did not accommodate the guns, young trees were cut down and planted around the Batteries to screen them. In winter, except when firs are available, these methods will not perhaps be so effective. Wagon teams were always concealed in woods if possible. Artillery will do well to keep clear of all villages, if within the range of hostile guns. Villages aid the location of targets by description and are apt to draw shell fire. It may be well here to emphasize the necessity of much practice with maps, e.g., locating strange places on straight maps, using maps to obtain range, line and angle of sight.

NIGHT OPERATIONS. Sec. 164, p. 251.

The chief work to be carried out at night is the occupation of a position and entrenching. Practice in peace training is all essential. Ammunition is constantly replenished at night and changes of gun position or the position of the teams are nearly all effected at night. Suitable artificial light is a great help; the showing of lights would generally be objectionable, but if position is well concealed from the target direction there would

be no objection. Firing by night is more indulged in by the enemy than ourselves, but it has been attempted on certain occasions against targets to which the range has been ascertained by day. The enemy make frequent endeavors to shell villages or buildings known to be occupied by our troops after dark, but the effect would not appear commensurate with the expenditure of ammunition—at least we should not consider it so.

RECONNAISSANCE. Chapter VIII, Sec. 181.

From the information available on the subject, it would seem that the B.C.s had more tactical control of their units than is contemplated by F. A. T. This is due mainly to the difficulty of communication in the field. B.C.s have certainly very often done the whole of their reconnaissance, making their choice of positions on the information and instruction from Brigade Headquarters. Space appears for the most part not to be confined, but since Batteries are always concealed, Observation Stations are nearly always distant. No account is taken of the danger angle.

Observing stations.—In the open position the choice appears to make little difference. If, however, occupied in the dark and the battery completely dug in, the battery commander is better on a flank clear of blast and smoke of enemy's high explosive shell. In covered positions the battery commander almost invariably observes from in front no matter what the nature of gun. The distance is from 500 yards up to 1,000 and more, according to nature of operation and ground. Communication is always by telephone. This, indeed, is the only possible means and endeavour is made to dig in the wire, perhaps with a plough.

In the event of the wire being broken, recourse must be had to a chain of orderlies. Megaphones are useful.

The Headquarter party is too large. Signallers and lookout men are not wanted as a rule. Patrols and ground-scouts never, i.e., as part of the battery headquarters. The battery commander has battery sergeant-major and a telephonist with him, and perhaps a director man who takes a few notes as penciller. The range-finder would be separately dug in, if used at all, and two or three men possibly dug in at intervals to pass orders on emergency. The ranging officer with the battery is dug in, probably under a limber in rear of line of guns, with telephone man. Section commanders are dug in close behind wagon bodies. The consensus of opinion of battery commanders seems to be decidedly against observation vehicles. They could only be used on certain occasions and are difficult to drag into position without being seen. Moreover, a battery commander does not feel secure perched upon such a vehicle. He prefers a tree or stack or

building of some kind, or else to be dug right in. Climbing irons or dogs, rope ladders, etc., would be of great use. German observatories are never seen now; they are effectually concealed if used.

RECONNAISSANCE OF A POSITION. Chapter IX, Sec. 192, p. 295.

Complete concealment in the reconnaissance of and the approach to and occupation of the observing station, is absolutely essential. A background is necessary to the observation station, and there should be as few people there as possible. All required must be dug in to complete cover, and a view of the battery is likely to be impossible.

The first object of the reconnaissance is contrary to para. 3 of this section, for it is almost always a position for the guns that will defy discovery as long as possible that is desired. The position of the observing station is subservient, being selected as occasion demands, and is normally in front of the guns. It is hardly ever necessary to mark the line of fire with aiming posts, the line is generally obtained roughly from the map, and a trial shot fired from which to make a correction.

METHODS OF OCCUPYING A POSITION. Sec. 193, p. 297.

In the above circumstances the Special Method is more often employed than the Ordinary. Occupation of Position by night requires special treatment, the method being adapted to circumstances. Whatever the method of occupation, digging should commence at the earliest possible moment.

ADVANCE FOR ACTION. Sec. 195, p. 302.

This section requires slight modifications in accordance with the above changes. The wagon line should be as far away from the battery as possible, convenient with ammunition supply, which would probably be by Ammunition Carriers by hand or else take place after dark.

TO COME INTO ACTION. Sec. 196, p. 393.

Batteries may require to have either or both wagons in action at the same time, i.e. Firing Battery Wagons and First Line Wagons, or to have the wagons on one side of the gun and the limber on the other, if reliance is placed on the vehicles for cover. Normally, however, cover is obtained by digging in.

LAYING OUT LINES OF FIRE. Sec. 198, page 310.

Two aiming posts seem to have been sometimes, but seldom used. A battery angle is sent if battery commander can see the battery; but far more often line is given roughly in a quick series or by compass or map in a deliberate series. Trial shots are fired and correction made as required. With heavy guns the

method employed is either the compass, or direction given by a reference to a map placed on a plane table, the latter the most popular. Where possible, as in the operation on the Aisne, the 18 pr. gun may be used to range for the 60 pr. to save ammunition. There are many casualties to directors. The hand angle of sight instrument is a good deal used. The plotter has never been used.

A common method of obtaining the line from a map is somewhat as follows: Place the map on a plane table or on some flat surface in the battery and set the map accurately by means of two, or better, three points located on the map by compass, taking into account the magnetic variation. The B. C. measures with a protractor the angle between the target and some object shown on the map, such as a church, and telephones the object selected to the Battery Leader, who is thus enabled to fix a line on the map with two pins, i.e., the line Battery—Church. Suppose the B. C. orders the line of fire 10° right of the fixed line, the Battery Leader will set his director at 10° right, on the line joining the two pins in his map; the director is then swung around to zero, when it will be in the required line of fire. Individual angles may then be given to guns, or aiming points selected in the ordinary way. When working with aircraft, the line should be obtained by clamping the director on the aeroplane when over the target. A good method of signalling when the machine is over the target is that adopted by the enemy, whose observers fire a small smoke ball which shows very clearly and could be very easily laid on with a director.

CO-OPERATION OF AIRCRAFT. Secs. 203-205, pages 324-329.

Air observation is largely used both by ourselves and by the enemy. Both the B. C. and the observer are provided with a map, the larger the scale the better, and the position on the map is given by the observer. The battery then lays out the line of fire by the aid of the map and observations are signalled back after each round. (Section 205 should be memorized.) Effective fire can be reached within some ten minutes of the first round fired. The first essential of any system is speed, on account of the exposure of the airmen to hostile fire during the operation. This system is slow and experiments have been undertaken with a view to devising other systems. Wireless telegraphy has been found to be the quickest and most satisfactory system of communication. The use of Very's Lights have been resorted to on occasions when wireless telegraphy is not available, and some fair results have been obtained by them. The German method of giving the line to the battery by firing a smoke ball over the target is most effective; it appears to be only a part of a somewhat elaborate system; the resulting fire is most effective.

RANGING. Sec. 207, page 330.

Section ranging is the method employed as being the simplest with percussion or long corrector, the former for choice owing to there being less chance for error. False crests do not abound in the N. E. of France. The general aspect of the country is not unlike Wiltshire and often remarkably like Salisbury Plains. There is a bigger sprinkling of woods and they are larger. The features are bolder and the valleys wider and deeper. Time shrapnel ranging, which is so suitable for overcoming the difficulty met with where there are so many small dips and depressions, is not apparently required by the conditions prevailing. Fuzes have sometimes burst at irregular heights; this is usually due to one of the following reasons:

1st. Sights getting slightly out of adjustment.

2nd. Want of exact precision in use of gears when adjusting sights.

3rd. Development of increased play in equipment.

4th. Bubble not being accurately centered before firing.

The importance of paying attention to these points must be impressed on all concerned with the training. The heights of burst given in the Manual must not be exceeded if the fire is to be effective

SEARCHING. Sec. 215, page 339.

Searching is much resorted to in spite of the waste of ammunition entailed. On the Aisne, the line of the land in the enemy's position was soon fairly known and constant reports sent in by aeroplanes increased the value and effect of searching. Sweeping has been employed on at least one occasion, and the effect appears to be satisfactory. The method adopted was an adaptation of that laid down in this section, the object being to avoid a regularity of fire, against which detachments can easily protect themselves.

TO REGISTER A ZONE. Sec. 219, page 344.

Cases of registering a zone by single batteries so far as is known have been rare. Either targets have been presented by bodies of troops moving in an area in such a way that they were capable of being dealt with by following them up as they moved with shrapnel fire, or else the Artillery have been employed in shelling certain held positions or portions of positions which may or may not have been visible from the observing station. Registration would seem to have been more the task of the Division of Artillery as a whole, as a division is made responsible for a certain zone and all the portions in that zone are ranged on, watched and shelled as required by the various batteries concerned, under Divisional arrangements.

OBJECTIVES. Secs. 220-226, page 344-351.

The Artillery duel has returned, and one of the principal tasks of our Artillery has been the silencing of the enemy's guns. The destruction or shelling of an observing station requires all the skill of an experienced B. C.; similarly infantry trenches require the most accurate fire to be brought against them. But for each case such as those mentioned, there will probably be many where it is required to bring a fire to bear on an area behind a ridge or crest, a wood, a village, a ravine, or to keep quiet guns posted in an invisible locality. In such cases accuracy of the service of the gun is a necessity, but extreme accuracy of observation loses some of its importance. A few batteries have made use of walls of fire and at Caudry in August batteries built walls of fire which held up all movements for a considerable length of time; indeed the wall was impenetrable so long as it lasted. In dealing with situations similar to those at the Aisne, where the opposing infantry trenches were within a few hundred yards of one another, and the guns of each side concealed in rear often as far back as 2,000 or 3,000 yards or even more, the advance observation post mentioned in sec. 153, para. 11, can be used with very great effect. An Artillery Officer sent into the infantry trenches may be able to see a target which would be invisible from near the battery and therefore able to direct accurate fire. Telephonic communication is usually essential. The enemy's trenches are not usually located on the tops or forward edges of slopes, but are apt to be thrown back behind the crest in order that they may be difficult to reach with shell fire. When so located, if aircraft are not available, it is almost always necessary to employ a distant observing station and telephones, necessitating long lengths of wire to control the fire.

Most batteries have never seen any such target as troops in the open or guns in any sort of position. There are exceptions, however, and guns have had to deal with infantry columns crossing the front, infantry advancing in large bodies—crowds—and the rush of an infantry counter attack. In such cases the 18 pr. shrapnel is admitted on all sides as being most effective. Time is certainly not the important factor that it is at practice. At the open pitched battles, as at Mons, Cambrai, situations appear to have been considerably confused, and battery commanders were practically independent except those close to their own brigade headquarters. Telephone communication broke down at once owing to the wires being cut, and any orders that reached battery commanders came by mounted messenger. There appears to have been no visual signalling.

GUN TARGETS.

At the battles just referred to there were cases of guns being located and even knocked out by shrapnel, but these seem to have been rare cases. The covered position is the one adopted and retained to the last. It must be clearly understood that the artillery duel is very much in evidence. All arms and all ranks agree that the artillery dominates the situation on either side. Its effect is devastating where a target is visible, and infantry, where the strengths approximate to an equality, are quite unable to face it. All efforts are consequently made to establish a superiority in artillery. On the battlefield there is no sign of battle, bar the few bursting shells and a few strips of newly-turned earth, which mark the infantry trenches. Not a man or a gun is visible unless some effort be made to test the strength of some corner of the field; even then it will be invisible to nine-tenths of the front. The chief effort on either side is to locate the big guns by any means. We employ aeroplanes, but the enemy apparently employ an amazingly efficient secret service in addition. The aircraft are always at a height of about 6,000 feet if up at all, and there they appear to be immune from fire. The big gun positions are frequently changed, not less than every two or three days, but ours, however well concealed, are located to a yard by the hostile gunners, and 6-inch or 8-inch high explosive shell dropped right on the guns or in the pits. It is important that these big guns have alternative emplacements always ready for occupation at short notice, after dark, and these should always be irregularly placed with big intervals up to 100 yards, and at varying ranges of 50 yards or so. Inside a wood is often a suitable position. A megaphone in a wood carries well and assists section commanders in these difficult circumstances. Searchlights are hardly used at all. German balloons are always aloft, but our authorities are not in favor of these aids to observation, for reasons which have been thoroughly discussed.

The shooting of the German artillery can only be described as "uncanny." Occasionally great waste of ammunition takes place, no doubt from faulty information, but parties of troops, whether gun teams, ammunition columns, bivouacs, billets or even headquarters of brigades and divisions have to make constant changes of their position or incur the penalty of having a dozen of the large shells dropped right into them without warning and when least expected. Dummy batteries, observation posts, etc., to deceive hostile aeroplanes, have proved valuable.

Seventy per cent. of our casualties are said to be due to artillery fire, and most of them to the high explosive shell. The "error of the gun" appears to be nearly non-existent, and it is

quite common to see four high explosive heavy shells dropped within two or three yards of each other. It is difficult to find any explanation for this; possibly the design of shell has much to do with it. The enemy's time fuzes are also astonishingly accurate, particularly those of the field howitzers. Their shrapnel is far inferior to that of the 18 pr. This is admitted by all. There appears to be very few cases of shields having been hit by bullets. Casualties generally result from the backward effect of the high explosive shell. These will quickly destroy a battery when located, but shrapnel from frontal fire never will.

Laying.—There is no direct laying. Our methods have well answered the test of war.

Methods of fire.—Gun fire is evidently very rare; battery fire is the usual method. The largest number of rounds fired by a battery in a day, according to present information, amounts to 1,152 for an 18 pr. battery, but the total number in the war is not double this for the same battery.

Control of fire.—Voice control has been employed in some of the somewhat confused actions referred to above. A Howitzer battery on one occasion was engaged with infantry at 600 yards firing shrapnel full charge; voice control was employed. Another battery, the day after disembarkation from the train, had to cover a front of over 180 degrees. It was shot at later from in rear also. Voice control was naturally used but in normal action it would never be considered for a minute.

Ammunition Supply.—No very definite system has been evolved as being the best. As much cover as possible must be gained both from overhead and from behind if possible. Sometimes both wagons may conveniently come up, or wagon on one side and limber on the other side of the gun. Replenishment of ammunition is normally by carriers, but may be effected by wagons at night, etc. Limber supply does not appear to have been ordered, but the limber ammunition has often been used up.

Corrector.—Officers do not sufficiently use the table on page 164, Field Artillery Training. The cardinal fault of our shooting would appear to be bursting shrapnel too short; the same applies to that of the enemy.

4.5 inch. Q. F. Howitzers.—Never used in brigade at all,—often by sections. Time shrapnel ranging with the howitzer is believed not to have been used at all.

60 pr. B L. has been invaluable. Economy of ammunition is of first importance. It can sometimes be attained by making use of the 18 pr. for ranging purposes.

Map reading.—Map reading forms a very important detail in the daily work of officers and non-commissioned officers and should therefore be practised as much as possible.

Signalling.—The amount of work and time devoted to visual signalling have not borne fruit in this war, but the more practice men have with the telephones and the buzzer the better. An enormous amount is dependent on the telephones. Heavy batteries go in for flag signalling with the observation officers.

Entrenching.—Types in "Field Artillery Training" of pits, etc., are not sufficient. Pits for men must be at least 4 feet deep and narrow, but many battery commanders prefer the gun to be in a deep pit. It depends partly on the weather. It is desirable to have a parapet in rear as well as in front on account of the high explosive shell. Solid overhead cover is also desirable. The width, 13 feet, is not excessive in bad ground or wet weather.

The chief considerations to be borne in mind are:

1st. A good and sufficient platform for the guns.

2nd. Cover from view from front and overhead.

3rd. Protection for detachments while serving the guns.

4th. Complete cover when not serving the guns.

5th. Overhead protection from bad weather.

MATERIAL REQUIRED BY AN ARTILLERY OFFICER AT THE FRONT:

1 Razor, Shaving brush, Soap, etc.

1 Pair Field boots.

4 Khaki shirts.

12 Khaki collars.

3 Khaki ties.

Shoe polish and brushes.

1 Unbreakable metal mirror.

1 Change of uniform.

1 Trench cap.

1 Pair puttees.

1 Cardigan jacket.

1 Muffler or scarf.

1 Sleeping valise with cork mattress.

1 Pair rubber boots.

2 Pairs ankle boots.

1 Sleeping cap.

1 Pair gauntlets.

1 Pair gauntlets (lined).

1 Mess tin, or officer's canteen complete.

1 Waterproof or oilskin, with sou'wester.

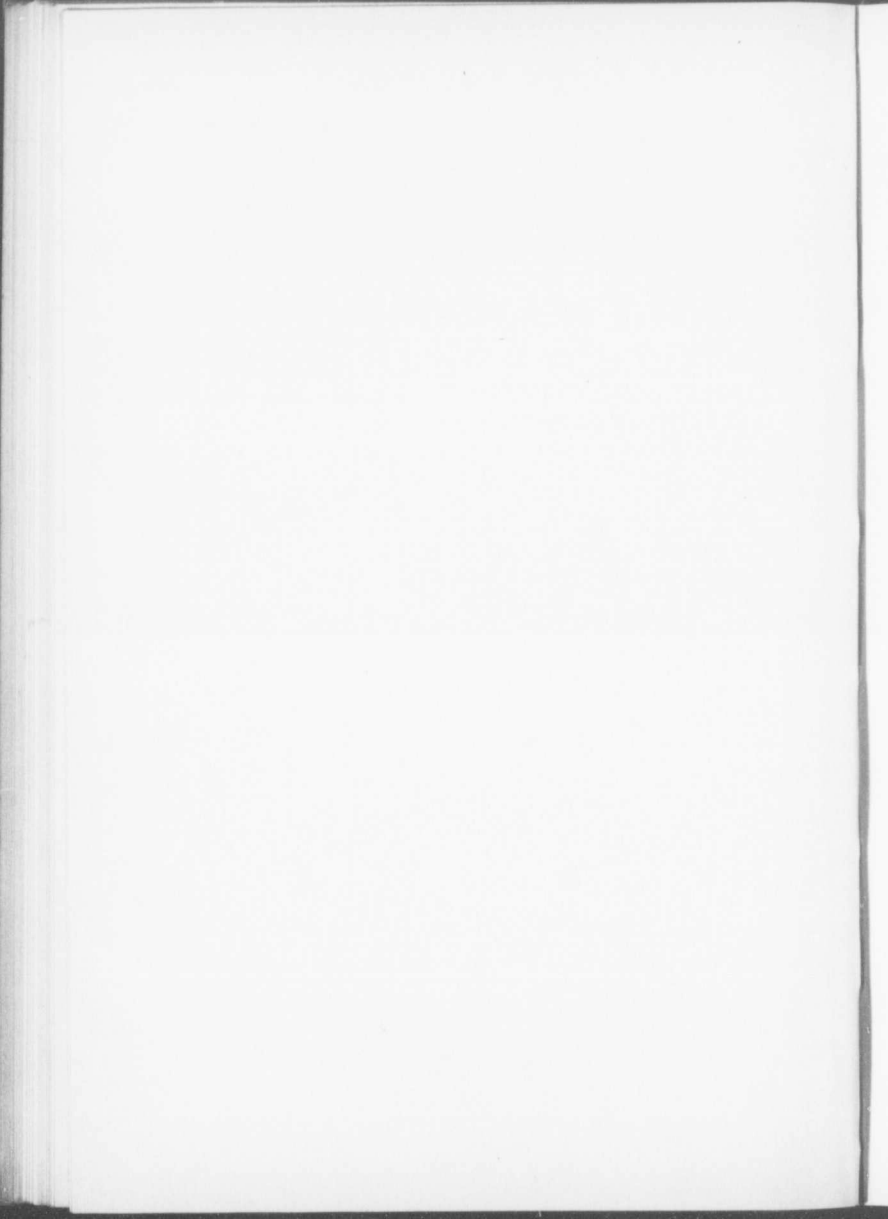
3 suits underwear.

