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CANADIAN SCHOOL OF ARTILLERY:

Notified in A.C.Is. 17th June, 1942

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26/G.S. Publications/760

GAS TRAINING

1942

(Gas Training, 1942, cancels Pamphlets No. 1 and No. 2 and Secs. 29 to 33 and 42 to 44 of Pamphlet No. 3 of the Manual of Protection against Gas and Air Raids.)

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F. C. BOVENSCHEN

THE WAR OFFICE,
17th June, 1942

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PREFATORY NOTE

Gas Training, 1942, contains information on the subject of gas which every officer should know. It contains in simple lesson form (Chapter II) the gas knowledge required by every man and the additional gas knowledge (Chapter III) required by junior leaders. Instructions for the use of gas training expedients (Chapter IV) are included. The introduction (page 1) should be carefully studied.

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INTRODUCTION

1. Gas is a weapon of war like the bullet and the shell. The soldier must accept all necessary war risks against gas, as he does against bullet and shell. He must not be diverted from his object by seeking complete protection and avoiding all risks.

2. The variety of ways in which an enemy may use gas gives rise to a large number of questions concerned with protection against it. It is impossible to provide, in advance, a solution to every problem that may arise.

3. Every officer and man is responsible for his own individual protection against gas, and he is provided with the necessary means as part of his personal equipment. Complete personal protection is afforded by the service respirator against the action of all war gases, except against the effects of blister gas upon the skin.

4. Protection against blister gas is, in fact, the main problem. Complete protection could be afforded only by the wearing of special garments in which the soldier could neither fight, nor live, nor perform many of the duties which are required when out of actual contact with the enemy. Since this solution is obviously impracticable, it follows that something less than complete protection has to be aimed at; in other words, that certain risks have to be run, the degree of acceptable risk depending on the local situation. In appreciating what risks are involved in any particular set of circumstances, and in deciding which to accept, commanders and junior leaders must be prepared to use their military and gas knowledge and their common sense.

5. By gas knowledge is meant an understanding of the characteristics and methods of use of the various war gases and the effects of ground and weather upon them, and familiarity with the capabilities and limitations of the service gas equipment. These matters are described in the present publication.

6. A soldier who becomes contaminated by blister gas liquid is not an immediate casualty and does not necessarily become one. If he takes the correct action (personal decontamination) in time he should not become a casualty at all.

7. As for what are, and what are not, legitimate war risks, it may be said generally that the risk of contamination in the forward area will normally have to be accepted, just as risks from shells and bullets have to be accepted, since the soldier must be able to develop his full fighting power. Troops in

reserve and those in action, though not in close contact with the enemy, can make more use of their gas equipment and still carry out their tasks satisfactorily; therefore they need not accept the same risks. All troops carry in their personal equipment the means of telling whether they have been sprayed, and the means of countering the effects of any spray which falls upon them. Consequently, troops in areas out of range of the enemy's ground weapons run no great risks, especially as the changing of their clothing, if necessary, presents comparatively few difficulties.

8. No troops should be subjected to the risk of being blinded by blister gas liquid from a drop of spray or the splash from a ground weapon if it can possibly be prevented. Eye-shields should habitually be worn when in the open by all troops who can do so without detriment to their duties.

9. The suddenness with which gas is liable to be encountered, and the fact that personal responsibility for individual protection rests upon every officer and man, make it imperative that training in the use of the gas equipment should reach a high standard. When suddenly confronted with gas the individual will then know instinctively what action to take, while good unit discipline will ensure that no precautions are relaxed unnecessarily.

GAS TRAINING

CHAPTER I.—PRINCIPLES AND SYSTEM OF TRAINING

1. General Instructions

1. *Principles.*—The first principle of training is to give the individual a thorough knowledge of his duties. The commander of each unit or sub-unit is responsible for the training of his command. Superiors exercise their functions of guidance and control. Gas training is part of the normal training of all ranks.

2. *Object.*—The object of gas training is to ensure that individuals and units are capable of protecting themselves against all forms of gas attack with the minimum loss of efficiency; that is, to ensure that the soldier will be able to fight despite the presence of gas.

3. *Policy.*—The onus of protecting himself against gas lies on the individual; every individual, therefore, is issued with personal gas equipment. Protection against gas is not a subject for a few specialists only. Every individual should be trained; there can be no exceptions. Individual men are taught by junior leaders. Gas officers and gas N.C.Os. are required to train junior leaders. Supervision by superiors is necessary.

4. *Individual soldiers.*—Individual soldiers should be taught essentials, and given confidence. Frequent short periods of practice in the use of personal gas equipment are necessary to maintain gas discipline. (Sec. 2.)

5. *Junior leaders.*—Junior officers and N.C.Os. should be trained as gas instructors of their men, and taught how to deal with the gas problems they will meet in the field. (Sec. 3.)

6. *Gas officers and gas N.C.Os.*—Selected officers and N.C.Os. are trained at the Army Gas School.* Their duties are given in Sec. 4. The minimum numbers required are:—

- i. One gas officer in each lieutenant-colonel's command.
- ii. One gas officer in each R.E. Squadron and company.
- iii. One gas N.C.O. in each battery, squadron, company, and equivalent sub-unit.