6 Pairs wool socks.

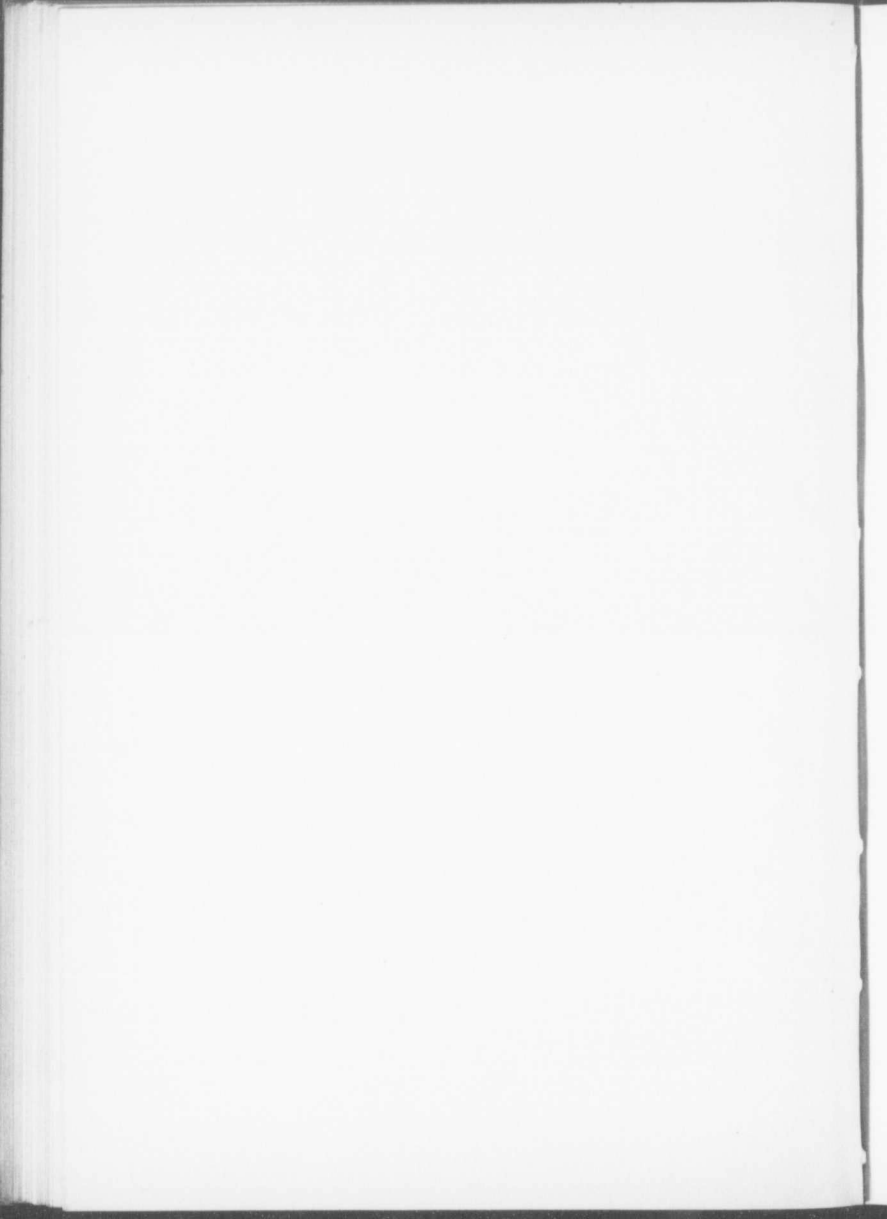
1 Writing portfolio (small).

1 Electric flash, and extra batteries.

- 1 Revolver, holster, and ammunition pouch (any make as long as it takes Government ammunition .455)
- 1 Pair binoculars (graticuled).
- 1 Prismatic compass.
- 1 Map case (expanding).
- 1 Pair saddle wallets.
- 1 Set pencils, plain, copying, red and blue.
- 1 Scale 1:100,000 (ivory).
- 1 Scale 1:80,000 (ivory).
- 1 Transparent protractor (circular).
- 1 Wrist watch.
- 1 Spare watch.
- 2 or 3 small note books.
- 1 Pair pocket dividers.







CHAPTER VI

BATTERY DRILL

F. A. T. gives detailed instructions for all formations, but they are compiled for the 6-gun battery organization. "Hand-book on Battery Drill" gives detail for the 4-gun Canadian Battery.

BATTERY FORMATIONS.

	<i>Intervals</i> (between sub-sections)	<i>Distances</i>
Line,	Full. Half. Close. 20 yds. 10 yds. 4 yds.	Between guns and wagons 4 yds
Battery column	20 yds. 10 yds. 4 yds.	Between guns and wagons 4 yds. From No. 1 to No. 1 of sub-sections, 40 yds.
Echelon	20 yds. 10 yds. 4 yds.	From No. 1 to No. 1 of sub-sections, open echelon 40 yds., short echelon 20 yds.
Battery quarter column	20 yds. 10 yds. 4 yds. between guns and wagons, 4 yds. (i.e. close interval) unless otherwise ordered.	Between sections from rear of front carriages to heads of following teams, 6 yds.
Column of sub-sections,	(between carriages) 20 yds. 10 yds. 4 yds.	Between sections from rear of front carriages to heads of following teams, 4 yds.
Column of route	Between carriages, as above, 4 yds.

Fig 1 "LINE" close order

♠ B.C.
♠ Tr.

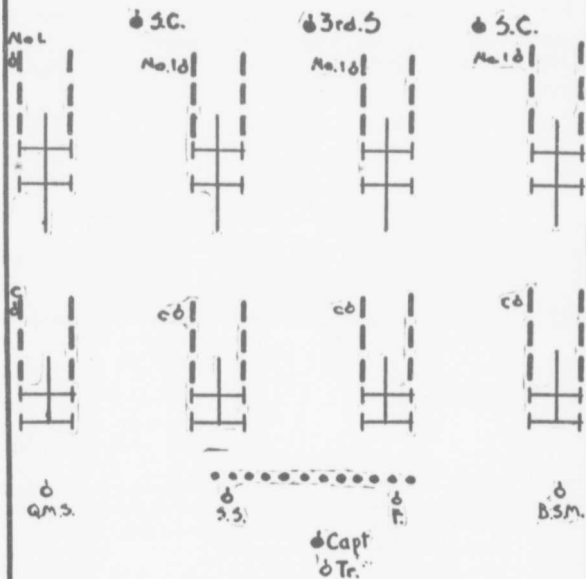


Fig 2 BATTERY COLUMN

♣ B.C. Half interval
♣ Tr

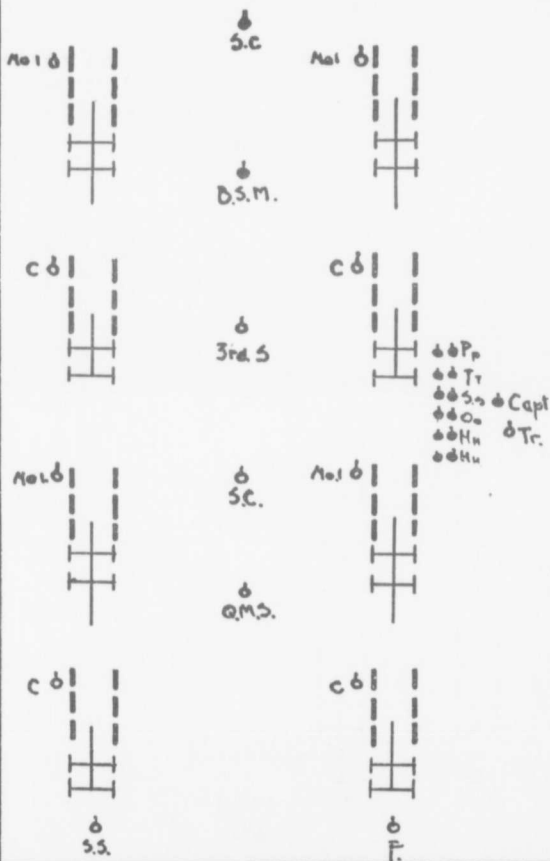


Fig 3. "OPEN ECHELON"
of section
From the right Close interval.

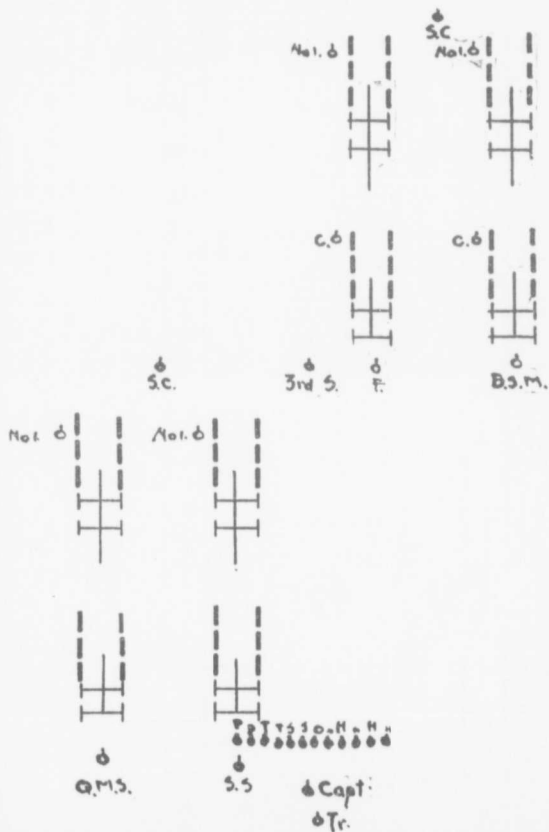
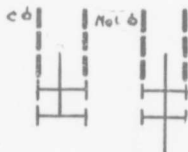
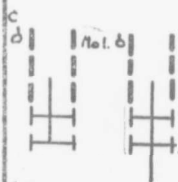


Fig 4 BATTERY QUARTER COLUMN
Half interval

● BC.

○ Tr.

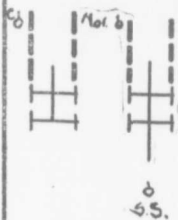
♣ S.C.



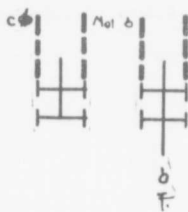
○ D.S.M.



○ 3rd S.



♣ S.C.



○ D.S.M.

○ S.S.

○ Tr.

Fig 5.
"COLUMN OF
SUB-SECTIONS
Half interval

♂ D.C.

♂ Tr.

♂♂ P.P.

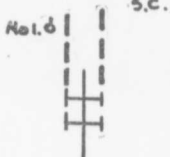
♂♂ Tr.

♂♂ S.S.

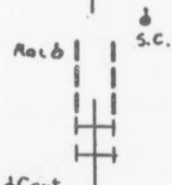
♂♂ O.O.

♂♂ H.H.

♂♂ H.H.



♂♂ 3rd S



♂♂ S.S.

♂♂ O.M.S

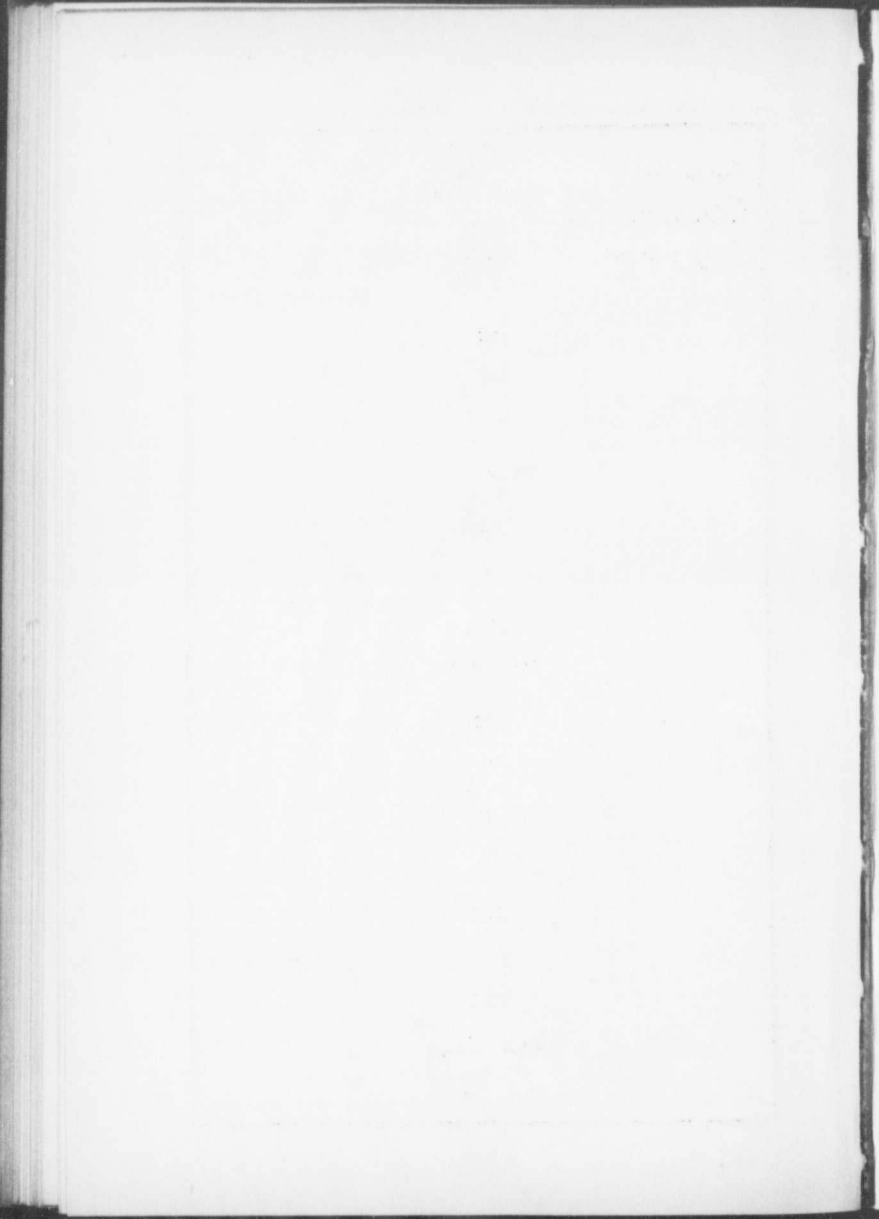
♂♂ Capt.

♂♂ Tr.

♂♂ F

Fig 6. —
COLUMN of
ROUTE"













CHAPTER VII

SECTION GUN DRILL

[Those paragraphs marked with an asterisk should not be taught until the drill has been learned.]

GENERAL INSTRUCTIONS

Preliminary instruction in the equipment should be given to each recruit before any attempt is made to teach him Section Gun Drill.

As soon as he is conversant with all parts of the equipment, and can handle in the best and quickest manner each of the working parts of the gun, instruction in Section Gun Drill should be commenced.

This instruction should take the form of practical demonstrations dealing with the work of each man of the detachment, and all men under instruction should, in turn, carry out the work of each particular number.

Once the work of each number has been thoroughly mastered it should not take long for the recruit to learn the actual drill.

It is most important that a distinction should be drawn between **instruction** and **drill**.

During the former the language used should be as simple as possible, and the meaning of all technical terms which are necessary should be carefully explained. A conversational tone should be adopted and under no circumstances whatever should anything in the nature of long quotations from drill books be allowed. The men should be permitted to assume an easy attitude and their interest should not be allowed to flag. They should be encouraged in the fullest possible degree to ask questions.

At **drill** on the contrary the most rigid discipline must be maintained, orders must be clear, decisive and emphatic, and the detachments made to work steadily, smartly, and rapidly. At the same time the utmost accuracy is essential and any deviation from the methods laid down must be at once strictly checked.

The following instructions are arranged so that all work carried out by each individual member of a detachment is grouped together.

Detailed Instructions for Gun Detachment.

The detachment consists of 10 men, 6 of whom work in the firing battery, the remainder forming a reserve.

The duties of each particular number are as follows:—

No. 1

1. Before leaving the gun park he must satisfy himself that the equipment of his sub-section is complete in every respect, reporting the fact to his section commander.

2. He must examine the buffer and see that it is properly filled. To do so he should remove the plug of the filling hole and bring the gun into a horizontal position, the control plunger should then be just covered with oil.

He must be careful to ascertain that oil is not leaking from the buffer through the packing. A leakage may be detected by means of two holes underneath the outer spring case, one in front and one in rear. A leakage of oil is liable to cause a serious accident to the equipment during firing.

Instructions for filling the buffer are shown on a metal plate on the outer spring case.

3. He only gives the words of command shown for him in Section Gun Drill. His executive orders should not be louder than is necessary for his sub-section to hear, but when assisting to pass orders down the battery, they should be given out loudly enough to ensure them getting through.

4. He must acknowledge all orders affecting his sub-section by saluting, also any orders that he may be required to pass down the battery. The salute must be given accurately and unmistakably so that it may be plainly seen.

5. When his gun is in action in the open he must ascertain at the first opportunity the target or reference point, and also both in the open and under cover the aiming point, or auxiliary aiming point, if either are used by the layer.

*6. He must calculate the deflection necessary to compensate for any difference in level of wheels. To do so he should make a liberal estimate of the number of inches difference in level of wheels and multiply it by the number of degrees elevation due to the range to be fired at, which can be seen on the rim of the range indicator. The result must be given in minutes deflection to the side of the higher wheel (see F.A.T., Sec. 119). **He must not alter this deflection after his gun has once opened fire.**

When a switch is made to a target at a different range he must bear in mind the amount of deflection already on the sight for difference in level of wheels when making his new calculation.

To avoid the necessity for giving deflection for difference in level of wheels, and to assist in steadying the carriage, the higher wheel may be dug in if time and ground permit. The hole should be dug in front, or in rear of, the higher wheel, and the gun run into it.

7. If the gun is in action on a side slope and the higher wheel has not been dug in, he will direct the layer to adjust the traversing gear so that the breech is one or two degrees on the side of the higher wheel, otherwise the gun is apt to "side-slip" down the slope.

*8. When a gun is in action on a forward slope or a high angle of elevation is likely to be required it is always advisable to dig in the trail. The track for the trail should be semicircular in shape and shaped in section thus:—V. The front edge should be gently sloped to avoid the trail resting on it.

No. 1 must see this done without waiting for orders.

*9. In order to find the highest elevation at which the gun can be fired without digging in the trail he must set the sight clinometer to the angle of sight ordered (zero if none has been ordered), and level the bubble by the handwheel on the **left** side, the gun then being elevated as far as possible by the handwheel on the **right** side. The range indicator will now show the highest elevation at which the gun can be fired. When the spade becomes buried after the first round about 900 yards extra range may be obtained.

10. He lays for direction by looking along the top of the spring case and moving the trail as required by means of the traversing lever. He should lay the gun within half a degree of zero traverse by the traversing lever for the first round (except when special traverse has been ordered), so that when the spade engages in the ground the layer will have as large an amount of traverse as possible available for subsequent corrections for line. To enable this to be carried out the layer must signal to No. 1 with the palm of his hand the direction in which he wishes the trail moved.

When the traverse (which he must closely watch) becomes exhausted he should immediately look over the spring case and note the direction in which it is pointing. The layer will then adjust the traversing gear as required (see paragraph 7), and when adjusted, No. 1 must move the trail so that the spring case is pointing in the same direction as before.

11. If when direct laying is employed and a new target is ordered and pointed out by means of the clock code, he should in order to save time, without looking for the target, at once throw his gun over in the direction indicated. The layer

should then have no difficulty in picking up the target in the field of the telescope.

*12. In the event of a missfire or of a new firing pin being inserted in the striker, it may be necessary to gauge the protrusion of the striker. The procedure will be as follows:—

Swing the breech screw and carrier into the loading position and remove the striker. Take out the main spring from the striker and reassemble the latter. Replace the striker (with out main spring) in position in the gun, press in the catch retaining breech screw and revolve the breech screw in the carrier until it is in position it would be for firing if the breech were closed. Press the striker forward in the breech screw as far as it will go and apply the gauge to the front face of the breech screw†. In the event of the protrusion not being between the limits of .09 and .11 of an inch the firing pin must be exchanged; if the protrusion is too great the act of closing the breech may fire the gun and an accident result.

No. 2

1. No 2 sits on the seat facing the breech and astride the brake arm, and must be careful that his left leg and arm are clear of the recoil (especially at extreme left traverse) before he reports "Set."

2. He is responsible that the brake is always put on when in action. When putting on the brake, either for travelling or firing, great care should be taken that the brake is not put on too hard. When in action the brake should be put on with the quick release lever housed.

3. He opens and closes the breech as follows:—

To open the breech.—He takes hold of the lever with his left hand (pressing the spring with his fingers) and draws it smartly towards him. When the gun is fired his left arm should be extended ready to grasp the lever breech mechanism as the gun is running up. As soon as the breech is opened and the cartridge extracted he should ease up the extractor so that the next round can slide home into the chamber.

To close the breech.—He swings the breech screw smartly round into its position in the gun.

A dented cartridge case or burred driving band may on some occasions cause difficulty in closing the breech. When such difficulty occurs he should grasp the lever breech mechanism with both hands and exert the whole weight of his body on the breech screw to **press** the shell home, but the

†Extract from Regulations for Magazines and Care of Matériel.

breech screw must on no account be used as a hammer to drive the cartridge home.

If the breech cannot be closed in this manner the most probable cause is a loose primer which should be examined, and if necessary screwed home. If the breech cannot be closed and the extractor will not withdraw the round, the primer must be unscrewed by the "key removing jammed cartridges." The plug end of the key is then screwed into the primer hole and the cartridge withdrawn. A drag-rope may be hooked to the eye of the key if necessary.

4. Before the range indicator can be moved on coming into action the clamping lever must be turned to the front and the gun depressed by means of the handwheel on the left side. Should the clamping lever become jammed a spanner, No. 122, may be inserted in the handwheel on the left side and slightly revolved; the lever can then be released.

5. H must follow up on the range indicator the ranges ordered. He should set the range indicator to a range greater than the range ordered and then **depress** until it reads the correct range. He should bring his eye close to the range indicator in order to ensure accurate setting. Elevation is given by turning the handwheel to the rear. **Rear—Raise.**

Should there be a tendency for the range indicator to revolve on the gun being fired he must keep it steady by holding the handle with his right hand.

6. When there is a change of target No. 2 must always be ready to assist No. 1 by manning the right wheel if required.

7. If the aiming point is to the left he must assist No. 3 by laying on it with the finder of the No. 7 dial sight.

8. At "Cease Firing" the gun must be fully depressed by the handwheel on the right side, and fully elevated by that on the left side. The clamping gear must then be engaged by turning the clamping lever to the rear, and slightly depressing the gun by the handwheel on the left side.

9. When manning the wheel to move the gun forward he should grasp the spoke which is nearest to the horizontal with his left hand, and the fourth one from it to the front with his right hand. The spokes should be grasped as near the felloe as possible.

10. When replacing the dial sight in its holder he must take care that the catch-pin of the holder engages in the recess in the carrier, otherwise the sight may be jolted out of the holder and seriously damaged.

11. He should only move the safety catch to "safe" when it is desired to travel with guns loaded.

No. 3

1. On coming into action he must be careful not to delay the placing of the wagon by standing outside the left gun wheel.

2. When fixing the telescope he must take care that the small stud in rear of the telescope fits the slot on the rear bearing of the sight bar.

3. To facilitate rapidity in laying he should clamp the No. 7 dial sight so that the eye piece suits the height of his eye, at the same time keeping it as low as possible.

4. When in action the normal position of his hands will be as follows:—The left hand on the elevating handwheel, and the right hand on the traversing handwheel. As soon as the gun is layed he grasps the firing lever with his right hand. Directly the gun is fired his right hand resumes its former position.

He must remember that to give elevation or to traverse the gun to the right he must turn the elevating and traverse handwheels respectively to the rear. **Raise—Right—Rear.** One complete turn of the elevating and traversing handwheels gives half a degree elevation and deflection respectively.

5. When placing **right** deflection on the rocking bar or No. 7 dial sight he should always turn the **right** micrometer head with the **right** hand **away** from himself. When giving **left** deflection he should turn the **left** micrometer head with the **left** hand **towards** himself. **Right—Away.**

6. When using the No. 7 dial sight whole degrees must be put on the main scale and minutes on the deflection or lower scale.

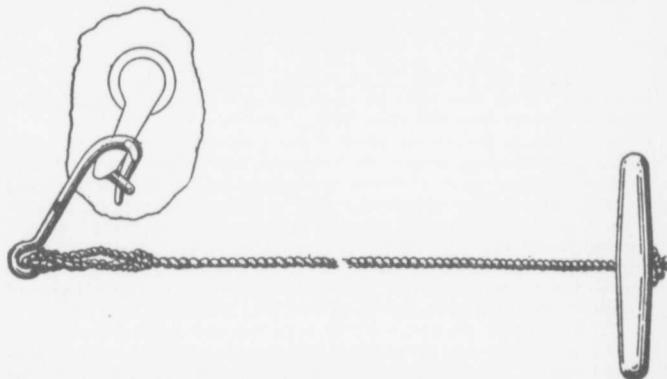
After making use of the thumb piece for setting the main scale, the micrometer head must be turned through several degrees (to ensure that the worm and rack are properly engaged) before making the final adjustment.

7. To raise the angle of sight the rear micrometer head of the sight clinometer must be turned to the right and vice versa to lower the angle of sight. **Right—Raise. Left—Lower.**

8. It must be remembered that after the spade has been embedded in the ground by the first round, the gun elevates for successive rounds about 10 minutes, and moves to the right or left according to the amount of traverse right or left on the traversing gear, and the slope or irregularities of the ground. The layer must try and rectify this movement as soon as possible after firing, and the gun should be relayed practically as soon as the run up is completed. By these means only can rapid and accurate fire be maintained.

9. He fires the gun by pulling the firing lever of the carriage smartly and at once releasing it. Should the firing lever on

the carriage become damaged the gun may be fired by 1, who will hook a lanyard to the loop on the trigger lever, as in diagram:—



10. Whenever the gun has to be moved in action, he must take off the brake by means of the quick release lever and put it on again by the same means only, when the gun is in the correct position. On the order "Cease Firing" the lever must be secured by its quick release strap.

No. 4

1. He should always have one round of ammunition ready for loading, and be prepared to set the fuze if necessary.

2. **To load.**—He places the head of the shell in the bore, being careful not to strike the breech, supporting the round on the back of the left forearm and pushing it home with the palm of the right hand, fingers uppermost, raising his right hand smartly so that his palm strikes against the upper part of the breech, thus keeping his fingers clear of the breech screw. The practice of pushing the round home by means of the fingers is dangerous, since if the breech should be quickly closed before his fingers are clear they are liable to be injured.

3. He is responsible for attending to the waggon brake. To put on the brake the handle must be turned to the right, and to take it off it must be turned to the left. **Right—Tight. Left—Loose.**

4. When examining ammunition boxes he must see that they are properly filled, that the lids open easily and that the locks are in good order. These instructions apply to all ammunition numbers.

No. 5

1. The rapid supply of ammunition to the gun is most important. This can only be maintained if there is a good mutual understanding between Nos. 5 and 6.

2. When in action six rounds per gun must be always available for immediate use with covers and clips removed and primers examined. If firing is likely to be continuous a larger supply should be available. To facilitate the supply of ammunition, extra rounds may be withdrawn and placed on the ground. If the ground is wet or boggy some article, such as an ammunition carrier, should be placed underneath the rounds in order to prevent dirt, &c., adhering. A cartridge covered with earth or mud is liable to jam in loading.

3. He should always use the fuze key for setting fuzes.

4. He should always follow up fuzes so that the least possible delay occurs between the calling out by No. 6 of the length of fuze required for his gun and the loading of the round.

5. He should always hand ammunition to 4 with the base of the cartridge leading.

6. He is responsible that every uncapped shell replaced by him in the limber or wagon body has the fuze set at "safety."

To set a fuze at "safety," the safety mark on the graduated scale and the vertical line on the setting ring must exactly coincide, thus:—



He examines primers in conjunction with No. 6 to see that they are screwed tightly home.

7. To "unhook" the wagon teams on coming into action 5 and 6 must go to the wheel traces, 5 on the off and 6 on the near side. They release the attachments and 6 steadies the

pole while 5 guides the "bar supporting pole" off the pole if necessary.

8. To "hook in" the team, 6 holds up the pole near the foot-board on the near side, and 5 guides the ring of the bar supporting pole on to the pole. As soon as the ring is on the pole, they fasten the attachments of the wheel traces.

9. When unhooking, the inside traces should be released first, and, when hooking in, the outside traces should be first attached.

No. 6

1. He must follow up all orders for corrector and range on his fuze indicator, so that the shortest possible time may elapse between the order to load and the calling out of the length of fuze.

2. The length of fuze must be called out loud enough for the section commander to hear, so that the settings may be checked.

3. The reader of the fuze indicator must invariably be used, and not the thumb nail.

4. When the reader comes between two readings on the indicator, the shorter reading should be called out.

5. When he is not following up on the fuze indicator, or setting it, he should be preparing ammunition, or assisting No. 5 in setting fuzes.

6. He is responsible that every uncapped shell replaced by him in ammunition boxes at "cease firing" has the fuze set at "safety," as shown above.

Casualties to Equipment.

*1. **Jammed breech mechanism.**—(See also Handbook, page 7.) If, after firing, the breech mechanism cannot be opened, No. 2 must first examine the trigger, and see that it has resumed its normal position, if not, he must press it into its position. If the breech is still jammed, he must then examine the guide for mainspring to see whether it is flush with the rear face of the carrier. If not flush, the firing mechanism must be moved before the breech can be opened. If flush, a drag-rope may be attached to the lever breech mechanism to pull it open, care being taken that the catch retaining lever breech mechanism is pressed in before pulling on the rope.

*2. **Gun not running up.**—The principle causes of failure of the gun to run up are:—

- i. Too much oil in the buffer.
- ii. Want of lubrication of guides.
- iii. Broken spring case.
- iv. Weak or broken springs.

Should the gun fail to run completely up after firing, Nos. 2 and 3 should, during the run up, assist to push it home in the cradle.

*3. To lay the gun when the sight clinometer cannot be used.—Set the field clinometer at the angle of sight ordered, place it on the clinometer bracket of the rocking-bar and level the bubble by the handwheel on the **left** side.

*4. To lay the gun if the range indicator cannot be used.—Set the field clinometer to the quadrant angle, place it on the clinometer plane of the gun, and level the bubble by the handwheel on the **right** side.

*5. To lay the gun when neither the rocking bar nor the dial sight can be used.—Set the field clinometer to the quadrant angle, place it on the clinometer plane of the gun, and level the bubble by either handwheel as may be most convenient. The direction will be obtained by making use of the sighting arrangement on the spring case and using the traversing gear as a deflection scale.

*6. **Dial sight.**—If the dial sight cannot be used and no other is available the line of fire can be obtained as follows:—

For angles up to 45° from the aiming point.—Set the field clinometer to the angle ordered and place it horizontally against the outer side of the top felloe of the left gun wheel.

For right deflection the pivot pin must be to the rear.

For left deflection the pivot pin must be to the front.

Look along the edge of the slider and direct the gun so that the edge of the slider and aiming point are in line. Aiming posts should now be planted in line with the rocking bar sight set at zero, or an auxilliary aiming point picked up. Deflection for level of wheels must be placed on the rocking bar sight is necessary.

If the angle is from 45° to 135° the clinometer should be placed on the face of the breech set as follows:—

For angles between 45° and 90° .—Subtract the angle from 90° and set the clinometer to the result obtained, the pivot pointing to the side of the aiming point.

For angles between 90° and 135° .—Subtract 90° from the angle ordered and set the clinometer to the result obtained, the pivot pointing away from the aiming point.

GUN DRILL.

The general principles of battery tactics which vary but little with the different equipments are laid down in Field Artillery Training.

The following paragraphs give the duties of the detachments on the section commander's orders.

Single detachments should be accustomed to drill as if forming part of a section, and the instructor should therefore always use the orders given for the section commander.

The Detachment.

The detachment consists of 10 men. The senior non-commissioned officer is No. 1, and is in charge of the sub-section.

The detachment fall in two deep, one pace between ranks, No. 1 on the right of the front rank, and when at "Detachment Rear," are formed three yards in rear of muzzle, No. 1 covering the off wheel.

To Tell Off.

At the order from the section commander. . . . Section—Tell off.—No. 1 numbers himself 1; the right hand man of the rear rank 2; the right hand man of the front rank 3; the second man from the right of the rear rank 4; his front rank man 5; and so on.

Positions when Mounted.

1 and 10 on their horses, and when limbered up usually on the left of the gun and wagon leaders respectively; 2 and 3 on the gun limber; 5 and 6 on the wagon limber; 4 on the wagon of the firing battery; 7 and 8 on the limber; 9 on the wagon of the first line; 2, 4, 6, and 8 on the near side, 3, 5, 7, and 9 on the off side.

To Mount.

At the order from the section commander. " . . . Section--Detachments prepare to mount"—The men double to their places at the carriages, 2, 6, 8, and 9 lay hold of the guard iron with their left hand placing the inner foot on the trail, perch, or spoke; 3, 4, 5 and 7 lay hold of the guard iron with their right hand placing the inner foot on the trail, perch, or spoke.

At the order "Mount"—The whole spring into their places, the men on the limbers turn round to the front, lifting their feet close together and throwing them over the guard irons.

They sit upright, holding the handstraps with their inward hand, and the guard iron with their outward hand. This is the position at "Attention."

When going over rough ground they should slightly raise themselves to avoid being jolted.

At the order "Sit at Ease"—The men on the carriages place the outward upon the inward hand and sit well back.

To Dismount.

At the order from the section commander. "...Section—**Detachments Prepare to Dismount**"—All the men except 4 and 9 turn to the rear, throwing their legs over the guard iron; 4 and 9 stand up.

At the order "**Dismount**"—The whole jump off and form detachment rear.

To Move the Gun with Dragropes when Limbered Up.

At the order from the section commander. "...Section—**With Dragropes Prepare to Advance**"—2 and 3 hook the dragropes to the gun-wheel washers; the two highest numbers go to the pole and the remainder man the ropes. Even numbers on the near side, odd numbers on the off.

At the order "**Walk March**" the carriages are moved to the front.

At the order "**Halt**" the carriages are halted and the detachments remain at their posts.

At the order "**Detachments Rear**" 2 and 3 replace the dragropes on the shield, and the detachments double to their places by the shortest way and halt.

To Move the Gun without Dragropes when Limbered Up.

At the order from the section commander. "...Section—**Without Dragropes, Prepare to Advance**"—2 and 3 push in rear of the shield; 4 and 5 man the gun wheels; the two highest numbers go to the pole and the remainder assist. Even numbers on the near side, odd numbers on the off.

At the order "**Walk March**" the carriages are moved to the front.

At the order "**Halt**" the carriages are halted and the detachments remain at their posts.

At the order "**Detachments Rear**" the detachments double to their places by the shortest way and halt.

Preparation for Action.

At the order from the section commander. "...Section—**Prepare for Action**."—1 and the detachment if mounted, dismount, and—

1 sees that the bore is clear, superintends the other men, and satisfies himself that the gun and carriage are in all respects ready for action.

2 removes breech and muzzle covers, straps them on the front of the shield, examines the breech mechanism, extractor, ranging gear, clamping gear, shield, and brake.

3 examines sights, brake, elevating, traversing, and firing gears.

4 examines the gun limber box. He provides himself with a fuze key from the carriage placing the lanyard round his neck and the key in his pocket.

5 examines the wagon limber box.

6 examines the wagon box.

5 and 6 provide themselves with fuze keys from the wagon.

7 and 8 examine the limber box of the first line wagon.

9 examines the wagon box.

The men who examine the ammunition boxes, uncover fuzes as ordered and see that they are set at "safety," and examine the fuze indicators.

As the fuzes are liable to deteriorate rapidly when unprotected from damp, it is important that only such as are required for immediate use should be uncovered.

Breech and muzzle covers may be replaced if necessary.

Each man resumes his place as soon as he has completed his duties.

Action Front.

At the order or signal from the battery leader or section commander "Halt, Action Front"—1 orders "No. . . . Halt, Action Front."

At the order from 1—

The detachment dismounts, 3 unkeys and with 2 lifts the trail; when the trail is clear of the hook, 3 orders "Limber Drive On."

On dismounted parades 6, 7, 8, and 9 will attend to the limber, 6 and 7 pushing in rear, 8 and 9 at the pole.

The limber advances one yard, wheels to the right about, at a trot, and proceeds direct to the wagon line.

2 and 3 carry the trail round half a circle to the right (3 shifting round the trail eye to avoid walking backwards), and lower it to the ground.

1 mans the near gun wheel, 4 assists if necessary.

As soon as the trail is lowered to the ground the wagon will drive up as laid down in F.A.T., Sec. 196, paragraph 5, and on the signal "Advance" from 1, 5 and 6 immediately unhook, 4 puts on the wagon brake, opens the wagon box and prepares to issue ammunition.

The position of the detachment is as follows:—

1 kneels on the left side of the trail.

2 sits astride on the seat on the right side.

3 sits on the seat on the left side.

4 kneels behind 3, or behind 2, if the wagon is on the right of the gun or at limber supply.

5 kneels in rear of wagon on the side nearest the gun.

6 kneels in rear of the wagon on the side farthest from the gun.

7, 8 and 9 remain with the first line wagons; they assist in the supply of ammunition and replace casualties in the firing battery as ordered.

At standing gun drill, when no first line wagons are present, they take post six yards in rear of their guns.

As soon as the detachment is in position orders will be given regarding the reference point and target, or aiming point, sight to be used or angle of sight required, deflection and also range.

1 throws back the traversing lever, lays approximately for direction, and points out the target or aiming point to 3.

2 lowers the shield, unclamps the clamping gear, hands the dial sight to 3, puts on the break, opens the breech, and adjusts the range indicator as ordered.

3 fixes the sight clinometer, dial sight, and, except when under cover, the telescope and lays.

4 supplies himself with a round of ammunition from the wagon.

5 prepares ammunition.

5 and 6 examine the primers to see that they are screwed tight home and screw up any which require it.

6 fixes and adjusts the fuze indicator.

Action Right—The trail is carried round a quarter of a circle to the left, 2 shifting round the trail eye.

Action Left—The trail is carried round a quarter of a circle to the right, 3 shifting round the trail eye.

In both cases the limbers advance one yard and wheel in the direction of the wagon line.

Action Rear—The trail is not carried round.

In each case the wagons are placed as for "Action Front."

When coming into "Action Front" on a side slope the trail should be carried round down hill.

To Form Detachment Rear in Action.

At the order from the section commander. "...Section—Detachments Rear"—1 doubles to his place (three yards in rear of and covering the right wheel), and gives the order "No.Double, March."

At the order from 1—The remainder double to their places by the shortest way and halt.

To Take Post from Detachment Rear in Action.

At the order from the section commander. "...Section—Take Post"—1 orders "No.Double, March."

At the order from 1—The detachment double to their places by the shortest way and halt.

General Duties in Action

1 is responsible for the entire service of the gun. He commands, attends to the traversing lever, but will not touch it once the gun is layed. He orders deflection for difference in level of wheels. He assists in passing orders down the battery when necessary. He will occasionally examine the settings on the sight clinometer, range, and fuze indicators.

2 attends to the breech mechanism, range indicator, clamping gear, and brake; lowers and raises the shield, and attends to the fuze indicator on the shield when required.

When an order is given to "add," or "drop," the range for his gun he will make the necessary alterations on his range indicator and call out the new range loud enough for 6 to hear.

3 lays, fires, attends to the releasing lever of the brake, and assists 2 to raise the shield. When laying direct he should level the sight clinometer as soon as possible.

4 loads, assists in setting fuzes when required, and attends to aiming posts if in use.

5 sets fuzes and supplies ammunition.

6 attends to the fuze indicator, and assists in supplying ammunition.

To Load.

At drill, only drill cartridges with wooden shell will be placed in the bore.

At the order from 1 "No. . . . Percussion Load"—

4 sees that his round is set at "safety," loads, and receives another round from 5.

5 supplies 4 with a round set at "safety."

2 closes the breech, adjusts the range indicator to the elevation ordered and reports "set" when ready.

3 checks the lay, places his hand on the firing lever, and reports "ready."

At the order from 1—No. . . . Corrector (Range) Load"—

6 sets the fuze indicator as ordered and calls out the length of fuze.

5 sets the fuze by hand or with the fuze-key and supplies the round to 4.

When there is no alternation of corrector or range for subsequent rounds, 1 will order "Time, Load."

The duties of 2, 3, and 4 are as for loading with percussion.

To Fire.

A gun is not to be fired without the order from 1, who must never give this order until he sees that the gun is in all respects ready.

As soon as the gun is ready and its turn comes to fire, 1 orders "No. . . . Fire."

On this order 3 fires the gun.

As soon as the gun is fired—

2 opens the breech.

3 re-lays.

Except when ranging with time shrapnel, guns should be reloaded at once.

Missfire (Service Ammunition).

If there is a missfire, the firing lever is pulled again at once. If it again fails to fire, after an interval of one minute the gun is unloaded and a fresh round placed in the bore. The primer is examined to see if struck, if not struck the striker is examined and changed if necessary. The gun is reloaded and fired when ordered. If the cap has been struck the round will be taken to the rear and examined.

None of the detachment should be directly in rear of the breech when it is opened.

*If the primer has failed to ignite, it will be set apart for special examination, a fresh primer being substituted in the cartridge.

If, however, the magazine of the primer has fired, and failed to ignite the cordite charge, provided there is an opportunity for firing the round immediately by the substitution of a fresh primer, this may be done; failing this the shell will be removed, the charge withdrawn and destroyed (by laying it out in a train and lighting one end). The cartridge case and primer will be returned in the usual manner.

Missfire (Blank Ammunition).

1. No officer, non-commissioned officer, or gunner, is to command or form part of a section or gun detachment firing blank ammunition at salutes or at training who has not been trained and passed in gun drill.

2. When firing Q.F. blank cartridges, no gun is to be reloaded within 15 seconds after firing.

Even after this interval no gun is to be reloaded unless the No. 1 has examined the chamber and the bore and removed any "debris" remaining from the previous round.

3. In firing salutes not less than four guns are to be used. When firing signal rounds during training, however, any num-

ber of guns may be used provided that the conditions of paragraph 2 are fulfilled.

4. In the event of a missfire, at least one more attempt should be made to fire the gun, when it is again its turn, but in any case the breech must not be opened for at least one minute with "black powder" charges and ten minutes with "smokeless powder" charges after the last failure to fire the gun. None of the detachment should be directly in rear of the breech when it is opened.

In firing salutes, an officer or senior non-commissioned officer should be detailed for the special duty of timing the interval after a missfire, and informing No. 1 of that gun when the breech may be opened.

5. As a further safeguard Nos. 1 are responsible that the charge is properly home in the case before the round is loaded. This can be done by pressing down the leather bound cup on the point of the traversing lever, a small mark being made under local arrangements on each traversing lever, to indicate when the charge is in its correct position.

Battery, Section or Gun Fire.

At the order from the section commander the gun is loaded by order of 1, fired in its turn at the interval ordered, and reloaded as soon as fired.

To Stop Firing.

At the order "Stop" the detachment will continue their duties but the gun must not be fired until the order "go on" is given.

To Stand Fast.

At the order from the section commander "...Section Stand Fast"—All stand fast whatever they are doing. At the order "go on" the work is continued.

To Unload.

At the order from 1, "No. . . . Unload"—2 opens the breech slowly, and 4 withdraws the round and places it on the ground.

If an alteration in range or corrector has been ordered 4 will receive another round from 5, set at the proper fuze. The unloaded round can be reset or returned to the wagon.

To Cease Firing.

Before giving the order to cease firing guns must be unloaded.

At the order from the section commander. "...Section—Cease Firing"—

1 folds the traversing lever on the trail.

2 closes the breech, takes off the brake, depresses the gun to its full extent, raises and secures the shield, secures the clamping gear, receives dial sight from 3 and replaces it in the holder. When replacing the dial sight in the holder care should be taken that the catch is fully engaged.

3 sets traversing gear at zero, runs down the elevating gear to the travelling position, assists 2 to raise the shield, replaces sight clinometer and telescope if in use, hands dial sight to 2, and secures the traversing gear and quick release lever by their straps.

4 brings in the aiming posts, if in use.

5 and 6 reset fuzes at safety, replace clips and ammunition, close all lids; 6 replaces the fuze indicator, and takes off the brake.

Casualties.

Men sent up to replace casualties will report themselves to their section commanders who will order such changes of duties in their sections and detachments as they consider necessary.

If the full detachments cannot be maintained, the duties are divided as follows:—

With 5 men—4 performs the duties of 6, and 1 performs the duties of 1 and 4.

With 4 men—4 performs the duties of 5 and 6; 1 the duties of 1 and 4; 2 sets fuze indicator on the shield.

With 3 men—1 performs the duties of 2 as well as his own; 2 performs the duties of 4, 5, and 6; 3 no change.

To Limber Up.

At the order from the section commander. "...Section—Front Limber Up"—

2 and 3 carry the trail round half a circle to the right (2 shifting round the trail eye to avoid walking backwards), and lower it to the ground.

4 and 5 man the wheels if necessary.

As soon as the trail is lowered the detachment gets under cover—

1 in front of 2.

2 and 3 between breech and wheels.

4 and 5 between muzzle and wheels.

The whole with their backs to the shield.

The limber comes up on the right of the gun and one yard clear. When clear of the gun wheel it inclines to the left until the near wheel of the limber has just passed the trail eye. 1 then orders "Halt." The limber is halted, squared, and when square 1 orders "Limber Up." 2 and 3 lift the trail and place it on the hook. 3 keys up. 4 and 5 man the wheels if necessary. The detachment mounts without further orders.

If the wagon team comes up it will be immediately hooked in by 5 and 6.

Right, left, and rear limber up are the same except that at—

Right limber up—The trail is carried round a quarter of a circle to the right, 2 shifting round the trail eye.

Left limber up—The trail is carried round a quarter of a circle to the left, 3 shifting round the trail eye.

Rear limber up—The trail is not carried round.

Except in the case of "rear limber up" some man-handling of guns or wagons will be necessary in order to prevent the guides striking the wagon.

To Change a Damaged Wheel.

Should a gun wheel be disabled in action, it should be immediately turned, so as to bring the sound portion on to the ground, and notice sent to the Captain. The latter will immediately send up another wheel, which will be brought alongside the damaged one and the wheels changed. To take the weight of the carriage while the wheel is being changed, a lifting jack may be used, or, the carriage may be lifted by 4 men lifting at the damaged wheel (backs to the wheel), and, as soon as the carriage is raised high enough, the loop of the bar supporting pole can be put under the shield near the hinge, with the end which is on the ground placed on a shovel to prevent it sinking in when the weight is taken by the bar. The bar acts as a vertical support while the wheel is being changed.

Should the wheel be damaged in such a manner that the axletree arm has fallen to the ground, the axletree can be raised above the horizontal by means of a limber as follows:

Place a limber so that its hook comes over the point of the axletree with the pole at right angles to the gun. Secure one dragrope on the double, round the pole near the tug. Then hook a second dragrope round the pole as near the foot-board as possible, passing the end of this rope over the limber box round the axletree, and back over the box. (The lynch pin can be left in to prevent the rope slipping.) Raise the limber pole through an angle of about 60° , taking care that the wheels do not run forward, take in the slack on the drag-

rope, and take three turns round the pole with the running end. The axletree can then be raised by five men pulling down on the dragrope on the front end of the pole; as soon as it is high enough the bar supporting pole is placed in position supporting the carriage. The new wheel can then be put on without difficulty.

Change of Target.

*When using No. 7 dial sight, before measuring a horizontal angle to obtain the line, the sight clinometer should be set at the angle of sight ordered and the bubble levelled; if no angle of sight has been ordered, the clinometer should be set at zero and levelled.

The dial sight is immediately layed on an aiming point, or auxiliary aiming point, and the angle noted. The switch angle is added to or subtracted from this angle, and the dial sight re-set to the angle thus obtained. The dial sight is relaid on the aiming point by moving the trail, and aiming posts planted (if required) in line with the telescope of the No. 7 dial sight set at zero. The traversing gear, for convenience, should be set at zero.

I must assist the layer by measuring the switch angle with his hand, picking up some object in the new line and directing the gun on it.

Parallel Lines to a Named Gun.

*The named gun being in the required line, will not be moved, but the deflection scale of the dial sight will be brought to zero. The section commander will pick up a suitable aiming point, and then, using the dial sight of the named gun as a director, the angle will be measured between the aiming point and the axis of the gun, and given out to the other guns, together with any concentration or distribution due to the position of the aiming point. If the named gun had any correction for difference in level of wheels, this deflection should not be included in the angle given to the other guns.

Laying By Means of Aiming Posts.

*On the order "Lines of Fire," 4 doubles out about 50 yards in front of the gun with his two aiming posts, and plants them as directed by 3, in line with the telescope of the No. 7 dial sight, set at zero. (The cowl may be set at any desired graduation to suit the position of the aiming post). With guns fitted with No. 1 dial sight, the aiming posts should be planted in line with the rocking bar sight set at zero. When lines of fire are given to individual guns from a director in

front of the battery, 4 will kneel down, and, as soon as he has received the angle for his gun, will stand up, salute, and pass on the order to 3.

If new lines of fire are ordered, 4 doubles out and on a signal from 3 picks up the aiming posts, the far one first, re-planting them as above.

For guns not provided with No. 7 dial sight—When laying by means of aiming posts, or an auxiliary aiming point, if the deflection scale of the rocking bar sight becomes exhausted, the procedure will be as for "change of target." After completing this procedure, an auxiliary aiming point must be picked up over the deflection leaf of the rocking bar sight.

To Ascertain the Lowest Elevation at which the Trajectory will Clear the Crest (or Intervening Obstacle).

*Set the sight clinometer at the angle of sight ordered, or at zero if none has been ordered, and level the bubble with the left handwheel. Then, using the handwheel on the right side, elevate or depress the gun until the bottom of the bore just clears the crest or obstacle.

To the reading on the range indicator add a liberal estimate in degrees due to the distance from the gun to the crest or obstacle. The range indicator will now show the lowest elevation which will clear the crest.

This should always be done by 1 when coming into action under cover, and the range reported to the section commander.

If the above procedure has been carried out with an angle of sight of zero and the subsequent angle of sight is one of elevation, the trajectory will clear the crest at an elevation less by the amount of such angle sight, and if one of depression, an elevation greater by that amount will be required.

Similarly, a corresponding alteration will be necessary on any subsequent order to raise or lower the angle of sight.

TO TEST THE SIGHTS IN THE FIELD.†

*Before commencing the tests a well-defined object must be selected to lay on at about 1,000 yards away, and the gun placed on a level platform.

To Test the Sights for Line.

Remove the striker and lay the bore for line on the object selected by means of the hole in the firing hole bush, and a

†These tests are only to be used when owing to emergency it is not possible to carry out the tests laid down in the Handbook .

thread stretched across the vertical lines on the muzzle. If the telescope pointer is on the target and the deflection scale is at zero, the telescope is in adjustment. If not, turn the adjusting bush on the pivot of the sight bar until the pointer is on the target. If the vertical line in the dial sight is not on the target when set at zero, turn the micrometer heads of the carrier until it is on the target and adjust the collars of the carrier to zero, and if necessary the pointer on the carrier.

To Test the Sights for Elevation.

Lay on the object with the telescope, and if the open sight does not agree, loosen the fixing screw of the foresight and screw the acorn up or down until it agrees with the telescope. If the dial sight does not agree revolve the micrometer head on the top of the sight until it agrees, then loosen the top clamp and revolve the micrometer scale to zero.

To Adjust the Sight Clinometer.

Lay on the object through the telescope. Turn the telescope upside down in its bearings, and if the tip of the pointer is on the same point, it is in collimation. If the telescope is in collimation, place the field clinometer set at zero on the top of the telescope holding it square, and level the bubble by the left handwheel. The telescope will then be horizontal and the sight clinometer must be adjusted to read zero.

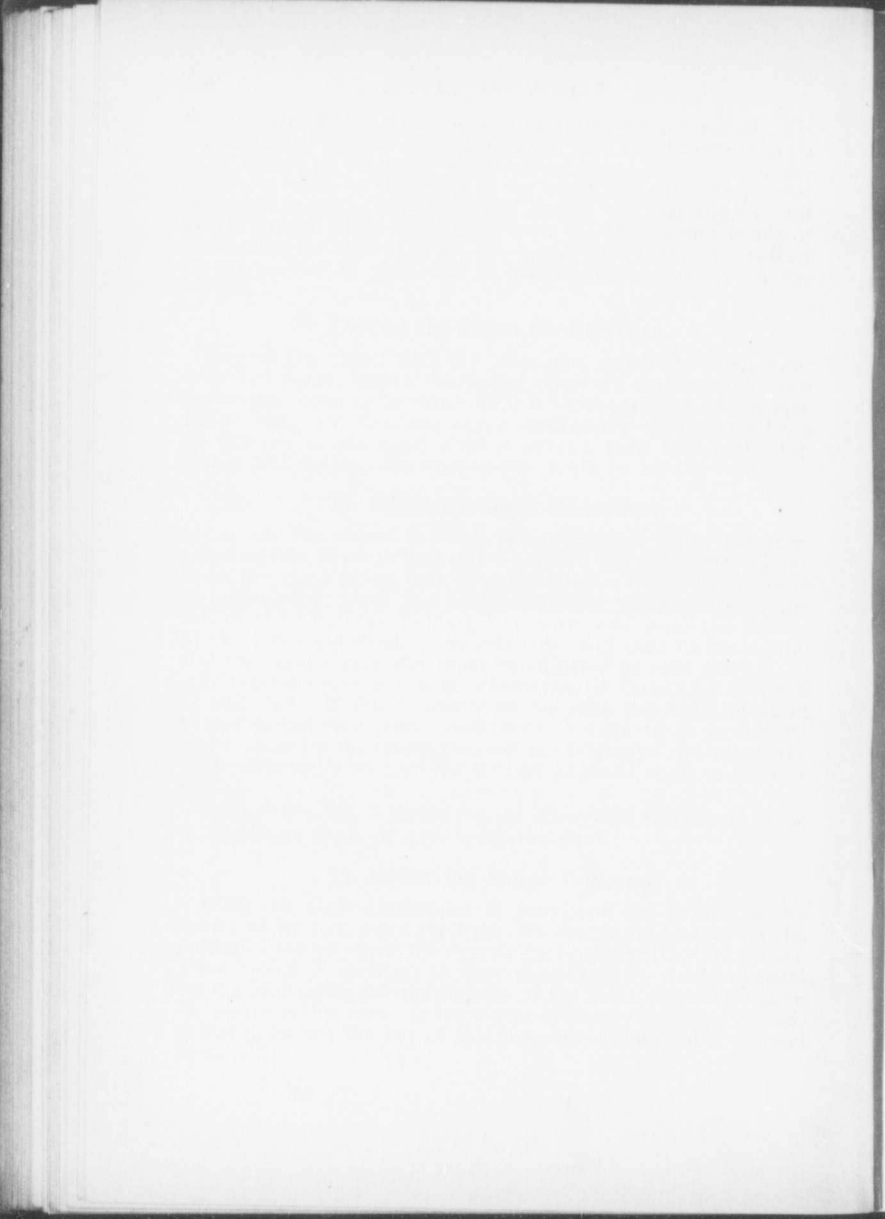
If the telescope is not in collimation it should be changed or adjusted. If this is impracticable take the angle of sight to the target with some instrument known to be in adjustment. Lay on the target through the telescope and adjust the sight clinometer to read the correct angle of sight to the target.

Note.—The No. 3 director must always be tested and made to agree for angle of sight with the guns.

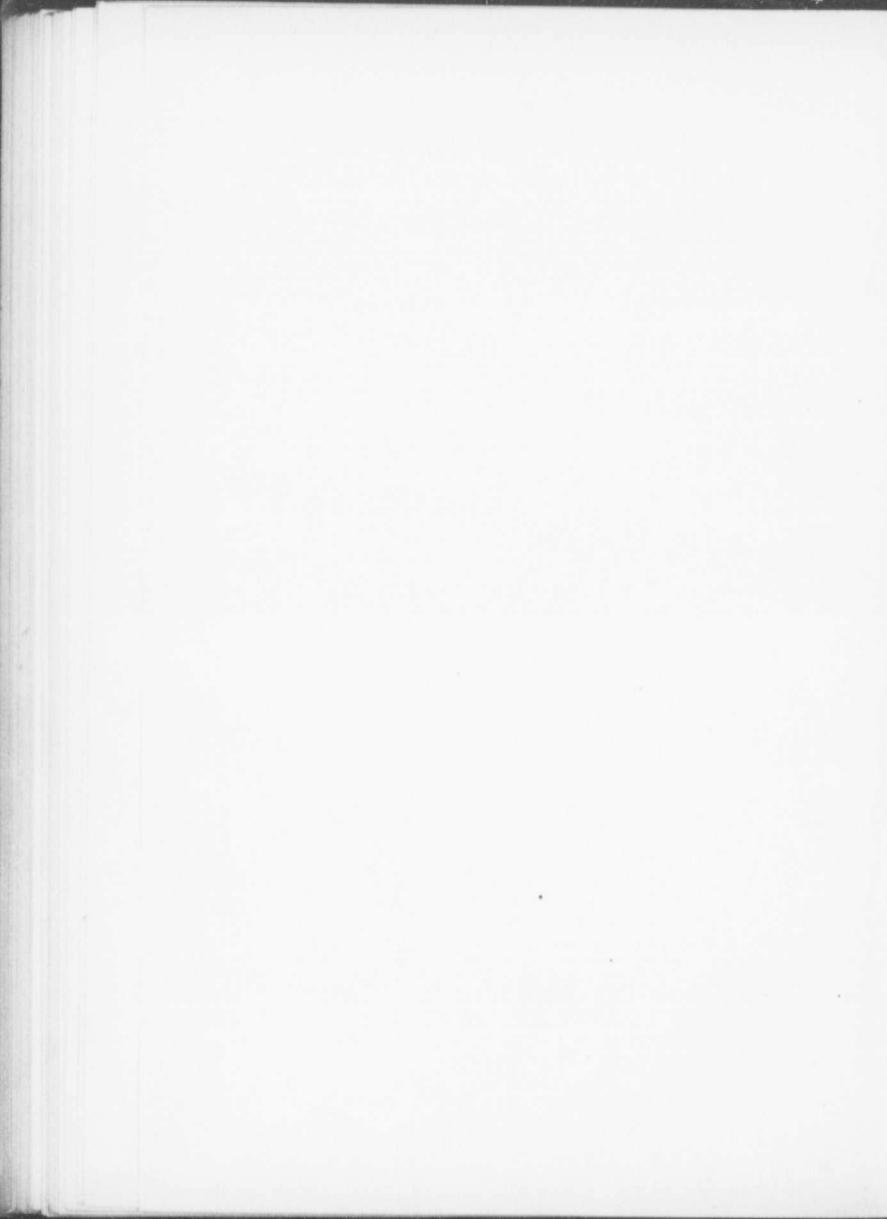
To Adjust the Range Indicator.

With the sight clinometer at zero, and the bubble in the centre of its run, place the field clinometer set at zero on the guides of the gun near the muzzle (seeing that they are clean). Then direct an assistant to depress the gun by the handwheel on the right side till the bubble of the field clinometer is in the centre of its run. If the range indicator is now not reading zero loosen the nut of the indicator and adjust it to read zero.

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CHAPTER VIII

HORSEMASTERSHIP

See Manual "Animal Management."

- Q. What do you consider a good artillery horse?
A. Weighs 1,100 or 1,300; sound; must be trained for riding or in teams (wheel, centre or lead); must not be nervous; jump a little; not afraid of water.
- Q. What are requirements of a good horseman?
A. Good seat, good hands, must be able to train a young horse for good artillery horse; must have a good temper—good groom, and understand minor ailments.
- Q. What is a true or false canter?
A. Canter false: leading with wrong foot. In riding school should lead with inside foot or outside foot near ground. Disunited and Collected: Disunited, with off fore and near hind; collected, with off fore and off hind.
- Q. How to make a horse change his canter. How to make him canter with proper foot leading when going on left rein.
A. Turn head outward, apply right foot on him hard, keep left foot on flank, and throw weight of body inward.

POINTS OF A HORSE:

Head should be small. Eyes should protrude, but not too much, and should be wide apart. There should be plenty of length from eyes to corner of mouth. Neck should be arched, long, lean and well muscled. Jaw should have lots of room, lips firm and thin. There should be great length from withers to point of shoulder. Forelegs should be as far forward as possible. He should be long in the forearm and short in the cannon bone. Feet: the angle of feet should be, for front 50" hind 55". Hindleg should have good length from strike to hock. Hock, large but not puffy.

CARE OF HORSES.

FEEDS:

Rations per horse per day: 8 lb. straw, 10 lb. oats, 15 lb. hay. If no straw is available give 3 extra lb. of hay; this is active service rations. Feed often in small quantities; when changing food do so gradually.

In barracks: hay 12, oats 10, straw 8. Always give largest feed at night and if possible feed hay almost 9 p.m. so as to keep horses quiet during night.

Water rations 8 gals. per diem.

EQUIVALENTS:

2 lb. straw equal 1 lb. hay; $1\frac{1}{2}$ lb. bran equal 1 lb. oats. Every horse should have a bran mash once a week; mix bran with boiling water, a little salt and some linseed. A good mash is: 2 or $1\frac{1}{2}$ lbs. bran, 2 or $1\frac{1}{2}$ lbs. oats; $\frac{1}{2}$ to $\frac{1}{4}$ lb. linseed, handful salt; let simmer on stove. To fatten a horse give 5 lbs. barley, $\frac{1}{4}$ to $\frac{1}{2}$ lb. linseed and boil to jelly—a little molasses added is good; feed this once a day. Horse has small stomach; don't give maximum feed first but increase gradually.

GOOD OATS

Are plump and short, good colour, black or white and same colour throughout, hard and dry. A handful squeezed should have no give. They should rattle when dropped. They should not float on water. They should run 34 lb. to bushel, and have gone up to 50 lbs. to a bushel. In weighing, they should come up to specifications.

HAY

Should be of good colour, green or brown, should not be yellow, should be long and cut between flower and seed, should smell sweet and be free from must or mould. In buying, open up a bale here and there.

STRAW:

Oat straw is best, wheat straw cheapest, barley straw inferior. It should be long and free from dust and chaff. Golden color. Pressed straw is the best. Rye straw should not be used.

Substitutes for straw: shavings, sawdust, sand; peat moss may be used instead of straw—also ferns, etc.

GENERAL:

Cooked food is not good for fast work, but give a mash once a week. In lieu of oats use barley, crushed, parched or boiled; wheat, crushed or parched (start at 2 lb. a day and increase). Feed chaff with wheat—wheat feed is 6 lb. at a maximum. Flour can be fed. 4 lb. of beans and peas a day is plenty; it is very heating. Feed in small quantities; beans and peas should be at least a year old—all one colour and free from weavils. Feed linseed if nothing else, about 1 to $1\frac{1}{2}$ lbs. per day, boiled. Potatoes, turnips, carrots or any roots can be fed, boiled and mashed in best way, mixed with other foods. A bran acts as a slight laxative and dry bran the opposite. When a horse comes in tired, a sand bath to roll in is refreshing. Sprinkling

sand on his back will make him roll. In making linseed tea or oatmeal broth, use boiling water and strain off. Carrots are good in the spring on account of their medicinal qualities. In using, split the carrots and feed two lb. a day, twice a week.

MINOR AILMENTS

Q. What would you do if a horse were off his oats?

A. First, open his mouth and see if he has lampas, or poor teeth. Lampas is swelling in root of mouth, and is very sore. If necessary, get a veterinary and lance. A horse grinds his food with molars, so his teeth need filing for sharp edges occasionally. If a horse bolts his oats, put stones in his oats or spread them on the ground or on blanket.

COUGHS, COLDS, DISTEMPER

Are contagious. Cure: good ventilation, warm bandages, put a hood on horse's head, knock off oats in case of fever, feed on soft food (bran mash) and keep warm and steam the head with hay; add eucalyptus as a counter irritant, rub throat with liniment, and isolate.

LOCKJAW:

Keep quiet, put in dark loose box, feed sloppy food and keep wound clean and disinfected.

CRACKED OR BROKEN LEG:

Suspend horse from ceiling by pulley and big girth. Have a veterinary set it; if this is impossible, shoot the animal.

BRUSHING

Is done at walk or trot at the fetlock. Keep thoroughly clean, put on salve such as zinc ointment, and shoe properly. It is often necessary to put on pad.

CRACKED HEELS

Are the result of neglect. The best cure is prevention, i.e., drying the heels. The cure is to apply dry bran poultice and a salve such as zinc ointment. In a very bad case use tow with the poultice when bandaging.

If a horse picks up a nail, examine to see if matter has formed or not. If so, apply poultice; if not, no harm has been done. In the latter case, if you wish to use horse, put tow or tar in the hole.

LAMENESS:

How to detect—with fore foot, the horse's head moves up and down with sound foot. If hind foot, the good hock raises up higher than hock of lame foot.

SPLINTS

Are on cannon bone on either side—they are blemishes but cause no real trouble.

RING BONE

Is on pastern between fetlock and coronet band. The best thing to do is to shoot, as there are few permanent cures, or give horse rest and blister with 1 part bin iodine of mercury, 1 part catharides to 12 parts of grease. Wash off in 24 hours and apply olive oil as soothing mixture.

LAMINITIS:

Is inflammation in the feet. If caught early put horse's feet in ice cold water; if not it renders horse useless. Symptom: feet feel hot.

SANDCRACKS

Are the splitting of the hoof, usually from coronet band down—a quarter crack is from heel but a sandcrack can be anywhere on hoof; a quarter crack is very hard to cure, caused by sand in dry country. Prevented by oiling hoofs. CURE: Take off shoes and tie up hoof with tape soaked in mixture of rosin and pitch, which in drying contracts the hoof.

BOG SPAVIN

Is distension of joint oil bag. Oil bag is ruptured and swelling appears on inside. A cold water bandage will reduce (cold in summer and hot in winter). It is easily cured.

BONE SPAVIN

Is growing together of small bones at hock, caused often by bruise. It doesn't do much harm after growing but lames him while growing. Cure: blister and rest.

CURB:

Sprain attack of hock 4 or 5 inches below hock. Try hot or cold water bandages.

WINDGALLS:

Distension of joint oil bags at fetlocks—a puffy swelling. Cure: cold or hot water bandages.

CAPPED ELBOW OR SHOE BOIL:

Foment to cure.

CAPPED HOCK:

Caused by bruise or kick. Foment to cure.

SCRATCHES:

Use zinc ointment or any grease.

COLIC:

Two kinds: 1, flatulent; 2, spasmodic. Flatulent—horse uneasy and off his feed, and flanks swollen. Spasmodic—horse is in pain, kicks, bites at belly, often goes down. This is a case for a veterinary; in case of emergency apply warm bandages belly, walk him about, give chloral hydrate ball, anema every half hour, with injection of warm water. Drench: a couple teaspoonfuls of gin, brandy or rum, 1 or 2 oz. turpentine, with pint of linseed oil. Whisky Drench: 2 wine glasses of whisky, 1 pint of warm water—same for brandy. Beer Drench: 2 teaspoonfuls of ginger, 1 quart of hot beer. Eggs and milk may be used.

GIVING A BALL:

To give a horse a ball, take his tongue well out to side, hold his head up, and pass ball well down his throat. Watch ball pass down his throat.

PULSE:

To take a horse's pulse, feel near eye on cheekbone, or on rear side under jowl. Normal pulse is 36; 50 is not serious; at 75 the horse is sick. Normal temperature is 100 degrees.

Ringworm.

Hair falls out in circular patches. **TREATMENT:**—Clip affected parts and burn clippings. Wash animal all over with some disinfectant (i.e., Cresel), 1 part to 80 of water. Apply tincture of iodine, if available, paraffin or soft soap to spots. Disinfect harness, etc.

Lice.

TREATMENT:—Apply mixture of fish oil, sulphur or sulphur ointment, (1 pt. sulphur, 8 pt. vaseline by weight), a mixture of 1 pint of kerosene oil mixed in a bucket of soapy water and scrubbed over the horse, or 2 plugs of chewing tobacco in water applied with rag.

Mange.

Marked skin irritation. Horse bites and rubs himself against any available object. Hair comes off in patches, skin becomes thickened and corrugated. It is very contagious. Retain veterinary at once. To prevent spread: isolate affected and suspected cases with their equipment.

Thoroughly disinfect all stables, utensils, harness, etc. Burn clothing. Picket in open. Change standings. TREATMENT:—Clip, burn clippings, dress all over with a mixture of paraffin, 1 pint, soap, 1 lb., and water, one gallon. Exercise regularly. If horses are urgently required, make up troop of affected animals to work by themselves. Men looking after them should not go amongst healthy animals as they may carry infection in their clothing. Contagious to man. Suspect any rash.

Ticks.

TREATMENT:—Pull out, taking care not to leave head in the skin, or touch with paraffin, turpentine or carbolic acid.

Sprains, tendons, etc.

TREATMENT:—Rest, apply cotton wool and linen pressure bandage and stand in cold water, or apply layer of soft clay. Renew when dry.

Wounds.

TREATMENT:—Get horse to stable before wound stiffens. Clean wound with carbolic acid and water; don't probe. Gravel will come out in course of time. Exclude all air; bandage. Dress the wound with carbolic spray—1 of acid, 4 parts of water. Do not let wound close up before all foreign matter has come out.

To Stop Bleeding.

Arterial: Bind with tourniquet between heart and wound. Venal: Bind on side furthest from heart. Plug the wound with tow or handkerchief, make a pad and bandage it on. Wash the wound as soon as possible, apply anti-septic, put on a pad and bandage tightly over pad. For a very bad wound: low diet, without oats. For a long wound: pin lips of wound together and sew with hair. A standard remedy: White lotion—1 oz. acetate of lead, 1 oz. sulphate of zinc, one quart of water.

Heel-Rope Galls.

PREVENTION:—Keep heel rope dry. TREATMENT:—Grease when marching. On returning to camp wash with soap and warm water, thoroughly dry and apply dry bran poultice.

Thrush.

It is caused by neglect in allowing horse to stand in urine or manure.

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 dryest ground available.

Dirty Sheath.

TREATMENT:—Draw out penis and wash it and sheath with soap and warm water or dirt will accumulate and maggots may appear.

Bullet Wounds.

TREATMENT:—Observe cleanliness in treatment of all wounds. Dust with boric acid and cover with clean pad of lint or tow; bandage must not be applied tightly except to stop bleeding.

Broken Knees.

TREATMENT:—Clean with water and treat as for heel rope galls. Do not poultice.

Cuts and Tears.

TREATMENT:—The same as for cracked heels.

Bit Injuries.

TREATMENT:—Work in snaffle or with bridle over nose. Improvise martingale if necessary. Rinse mouth with clean water after feeding.

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 the fans of saddle. When healed, place piece of sheep skin under girth.

Sand Colic.

PREVENTION:—Feed clean food on clean surface, such as blanket. TREATMENT:—Give chloral hydrate balls and seed oil.

Constipation.

TREATMENT:—Soft food and green also if available, regular work with frequent enemas.

Diarrhoea.

TREATMENT:—Dry bran, keeping body warm with rugs and bandages.

Strangles.

SYMPTOMS:—Swelling at back or under 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.

Glanders.

SYMPTOMS:—Thick gluey discharge from one or both nostrils, ulcers on membrane inside nostrils, glands between lower jaw enlarged, and hard, and appear to be fixed to bone. On suspicion immediately obtain veterinary aid. Very contagious.

Farcy.

SYMPTOMS:—Strong form of glanders appears as a running sore, usually on inside of hind legs, occasionally neck and face. No tendency to heal. **TREATMENT:**—As for glanders.

Epizootic Lymphangitis.

SYMPTOMS:—Sores similar to farcy both as to nature and locality, but with a greater tendency to heal. They usually result from a wound, from which cord-like swellings appear, and on the course of which these sores form. **TREATMENT:**—Proceed as for farcy. They are very contagious.

Saddle Sores.

TREATMENT:—Where hair is rubbed off and skin not broken, apply salt and water or borax and water (2 teaspoonfuls of borax to 1 pint of water) or vinegar and water. For an open wound, apply white lotion or ground linseed.

A Sitfast.

TREATMENT:—Cut out all dead skin till live skin is reached, then treat in ordinary way as for open or closed wounds.

Collar Galls.

TREATMENT:—Same as for saddle sores.

Foot Injuries.

Corns: Caused by bad shoeing. **Cure:** Put on a composition of oil tar and tow, stuffed into corn, or carbolic oil and tow. (Note): Let all matter out first. The seat of corn should be pared out.

Navicular Disease.

No cure; take horse's shoes off.

Brushed Sole.

(Sole worn thin). A leather sole is inserted under the shoe to cover the feet.

False Quarters.

The growth ceases at one portion of coronet. **Cure:** Blister coronet to promote growth.

Seton.

TREATMENT:—A hole made in horse's leg with a piece of tape passed through the hole and pulled back and forth to produce irritation.

Firing.

TREATMENT:—Draw several lines with hot iron over affected part. Horse is laid up for six months.

Mud Fever.

TREATMENT:—Give saltpetre with 2 to 4 oz. of Epsom salts in a drench, and apply externally to the eruptions, 2 oz. of acetate of lead, mixed with 8 oz. of olive oil.

Choking.

TREATMENT:—Give two oz. oil once a day; and no food or water for 12 hours.

Tired Horse.

TREATMENT:—If a horse is very tired, give him a sand bath and sponge out eyes, ears, nostrils, and dock; give gruel made of maize or oatmeal, and clothe warmly. Feed warm mash and give carbonate of ammonia ball.

Seedy Toe.

Is caused by clip pressure on shoe. TREATMENT:—Cut away all diseased horn, and blister coronet.

General Remedy.

Oatmeal gruel made in a clean bucket, as follows: A double handful of oatmeal in quart of boiling water, with more boiling water and salt added later. Let it stand five minutes, then if too hot cool with cold water and serve.

Scalds.

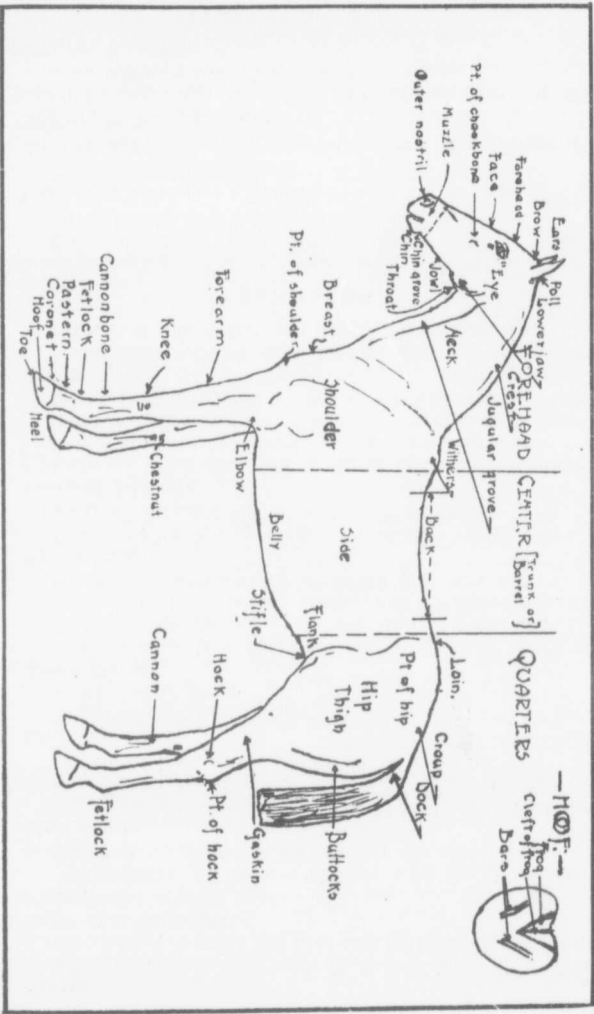
TREATMENT:—Dress with flour to keep out air and apply carron oil (limewater and linseed oil in equal parts).

BANDAGES.

1. A warm bandage—to keep a horse warm. Woollen is best and not to be put on tighter than necessary. Start at knee and go to fetlock and back and tie on outside.
2. A working bandage—a stockingette put on very tightly. Take it off when back in stable.
3. Hot bandage: Flannel or blanket material to hold heat.
4. Cold water bandage—linen.
5. Sweat bandage—put on cold water bandage first, oil silk to keep moisture and then a warm bandage.

DISINFECTANTS:

Carbolic acid, zinc sulphate.



HORSEMASTERSHIP, BIVOUACING, CARE OF HORSES ON THE MARCH, AND SHIPPING, ETC.

Give a small feed before all long marches, no matter how early they may commence, and feed en route during marches exceeding five hours. The length of time required by a horse to consume its feed demands that at least five hours a day should be allowed. It is advisable when circumstances permit to remove nosebags when horses have done and let them graze.

- Q. State what you know about selecting a site for camps and bivouacs.
- A. 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. Good water supply is essential. Other points to be considered are the facilities offered for obtaining shelter, fuel, forage and straw. On arriving within two or three 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. 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 or other measures he is to take. If grazing is necessary, the allotment and protection of grazing areas must be arranged for. The position to which dead animals must be taken and method of disposal must be settled. The general position of latrines and kitchens in each area must be fixed. 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.

NOTE:—It may be necessary to take precautions against observation by aircraft; when this is the case, regular formations should be avoided, and all possible arrangements made to conceal the guns and horses.

- Q. What care should be given to horses in camps or bivouacs?
- A. If possible choose ground flat enough to give a level standing to the horses, but with sufficient natural slope to carry away storm water, sheltered by higher ground from wind, within easy reach of the water supply, but not draining into it. Shift after a wet night.

In very cold weather do not groom but wisp and rub mud off legs. Put more covering on backs. Do not let a horse stand in hot sun with his back wet.

A horse when picketed requires 3 to 5 yards between picket line and heel pegs, and 5 ft. between head ropes. The head ropes 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 through a shackle on the forefoot. This will soon have the desired effect. Picket kickers separately. A gangway of 5 yards should be maintained between the horse lines. Horses require hay, grass or some substitute in addition to grain. Give a hungry horse some hay first, then his oats. Scrub nosebags frequently. Turn and dry them in the sun. In order to avoid risk of infection they should not be interchanged. Avoid waste by keeping nosebags in repair and using hay nets when available. Do not herd horses in mobs when grazing but have guards out who should only be mounted when rounding up. Keep kickers apart or hobble their hind pasterns.

Q. State how slinging horses on board ship is carried out.

A. (a) Horses should be unsaddled and unharnessed, and halter slipped under head collar, bridoon rein loose but knotted.

(b) Do not let horse's head loose. Fasten with double guy, one end being held on shore or in boat, and other end on ship. Horse may fall backwards out of the slings, but will never fall forward. Five men are required to handle the horse, one at each side, one at the head, one at the breast, and one behind.

(c) Pass one end of sling under belly, both ends being brought up to meet on back; one man passes his loop through other loop, and it is received by man on other side who hauls it through, hooking the tackle to it, both men holding ends until taut. The men at the breast and behind then bring their ropes around and make them fast to hummets; the man who holds the horse's head makes fast the guy to the ship's head collar.

(d) Fasten the breech band and the breast girth securely; blindfold timid or restive horses.

(e) Two or three men must be at the hatchway and between decks to guide the horse when being lowered. Provide a mat or straw bed for horses to alight on.

Q. What points must be looked to when placing horses on board ship?

A. (a) Sufficient and good water and forage.
(b) Fittings good, sound and up to date.

- (c) Animals properly sheltered.
- (d) Ventilation good, wind sails and fans in good order.
- (e) Put horses accustomed to each other together.
- (f) In rough weather sacks filled with anything soft will often preserve horses from injury.
- (g) Hand rub horse's legs regularly.
- (h) Feed horses at first few oats and much bran, subsequently increase oats; full ration of hay all through.
- (i) Cinders spread will give horses good foothold.

Q. State how slinging of guns and vehicles is carried out.

A. For slinging guns and limbers the following method has been found to work well:

Two four inch slings are used, one round each axle-tree and a hook rope hooked into the trail eyes. The bights of the sling are placed on tackle hook, to which the end of the hook rope is also made fast. Limbers have their poles removed and are slung in their case, being made fast to tackle hook from 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 other. These four hooks are then secured to all four wheels of vehicle. Vehicles will as a rule be embarked loaded on their wheels, all loose articles being stowed within the wagons, and the poles and shafts being removed before slinging. If the wheels are removed, special care must be taken that the lynch pins and washers are put away. Those carriages required first on disembarkation should be stowed away last.

RULES FOR ENTRAINING GUNS AND HORSES

1. Send an officer ahead to ascertain facilities for entraining.
2. Tell off parties to entrain horses, guns and wagons.
3. Entrain baggage, horses, guns and wagons together if possible.
4. Detail men in charge of trucks containing horses and vehicles.
5. Guns and vehicles and riding horses should be on same train as men who ride or drive them.
6. Saddlery may be removed from horses on long journeys under peace conditions, if ordered by O.C.
7. Under service conditions horses are entrained harnessed or saddled.
8. Horses should be fastened by head ropes to car whether harnessed or not, sufficient freedom being allowed to enable horses to adapt themselves to jostlings of train.

9. It is immaterial whether all horses face the same way or not. If there are not sufficient horses to fill car, they should be secured by means of sliding bar within the proper space.

10. Cars should be examined. If of wood, floor planking should be at least $1\frac{1}{2}$ inches thick. Cinders, gravel, or sand should be sprinkled to prevent horses slipping.

GUNS AND CARRIAGES

General Points Which Should be Attended To

1. Distribute load evenly over floor. If any of the flooring planks are rotten place a sleeper across them under the wheels. The floor should be at least 2 inches thick.

2. See that poles or shafts do not stick up so that they would strike against bridges, etc., as would usually occur if they were more than 7 feet above floor of truck.

3. Lash wheels nearest to end of truck securely by drag ropes, giving a turn around each axle of each pair of wheels to prevent shifting with jerks of the train.

4. The best way to stow carriages is, trails and perches resting on floor; poles to front; trails and perches to rear; wheels of each vehicle interlocking with those of the carriage in front of it.

GENERAL RULES FOR NIGHT MARCHES

1. Local guides should be secured if possible.

2. Outpost should not be withdrawn until the last moment.

3. March should generally be protected by a small advance and rear guard, usually infantry only. Flanks must also be protected.

4. All ranks must know what to do in case of an alarm.

5. Every commander must have a fixed place in the column.

6. Branch roads should be blocked by advance guard to prevent troops going astray.

7. Hours and periods of halts should be arranged beforehand.

8. NOISES MADE BY HARNESS AND VEHICLES AT NIGHT:—The causes of noises are: In harness—Mouthpiece of bits and links, spare and quick release ends. In vehicles— The play of pole bar, swingle trees, wheels, trail eyes and shield of gun.

9. No special stores are issued for the purpose of stopping noise, but material such as canvas sacking can be used for placing around links of traces, pole-bar, etc. Twine or small cord between ring of bits, and wheels may be covered by motor tires—8 to a gun—of leather belting 6 to 7 inches wide and 15 feet long, laid along the tire and across the felloes.

10. No talking or smoking should be allowed.

CARE OF HORSES ON THE MARCH

1. Nothing should be carried beyond the authorized articles.
2. Rise in the stirrups. See that the load is evenly distributed on both sides of saddle.
3. If possible at some halts, off saddle or loosen girth or shift the saddle. When saddles are removed slap back of horse to promote circulation, and allow horse to roll.
4. Take every opportunity of watering on the march. Always water before feeding, never immediately after.
5. Dismount, remove bits and loosen girths before watering.
6. Do not allow horses to go further into a pool to drink than is necessary, or the water will be fouled for those coming after.
7. Do not move at a fast pace after watering.
8. Select watering place with good approach and sound bottom, and water at least 4 inches deep. Running water and gravel bottom make the best watering places.
9. Horses do not drink well in the early morning. All horses should be watered after about 3 hours' march.

SADDLING AND HARNESSING

- Q. Name the parts of the saddle.
- A. Sideboards, burrs, fans, front and rear arch, padded numnah panels, pommel, cantle, webbing under seat, V-shaped attachment, saddle flaps, stirrups and stirrup leathers, girth, and surcingle.
- Q. How is saddle fitted and placed on a horse?
- A. The saddle should be placed in middle of horse's back, the front of it behind the withers so as not to interfere with play of horse's shoulder. The fans should be clear of the back, and the front arch clear of the withers by not less than the width of two fingers. When the rider is in the saddle the sideboards should have a level bearing.
- Q. How should the girth fit?
- A. The girth should be sufficiently tight to keep the saddle in place and no tighter. It should not be put on with violence but should be tightened gradually.
- Q. How should the surcingle fit?
- A. It should lie flat over the girth and just as tight but no tighter.
- Q. How should the head stall fit?
- A. The head stall should be parallel to and behind the cheek bone.
- Q. How should the nose band fit?
- A. Nose band should be the breadth of two fingers below the cheek bones and should admit two fingers between it and the nose.

- Q. How should the brow band fit?
 A. Just below the ears so as not to interfere with their movement.
- Q. How should the throat lash fit?
 A. The throat lash should fit loosely, being only sufficiently tight to prevent the head stall slipping over the horse's head.
- Q. How should the Portsmouth bit be fitted to a horse?
 A. Care should be taken to fit each horse with a bit of the correct size. A narrow bit pinches the horse's lips and a wide bit moves from side to side. The bit should be fitted so the mouthpiece is one inch above the lower tusk of a horse and two inches above the corner tooth of a mare.
- Q. How many methods are there of folding a saddle blanket?
 A. Pocket, channel, six fold and built up fold.
- Q. How should the riding rein be fitted?
 A. It should be of such length that the driver has complete control of his horse.
- Q. How should the leading rein fit?
 A. The short piece on the near side should be so fitted that the bearing of the bit in the horse's mouth is even when the rein is in the driver's hand.
- Q. How should the breast collar fit?
 A. It should hang horizontally from the padded neck strap; the lower edge being about one inch above the point of the shoulder. The higher it is the less chance there is of the horse becoming galled, but it should not be high enough to choke the windpipe.
- Q. How should the flank strap be fitted?
 A. It should be so fitted that the traces should be in a straight line when the horses are in draught.
- Q. What governs the length of trace?
 A. The length of trace must depend on the size of horse; but the traces of each pair of horses must be of the same length.
- Q. How should the breeching be fitted?
 A. It should be kept horizontally by the loin straps, and hang 16 inches below the dock with a play of 4 to 6 inches.
- Q. How should the strap supporting pole-bar fit?
 A. The strap should be sufficiently short to carry the bar the width of a hand above the sharp breast bone; if lower, the bar will gall the horse's chest; great care must be taken to have the bar horizontal.
- Q. State the disposal of harness in camp or bivouac.
 A. Harness and saddlery is to be laid down one yard in rear of line of heel pegs.
 (a) Breast collar is placed on its lower edge in a circle.
 (b) The breeching is coiled round it.

(c) The traces coiled around the breeching.

(d) The saddle is placed on top, seat uppermost, the bottom of the flaps being turned up inward; this keeps the breast collar from being crushed.

(e) Head gear is laid across the seat.

(f) Leggings and whip are placed underneath the seat of riding saddle.

(g) The whole is wrapped in a waterproof sheet.

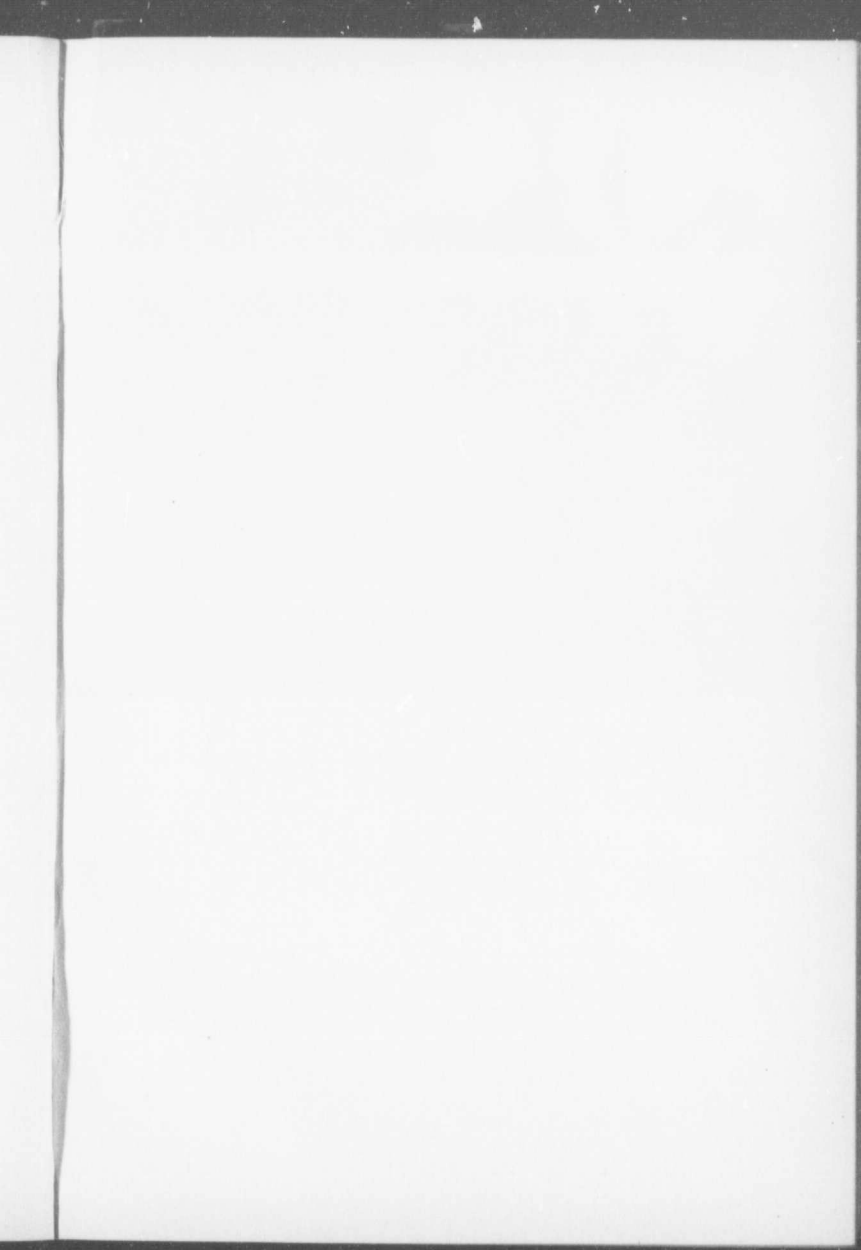
Q. State the disposal of saddlery in camp or bivouac.

A. (a) Saddle, complete is placed on ground resting on pommel, the stirrup irons are hooked on the fans of the side bars.

(b) The bridle is placed with the head piece of the bit on the side bar.

(c) The whole is wrapped in the saddle waterproof cover.











CHAPTER IX

FIRST AID HINTS, ETC.

Normal pulse, 72 per minute; normal respiration, 15 to 18 per minute; normal temperature, 98.4 Fahr.

Treatment of Cases of Emergency.

FIRST FIELD DRESSING:—Every man and officer carries on the field a dressing which is placed in the pocket of the right side of the shirt or the frock. It consists of a packet of khaki cotton cloth containing in a linen covering two dressings, each composed of $2\frac{1}{2}$ 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.

1. **BLEEDING:**—Bleeding may be either external or internal, and may be arterial, venous or capillary.

(a) **ARTERIAL BLEEDING.** The blood is of a bright red color and at first escapes in spurts. **TREATMENT:**—Expose the wound, apply the gauze of the first field dressing and first try pressure on the bleeding point with the fingers over this protection. If this fails, compress the artery against the bone, close to the wound, but between it and the heart. Pressure should be maintained until some more permanent means can be employed—such as improvised tourniquet—or medical assistance procured. Absolute rest is essential. If the bleeding is from a limb, raise it.

(b) **VENOUS BLEEDING.** The blood is of a dark color, it flows or oozes out, but there is no appearance of pulsation. **TREATMENT:**—Lay the patient down, remove any constriction which may be around the limb, elevate the limb and apply a pad and firm bandage.

(c) **CAPILLARY BLEEDING.** The bloody ooze comes from the entire surface, not from any one point. **TREATMENT:**—Bathe the part with cold water, or preferably with hot, of a temperature of 140 to 160 Fahr., or rather hotter than the hand can bear, and apply a pad and bandage firmly over the wound.

2. The following table shows the situation of main arteries and treatment when wounded:—

POSITION.	NAME OF ARTERY.	TREATMENT.
Head.....	Temporal & facial.	Apply first field dressing over wound and bandage tightly.
Armpit.....	Axillary.....	Compress subclavian downwards and backwards behind middle of collar bone.
Arm on inner side.	Brachial.....	Compress artery by hand in line with seam of the coat.
Palm of the hand..	Palmar arch.....	Very difficult to treat. Place a roll of bandage or a firm pad in the hand, close the fingers over the pad and bandage firmly. Bend up the arm and if necessary apply pressure to the brachial artery.
Thigh.....	Femoral	Press in groin by fingers or tourniquet.

3. An improvised tourniquet may be made as follows:—Take a handkerchief, a smooth rounded stone, and a stick. Wrap up stone in centre of handkerchief, tie knot over it and place the stone over the artery. Pass the ends of the handkerchief round the limb and tie them securely, leaving sufficient space for stick to be admitted; pass the stick then between the handkerchief and the skin, and carefully twist it until by tightening the handkerchief the stone is pressed upon the artery with sufficient force to arrest the flow of blood. A pad should be placed between the stick and the skin to prevent the latter being bruised and the end of the stick must be secured with a bandage to prevent the tourniquet untwisting. Many other substitutes for the above may be adopted. The tourniquet should be applied no tighter than is absolutely necessary to stop the arterial bleeding and should only be used as a last resource. A medical officer should be sent for as soon as possible.

4. INTERNAL BLEEDING:—The symptoms of internal hemorrhage are, prostration and weakness. The surface of the body is cold and the face pale, the lips lose their color. The pulse is weak or imperceptible. There is sighing, respiration and a cold, clammy sweat. TREATMENT:—(a) Keep patient absolutely quiet. (b) Do not give stimulants.

5. DROWNING:—If breathing has ceased, immediately on removal from water place patient face downward on ground, with arms drawn forward and face turned to the side. Then without stooping to remove or loosen clothing commence artificial respiration. To effect artificial respiration put yourself astride or on one

side of the patient's body in a kneeling or squatting position facing his head, placing your hand flat on the small of his back parallel and nearly touching, and the fingers spread out over the lowest ribs. Lean forward with the arm 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 lower part of 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 necessary—is driven out of the patient's lungs. Water and slime from the air passages may 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, three. Repeat this forward and backward movement, pressure and relaxation of pressure, 12 or 15 times a minute, without any marked pause between the movements. Whilst the operator is carrying out artificial respiration, others may, if there be opportunity, busy themselves in applying hot flannels, hot bottles, etc., between the thighs and to the armpits 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, and rubbing arms, legs, body, always towards the heart, and continue after the patient has been wrapped in blankets or dry clothing. As soon as possible after the complete restoration of respiration remove the patient to the nearest shelter. On restoration, and if power to swallow 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 case of suffocation by charcoal fumes, or coal gas, mining accidents, hanging, lightning stroke, and severe electric shock.

6. SNAKE BITES OR POISONED WOUND:—Apply a ligature or tourniquet above the bite, i.e., between it and the heart. Make $\frac{1}{2}$ inch deep cruciform incision with a clean knife and rub in crystals or solution of permanganate of potash. Give stimulants such as brandy, salvolatile, or hot black coffee. If breathing is bad, artificial respiration should be tried.

7. STINGS OF VENOMOUS INSECTS:—Apply solution of ammonia or bi-carbonate of soda, if available,

8. **BURNS AND SCALDS**:—Apply oil, vaseline, boracic powder. Cover from air. Quickly cut clothes off, never pull them off.

9. **SHOCK, LOSS OF CONSCIOUSNESS AND FITS**:—For shock, put to bed and cover with warm blankets or rugs, if possible. Give hot drinks and stimulants if conscious.

LOSS OF CONSCIOUSNESS:—Send for medical aid at once. Lay patient on his back with the head low. Loosen all tight clothing round body. Give no food or drink unless under medical direction. Allow plenty of fresh air to the patient.

FAINTING:—Lay patient on back with head low. Loosen clothing. Plenty of fresh air.

FITS:—Lay patient on his back with head slightly raised. Loosen clothes about his neck and chest, and prevent him from biting his tongue by placing the handle of a toothbrush or similar article as a gag between his teeth. Employ sufficient restraint only to prevent him doing himself an injury. Do not give stimulants.

10. **SUNSTROKE OR HEATSTROKE**:—Place patient at once in shade or cool place. Allow plenty of fresh air. Raise head and remove clothing from neck and upper part of body. Douche head, neck or spine, or whole body with water. Do not give stimulants.

11. **FROST BITE**:—Rub affected part with snow or cold water. Avoid taking patient into a warm room until the part has been thoroughly but very gradually thawed. Do not apply heat in any form.

12. **SPRAINS**:—Bandage firmly as soon as possible after accident, keep the bandage wetted with some evaporating lotion, raise and rest the injured part.

13. **WOUNDS**:—Do not attempt to clean up the wounds on the field. Stop the bleeding and apply a dressing. In applying the field dressing, care should be taken to place it directly on the wound, without in any way touching with the fingers either the wound or the surface of dressing which comes in contact with wound. This may be done by taking hold of dressing, by pinching it up at back, turning it inside out and applying the fresh surface direct to wound.

March Discipline.

March discipline includes everything that affects the efficiency of man and horse during a march.

The following rules should be observed by the artillery:

1. Order of units should be changed daily.
2. Pencillers, telephonists, signallers, orderlies and horseholders should ride two abreast at the head of the brigade or battery to which they belong.

3. Batteries should always march in column of route on the left of the road (Canada—right of road), and proper distance should be maintained. When a halt is ordered each carriage is drawn up on left (Canada—right) of road. Cross roads must be left clear.

4. Men may mount or dismount when the column is moving at the walk.

5. On the march the first halt usually takes place not long after the start, careful examination should be made of horses and harness. Subsequent halts are made at regular intervals.

6. It is of great importance that horses should not be harnessed for any length of time previous to march, and should not be hooked in until just before time to move off.

7. When horses are standing in harness, drivers should be dismounted. At no time should drivers be allowed to lounge in their saddles. Opportunities which may occur for watering and feeding horses should always be seized. Watering requires to be carried out on a regular system.

8. The maintenance of an even and regular pace is essential, otherwise the constant opening and closing up becomes trying to both horses and men.

9. The last couple of miles should be done at the walk so as to bring the horses in cool.

10. Men should have time to get breakfast and the horses should be fed before the march commences.

Marching in Frost and Snow.

1. Men should not be allowed to sit down or fall asleep during a halt. It is best not to make long halts. Men should be allowed to dismount from time to time.

2. Frost-bite—How to preserve feet and limbs.

Keep feet clean, as dirty feet are more liable to perspire and are more sensitive to cold.

3. Wash feet with soap and then smear them with some greasy substance such as unsalted grease or kerosine.

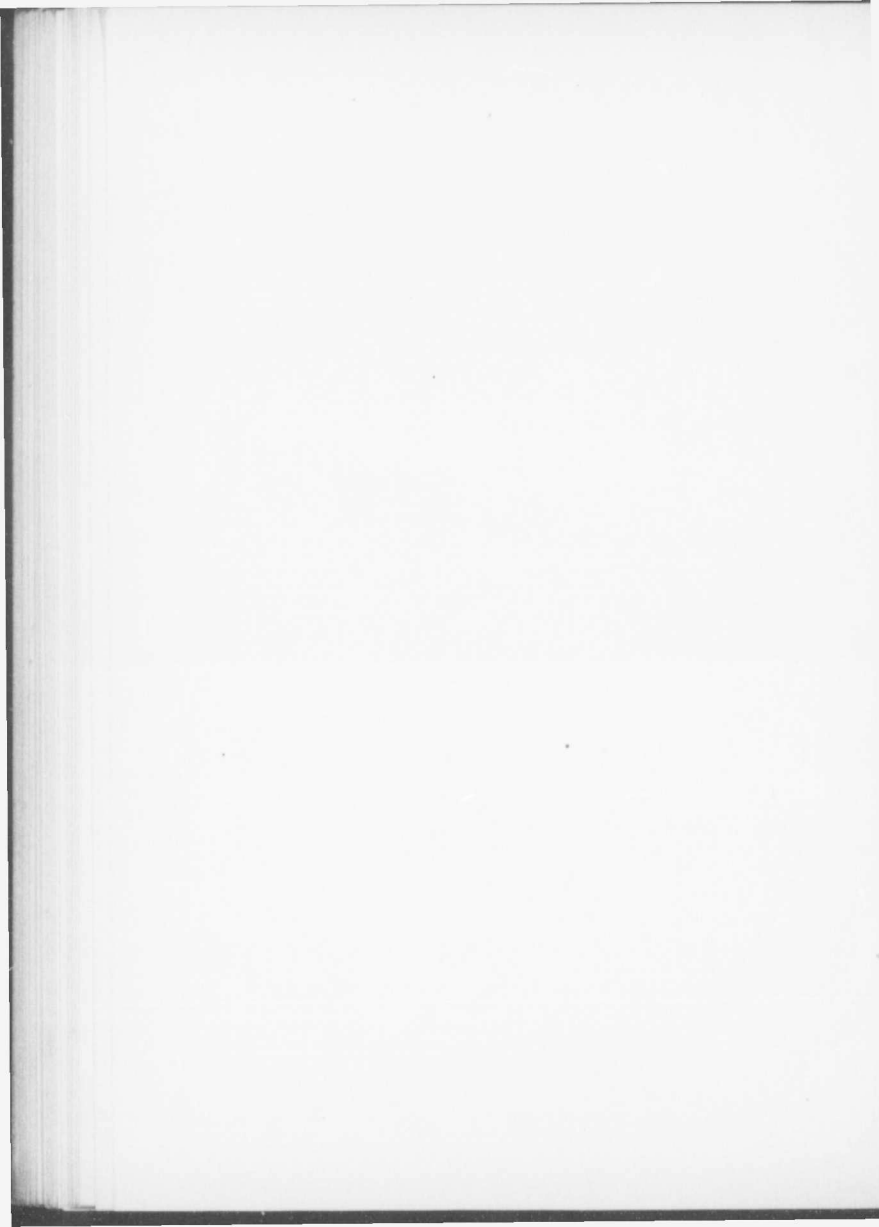
4. Wear stout, roomy boots and woollen clothes or stockings, or feet may be wrapped in a double set of linen foot-cloths, the under pair being greased.

5. To protect hands and face—smear them with one of the greasy substances mentioned above, wear mitts or woollen gloves and ear flaps.

6. When frost-bite is felt anywhere, rub the part at once with snow until the color returns but on no account warm it near the fire.





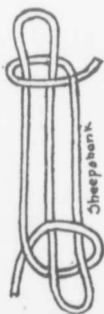
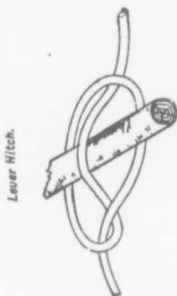
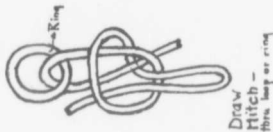
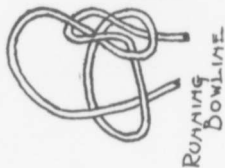


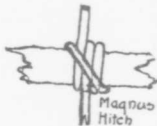
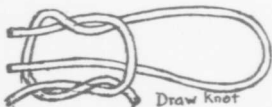




CHAPTER X

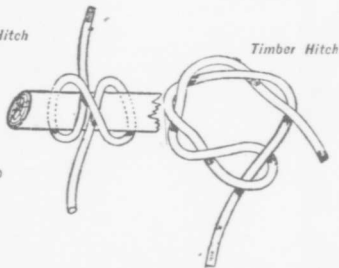
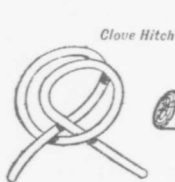
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Chap. 4.

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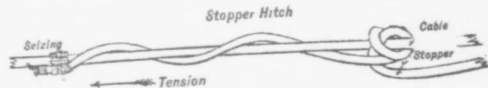
2 Half Hitches.



Round Turn and 2 Half Hitches.



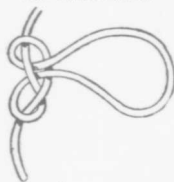
Fishermen's Bend.



Blackwall's Hitch.



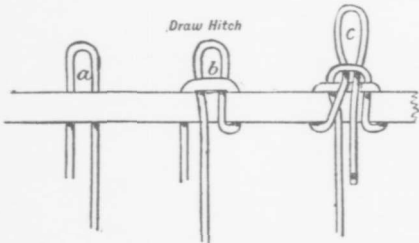
Man Harness-Hitch.



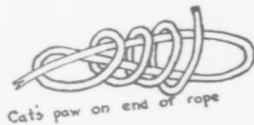
Double Blackwall's Hitch.



Draw Hitch

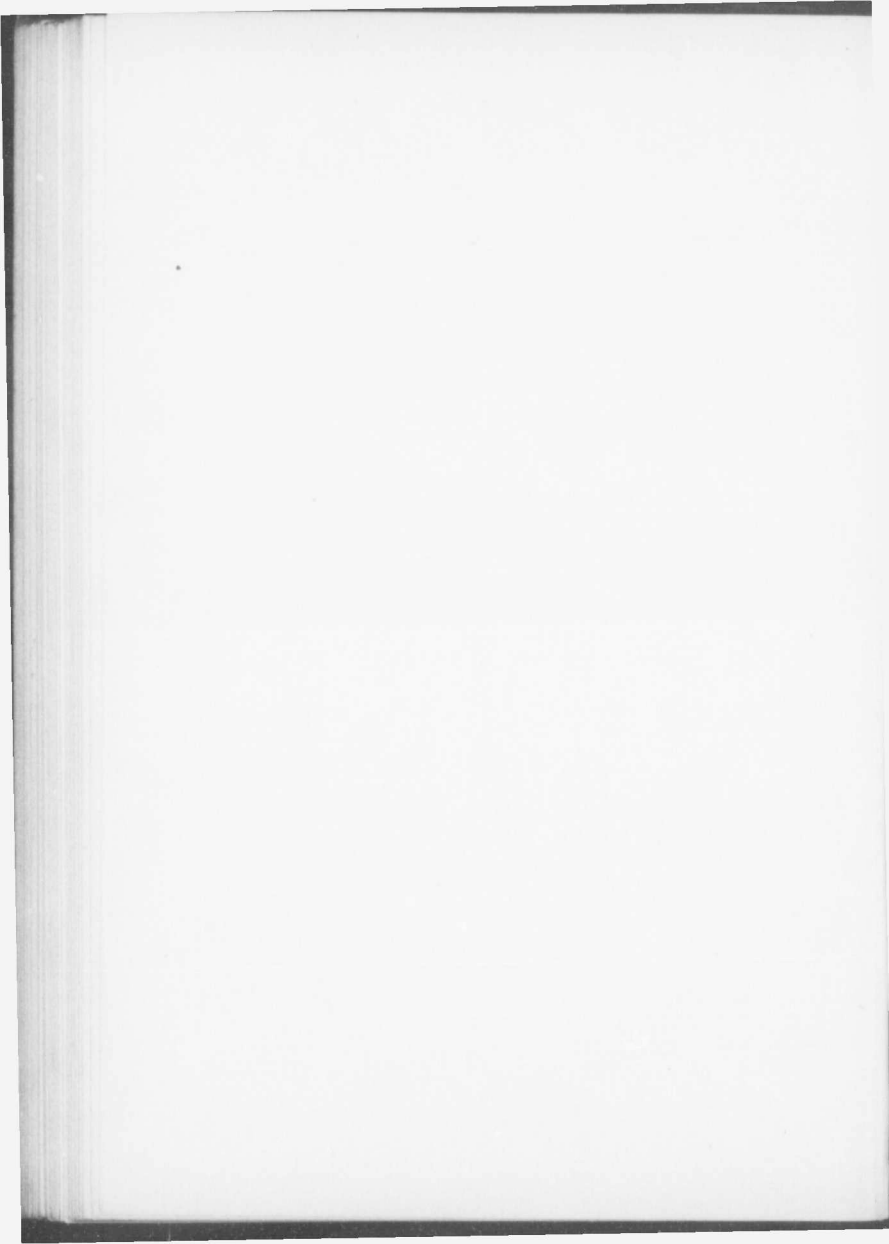


Cat's Paw on Centre of Rope.

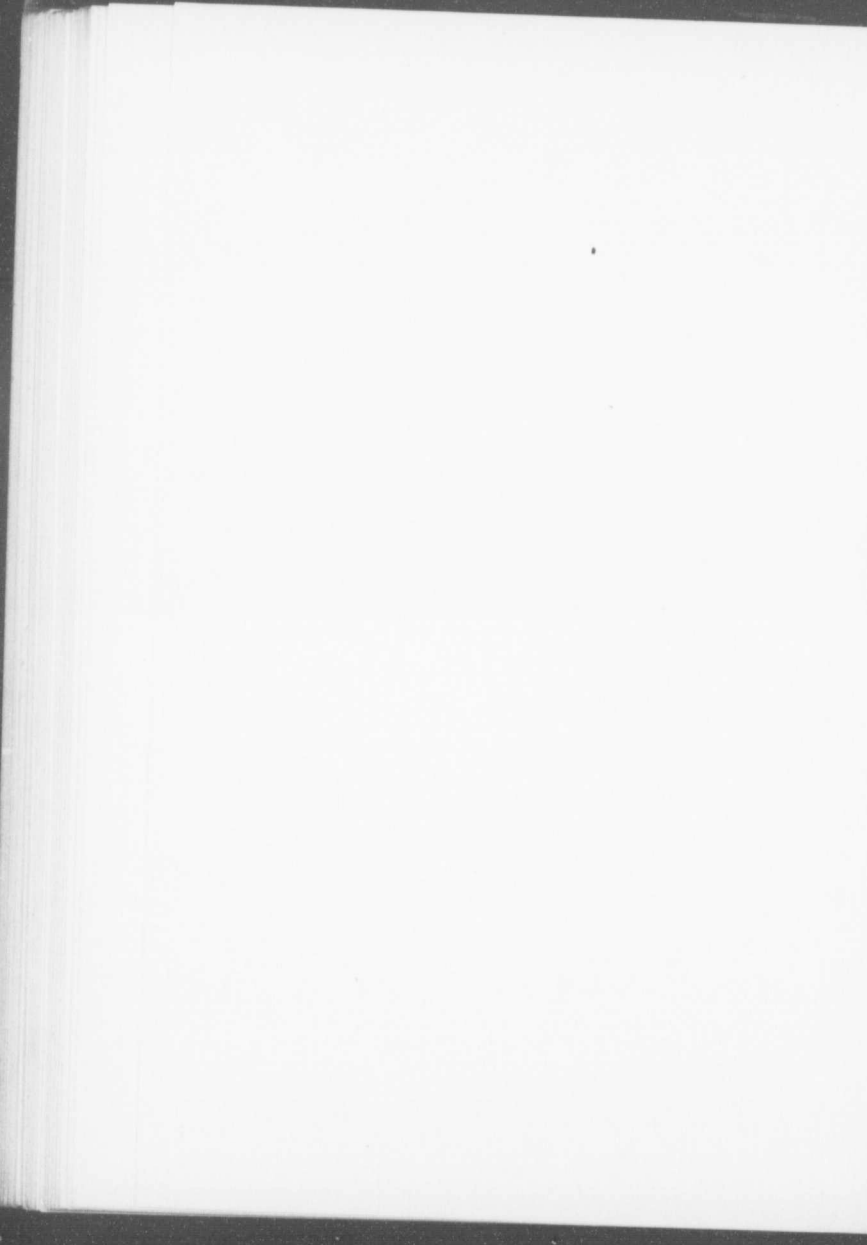






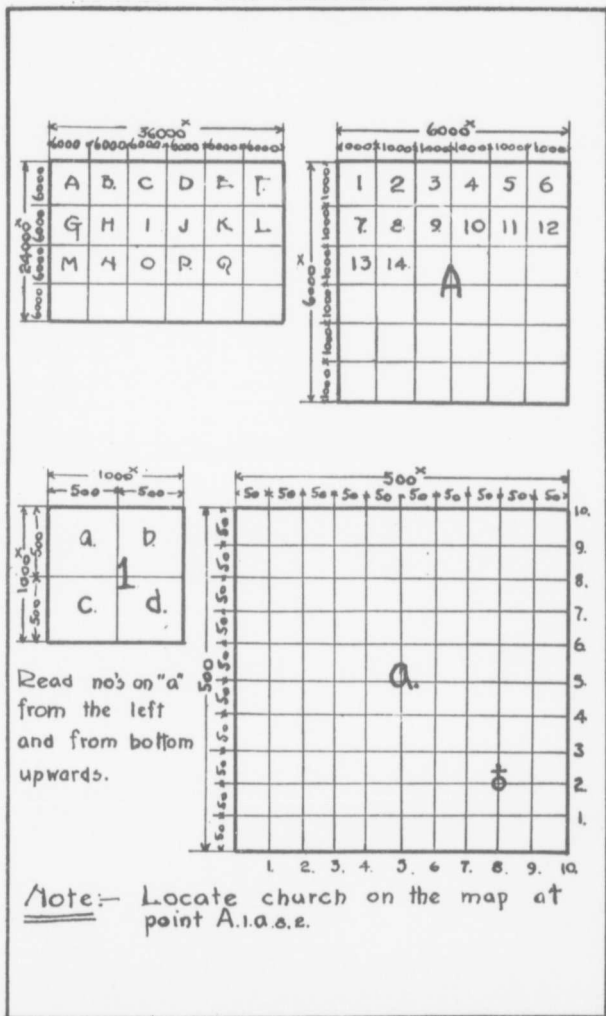


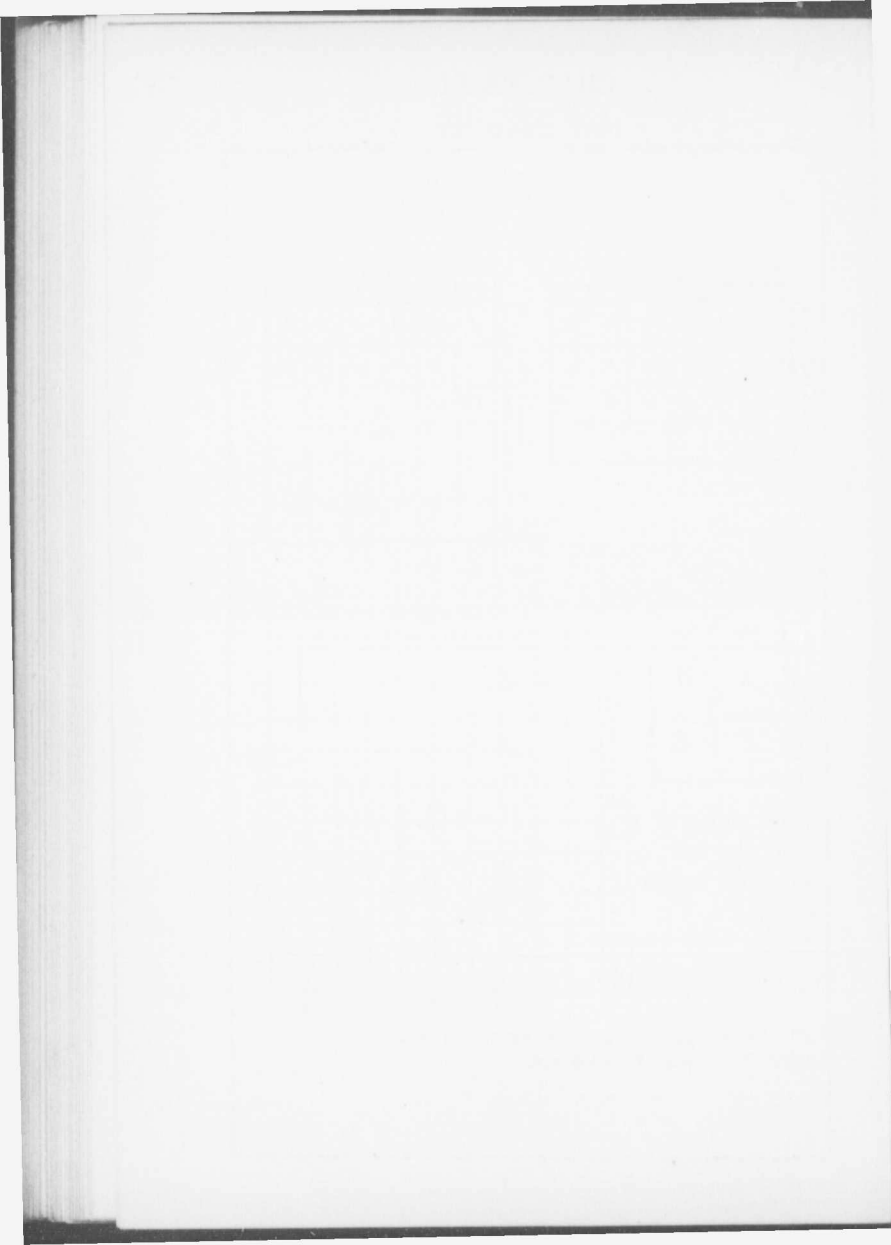




CHAPTER XI

MAP READING













CHAPTER XII

"HALT, ACTION FRONT."

Why Soldiers Drill.

By "Action Front" in the Westminster Gazette.

"Yesterday one of the enemy's guns was put out of action by our artillery."—extract from despatch.

"Stand fast," the instructor bellowed, and while the detachment stiffened to immobility he went on bellowing other and less printable remarks. After he had finished these, he ordered "Detachment rear!" and taking more time and adding even more point to his remarks, he repeated some of them and added others, addressing abruptly and virulently the "Number" whose bungling had aroused his wrath.

"You've learnt your gun drill," he said, "learned it like a sulphur-crested cockatoo learns to gabble "Pretty Polly scratch a poll"; why in the name of Moses you can't make your hands do what your tongue says has me beat. You, Donovan, that's No. 3, let me hear you repeat the drill for Action Front."

Donovan, standing strictly to attention, with his eyes fixed straight to his front, drew a deep breath and rattled off: "At the order or signal from the battery leader or section commander, 'Halt action front!' One orders 'Halt action front!' At the order from One, the detachment dismounts, Three unkeys, and with Two lifts the trail; when the trail is clear of the hook, Three orders 'Limber drive on!'"

The instructor interrupted explosively.

"You see," he said, "you know it, Three orders 'Limber drive on.' You're Three. But did you order 'Limber drive on' or limber drive off, or drive anywhere at all? Did you expect drivers that would be sitting up there on their horses, with their backs turned to you, to have eyes at the backs of their heads to see when you had the trail lifted, or did you be expectin' them to thought-read that you wanted them to drive on?"

Not in the Gun Drill.

Three, goaded at last to a sufficiency of daring, ventured to mutter something about "was going to order it."

The instructor caught up the phrase and flayed him again with it. "Was going to," he repeated, "'was going to

order it. Perhaps some day, when a bullet comes along and drills a hole in your thick head, you will want to tell it you 'was going to' get out of the way. You maybe expect the detachment to halt and stand easy, and light a cigarette, and have a chat while you wait to make up your mind what you are going to say, and when you're going to say it? And if you ever get past recruit drill in the barracks square, my lad, and smell powder burnt in action, you'll learn that there's no such thing as 'going to' in your gun drill. If you're slow at it, if you fumble your fingers, and tie knots in your tongue, and stop to think about your 'going to,' you'll find maybe that 'going to' is gone before you make up your mind, and the only thing 'going to' will be you and you're detachment, and its Kingdom. Come you'll be 'going to' at that. And now we'll try it again, and if I find any more 'going to' about it this time it's an hour's extra drill a day you'll be 'going to' for the next week."

He kept the detachment drilling and grinding for another hour before he let them go, and at the end of it he spent another five minutes pointing out the manifold faults and failings of each individual in the detachment, reminding them that they belonged to the Royal Regiment of Artillery, that is "The right of the line, the terror of the world, and the pride of the British Army," and that any man who wasn't a shining credit to the Royal Regiment was no less than a black disgrace to it.

When the detachment dismissed, and for the most part gravitated to the canteen, they passed some remarks upon their instructor, almost pungent enough to have been worthy of his utterance. "Him an' his everlastin' 'Cut the Time!'"

"I'm just about fed up with him," said Gunner Donovan bitterly, "and I'd like to know where's all the sense doing this drill against a stop watch. You'd think from the way he talks that a man's life was hanging on the whiskers of half a second. Blanky rot, I call it."

"I wouldn't mind so much," said another gunner, "if ever he thought to say we done it good, but not 'im. The better we does it and the faster, the better and the faster he wants it done. It's my belief that if he had a gun detachment picked from the angels above he'd tell 'em their buttons and their gold crowns was a disgrace to heaven, that they was too slow to chase worms or catch a cold, and that they'd 'ave to cut the time it took 'em to fly into column o' route from the right, or "alt action front."

These were the mildest of the remarks that passed between the smarting numbers of the gun detachment, but they

would have been astonished beyond words if they could have heard what their instructor, Sergeant "Cut-the-Time," was saying at that moment to a fellow-sergeant in the sergeants' mess.

"They're good lads," he said, "and it's me, that in my time has seen the making and the breaking and the handling and the hammering of gun detachments enough to man every gun in the army; that's saying it. I had them on the "Halt, action front," this morning, and I tell you they've come on amazing since I took 'em in hand. We cut three solid seconds this morning off the time they've been taking to get the gun into action, and a second a round off the firing of ten rounds. They'll make good gunners yet if they keep at it."

"Three seconds is good enough," said the other mildly.

"It isn't good enough," returned the instructor, "if they can make it four, and four's not good enough if they can make it five. It's when they can't cut the time down by another split fraction of a second that I'll be calling them good enough. They won't be blessing me for it now, but come the day maybe they will.

Another Picture.

The battery was moving slowly down a muddy road that ran along the edge of a thick wood. It had been marching most of the night, and, since the night had been wet and dark, the battery was splashed and muddy to the gun-muzzles and the tops of the drivers' caps. It was early morning, and very cold. Gunners and drivers were muffled in coats and woollen scarves, and sat half-asleep on their horses and wagons. A thick and chilly mist had delayed the coming of light, but now the mist had lifted suddenly, blown clear by a quickly risen chill wind. When the mist had been swept away sufficiently for something to be seen of the surrounding country, the major, riding at the head of the battery, passed the word to halt and dismount, and proceeded to "find himself on the map." Glancing about him he picked out a churchsteeple in the distance, a wayside shrine, and a cross-road near at hand, a curve of the wood beside the road, and by locating these on the square map, which he took from its mud-splashed leather case, he was enabled to place his finger on the exact spot on the map where his battery stood at that moment. Satisfied on this, he was just about to give the order to mount when he heard the sound of breaking brushwood and saw an infantry officer emerge from the trees close at hand.

The officer was a young man and was evidently on an errand of haste. He slithered down the steep bank at the edge of the wood, leaped the roadside ditch, asked a question of the nearest man, and, getting an answer from him, came at the double past the guns and teams towards the major. He saluted hastily, said "Mornin', sir," and went on breathlessly. "My colonel sent me across to catch you. We are in a ditch along the edge of the far side of this wood, and could just see enough of you between the trees to make out your battery. From where we are we can see a German gun, one of their big brutes, with a team of about twenty horses pulling it, plain and fair out in the open. The colonel thinks you could knock 'em to glory before they could reach cover."

Prepare for Action.

"Where can I see them from?" said the major quickly.

"I'll show you," said the subaltern, "if you'll leave your horse and come with me through the wood. It's only a narrow belt of trees here.

The major turned to one of his subalterns, who was with him at the head of the battery.

"Send back word to the captain to come up here and wait for me!" he said rapidly. "Tell him what you have just heard this officer say, and tell him to give the word, 'Prepare for action.' "And now," he said, turning to the infantryman, "go ahead."

The two of them jumped the ditch, scrambled up the bank, and disappeared amongst the trees.

A message back to the captain who was at the rear of the battery, brought him up at a canter. The subaltern explained briefly what he had heard, and the captain, after interrupting him to shout an order to "Prepare for action," heard the finish of the story, pulled out his map, and pointing out on it a road shown as running through the trees, sent the subaltern off to reconnoitre it.

The men were stripping off their coats, rolling them and strapping them to the saddles and the wagon-seats; the Numbers One, the sergeants in charge of each gun, bustling their gunners, and seeing everything about the guns made ready; the gunners examining the mechanism and gears of the guns, opening and closing the hinged flaps of the wagons, and tearing the thin metal covers off the fuses.

Why Soldiers Drill.

It was all done smartly, and one after another the sergeants reported their sub-sections as ready. Immediately the

captain gave the order to mount, drivers swung themselves to their saddles, and the gunners to their seats on the wagons, and all sat quietly waiting for whatever might come next.

The lifting of the mist had shown a target to the gunners on both sides apparently, and the roar and boom of near and distant guns, beat and throbbed quicker and at closer intervals, while from somewhere beyond the wood came the faint roll and crackle of rifle-fire.

In three minutes the major came running back through the wood, and the captain moved to meet him.

"We've got a fair chance!" said the major exultingly. "One of their big guns clear in the open, and moving at a crawl. I want you to take the battery along the road here, sharp to the right at the cross-road, and through the wood. The Inf. tell me there is just a passable road through. Take guns and firing battery wagons only; leave the others here. When you get through the wood, turn to the right again, and along its edge until you come to where I'll be waiting for you. I'll take the range-taker with me. The order will be 'open sights'; it's the only way; not time to hunt a covered position! Now, is all that clear?"

"Quite clear," said the captain tersely.

"Off you go, then," said the Major; "remember, it's quick work. Trumpeter, come with me, and the range-taker. Sergeant-Major, leave the battery staff under cover with the first line."

He swung into the saddle, set his horse at the ditch, and with a leap and scramble was over and up the bank and crashing into the undergrowth, followed by his trumpeter and a man with the six-foot tube of a range-finder strapped to the saddle.

Before he was well off the road the captain shouted the order to walk march, and as the battery did so, the subaltern who had been sent out to reconnoitre the road came back at a canter.

"We can just do it," he reported; "it's greasy going, and the road is narrow and rather twisty, but we can do it all right."

The captain sent back word to sections commanders, and the other two subalterns spurred forward and joined him.

"We go through the wood," he explained, "and come into action on the other side. The order is 'open sights,' so I expect we'll be in an exposed position. You know what that means. There's a gun to knock out, and if we can do it and get back quick before they get our range we may get off light. If we can't—" and he broke off signi-

ificantly. "Get back and tell your Numbers One, and be ready for quick moving."

Immediately they had fallen back the order was given to trot, and the battery commenced to bump and rumble rapidly over the rough road. As they neared the cross-roads they were halted a moment, and then the guns and their attendant ammunition wagons only went on, turned into the wood, and recommenced to trot.

Getting to It.

They jolted and swayed and slid over the rough, wet road, the gunners clinging fiercely to the hand-rails, the drivers picking a way as best they could over boulders and between ruts. They emerged on the far side of the wood, found themselves in an open field, turned sharply to the right, and kept on at a fast trot. A line of infantry were entrenched amongst the trees on the edge of the wood, but their shouted remarks were drowned in the clatter and rattle and jingle of wheels and harness. Out on their left the ground rose very gently, and far beyond a low crest could be seen clumps of trees, patches of fields, and a few scattered farmhouses. At several points on this distant slope the white smoke-clouds of bursting shells were puffing and breaking, but so far there was no sign to be seen of any man or of any gun. When they came to where the major was waiting he rode out from the trees, blew sharply on a whistle, and made a rapid signal with hand and arm. The guns and wagons had been moving along the edge of the wood in single file, but now at the shouted order each team swung abruptly to its left and commenced to move in a long line out from the wood towards the low crest, the whole movement being performed neatly and cleanly and still at a trot. The major rode to his place in the centre of the line, and the battery, keeping its place close on his heels, steadily increased its pace almost to a canter. The major's whistle screamed again, and at another signal and the shouted orders the battery dropped to a walk. Every man could see now over the crest and into the shallow valley that fell away from it and rose again in gentle folds and slopes. At first they could see nothing of the gun against which they had expected to be brought into action, but presently someone discovered a string of tiny black dots that told of the long team and heavy gun it drew. Another sharp whistle and the major's signal brought the battery to with a jerk.

"Halt, action front!" The shouted order rang hoarsely along the line. For a moment there was wild commotion; a seething chaos, a swirl of bobbing heads and plunging horses.

But in the apparent chaos there was nothing but the most smooth and ordered movement, the quick but most exact following of a routine drill so well ground that its motions were almost mechanical. The gunners were off their seats before the wheels had stopped turning, the key snatched clear and the trail of the gun lifted, the wheels seized and the gun whirled round in a half-circle and dropped pointing to the enemy. The ammunition wagon pulled up into place beside the gun, the traces flung clear, and the teams hauled round and trotted off. As Gunner Donovan's trail was lifted clear his yell of "Limber, drive on," started the team forward with a jerk, and a moment later, as he and Number Two slipped into their seats on the gun the Number Two grinned at him. "Sharp's the word," he said; "d'you mind the time——" He was interrupted roughly by the sergeant, who had just had the target pointed to him, jerking up the trail to throw the gun roughly into line.

"Shut your head, and get to it, Donovan. You see the target there, don't you?"

"See it a fair treat!" said Donovan joyfully; "I'll bet I plunk a bull in the first three shots."

Back in the wood the infantry colonel from a vantage-point half-way up a tall tree watched the ensuing duel with the keenest excitement.

The battery's first two ranging shots dropped in a neat bracket, one over and one short; in the next two the bracket closed, shorter shot being almost on top of the target. This evidently gave the range closely enough, and the whole battery burst into a roar of fire, the blazing flashes running up and down the line of guns like the reports of a gigantic Chinese cracker. Over the long team of the German gun a thick cloud of white smoke hung heavily, burst following upon burst and hail after hail of shrapnel, sweeping the men and horses below. Then through the crashing reports of the guns and the whimpering rush of their shells' passage, there came a long whistling scream that rose and rose and broke off abruptly in a deep rolling cr-r-r-rump. A spout of brown earth and thick black smoke showed where the enemy shell had burst far out in front of the battery.

A Fierce Duel.

The infantry colonel watched anxiously. He knew that out there somewhere another heavy German gun had come into action; he knew that it was a good deal slower in its rate of fire, but that once it had secured its line and range it could practically obliterate the light field guns of the bat-

tery. The battery was fighting against time and the German gunners to complete its task before it could be silenced. The first team was crippled and destroyed, and another team, rushed out from the cover of the trees, was fallen upon by the shrapnel tornado and likewise swept out of existence.

Then another shell from the German gun roared over, to burst this time well in the rear of the battery.

The colonel knew what this meant. The German gun had got its bracket. The battery had ceased to fire shrapnel, and was pouring high-explosive about the derelict gun. The white bursts of shrapnel had given place to a series of spout-volcanoes that leaped from the ground about the gun itself. Another German shell fell in front of the battery and a good 200 yards nearer to it. A movement below attracted the colonel's attention, and he saw the huddled teams straighten out and canter hard towards the guns. He turned his glasses on the German gun again, and could not restrain a cry of delight as he saw it collapsed and lying on its side, while high explosive shells still pelted about it.

The teams came up at a gallop, swept round the guns, and halted. Instantly they were hooked in, the buried spades of the guns wrenched free, the wheels manned, the trails dropped clashing on the limber hooks. And as they dropped, another heavy shell soared over and burst behind the battery, so close this time that the pieces shrieked and spun about the guns, wounded three horses and a couple of men. The Major, mounted and waiting, cast quick glances from gun to gun. The instant he saw they were ready he signalled an order, the drivers' spurs clapped home, and the whips rose and fell whistling and snapping. The battery jerked forward at a walk, that broke immediately into a trot, and from that to a hard canter.

Even above the clatter and roll of the wheels and the hammering hoof-beats the whistle and rush of another heavy shell could be heard. Gunner Donovan, twisted sideways and clinging close to the jolting seat, heard the sound growing louder and louder, until it sounded so close that it seemed the shell was going to drop on top of them. But it fell behind, and exactly on the position where the battery had stood. Donovan's eye caught the blinding flash of the burst, the springing of a thick cloud of black smoke. A second later something shrieked, hurtling down and past his gun team, struck with a vicious thump into the ground.

"That was near enough," shouted Mick, on the seat beside him. Donovan craned over as they passed, and saw, half-buried in the soft ground, the battered brass of one of their

own shell cartridges. The shell had landed fairly on top of the spot where their gun had stood, where the empty cartridge cases had been flung in a heap from the breech. If they had been ten or twenty seconds later in getting clear, if they had taken a few seconds longer over the coming into action or limbering up, a few seconds more to the firing of their rounds, the whole gun and detachment . . .

Gunner Donovan leaned across to Mick and shouted loudly, but his remark was so apparently irrelevant that Mick failed to understand. A sudden skidding swerve as the team wheeled nearly jerked him off his seat, the crackling bursts of half a dozen light shells over the plain behind him distracted his attention for a moment further. Then he leaned in towards Donovan. "What was that?" he yelled. "What didjer say?"

Donovan repeated his remark: "Gawd—bless—old 'Cut-The-Time.'"