*In Canada—Canadian Small Arms training centres.

7. *Staff officers.*—Staff officers with specialist training in gas warfare are appointed to assist in maintaining an efficient standard of gas training throughout the formation, to assess the probable dangers from the use of gas by the enemy in the formation area and, in the event of orders being given for retaliation, to advise the commander on the use of gas against the enemy.

8. *Commanding officers.*—C.Os. should be sufficiently familiar with the details of the subject to use their juniors effectively and to ensure that the gas equipment provided is properly maintained and used. Notes on gas training inspections are given at Appendix A.

9. *Training expedients.*—To provide realism in training the following expedients are issued:—

Choking gas.—Phosgene in small cylinders; C.A.P. generators.

Nose gas.—D.M. ampoules; D.M. generators.

Tear gas.—C.A.P. capsules; B.B.C.

Blister gas.—Mustard gas in pint pots; blister gas training mixture.

Thunderflashes, or other expedients used to represent high explosive projectiles, should be used in situations in which gas training expedients are employed, except the direct contamination of ground. Blister gas spray can be simulated by means of a stirrup pump spraying blister gas training mixture. Gas chambers can be improvised. Phosgene, mustard gas, and B.B.C. are supplied for use at gas compounds. (Secs. 23 to 28).

10. *Collective training.*—Special gas exercises are not recommended during collective training. Better value is obtained by introducing gas problems in all exercises. Realism is essential, and calls for the proper use of training expedients and careful umpiring. Suitable problems, primarily intended to exercise junior leaders and men, are given in Secs. 29 to 40.

11. *Enthusiasm.*—Until the gas weapon is used there will be difficulty in maintaining enthusiasm for gas training. Enthusiasm is, however, one of the first essentials of training. Gas is likely to be used on a large scale. The first attacks are always the most dangerous, and may have a surprise effect on men who have not experienced gas in war. The British Army is well equipped to meet gas; the degree of danger therefore depends on the state of training and main-

*In Canada—chlorine.

tenance of gas discipline. "A little and often" is a useful method with gas training. (Sec. 15, para. 12.)

2. Individual Soldiers

1. *Standard to be attained.*—The soldier should be taught:—

i. War gases.—That any feeling of choking, irritation of the nose or eyes, any suspicious smell, any suspicious liquid, or any hostile smoke, should be treated as a war gas until proved otherwise. He should be given experience of a tear gas and a nose gas, and be shown an example of a choking gas and a blister gas.

ii. Equipment.—The various articles of personal gas equipment, their uses, how they are carried and how to take care of them.

iii. Respirator.—Description and care. Carriage of respirator. Respirator drill, in which he should become highly proficient. He should be given confidence in the respirator by means of gas chamber tests, and should be exercised in carrying out normal duties with the face-piece adjusted by day and night.

iv. Decontamination.—Personal decontamination, and decontamination of his weapons and of vehicles.

v. Gas alarm system.—The difference in the methods of protection against blister gas spray and other forms of gas attack; this difference necessitates frequent practice in the immediate action to be taken on hearing the gas "rattle" alarm or the shout of "gas," and the verbal warning "spray." The use of gas detectors and gas warning signs. The gas duties of sentries.

2. *Initial lessons.*—Instructors at training centres and junior leaders in units should be trained to teach their men the following initial lessons:—

i. War gases (Sec. 5).

ii. Personal gas equipment (Sec. 6).

iii. Description and care of respirator (Sec. 7).

iv. Carriage of respirator (Sec. 8).

v. Respirator drill (Sec. 9).

vi. Gas cape and light gas suit (Sec. 10).

vii. Personal decontamination (Sec. 11).

viii. Decontamination of weapons and vehicles (Sec. 12).

ix. Gas detectors and gas warning signs (Sec. 13).

x. Gas alarm system and gas duties of sentries (Sec. 14).

3. *Further training.*—In addition, under a gas officer or gas N.C.O., the soldier should be:—

- i. Given confidence in the respirator by a gas chamber test, early in his training. (In the absence of a gas officer or gas N.C.O. this test may be conducted by an officer or selected N.C.O., who has qualified on a unit junior leader's gas course.) (Sec. 17.)
- ii. Given experience of a nose gas and a persistent tear gas, shown a war example of a choking gas and a blister gas, and be allowed to form his own opinion of how to recognize them. He should have a large drop of blister gas liquid placed on his forearm, to be followed by personal decontamination, in order to give him confidence in gas ointment. He should be shown the appearance of blister gas liquid on detectors, clothing, equipment, and ground. (Sec. 23, para. 4.)
- iii. Given a short talk on enemy gas weapons (Sec. 19); and reminded of the efficacy of our protective equipment, provided it is used properly and kept in serviceable condition.
- iv. Shown the gas film. (Appendix B.)

4. *Recruit syllabus.*—The syllabus for the gas training of recruits is given at Appendix C. This syllabus should be taught at training centres.

5. *Practice for trained men.*—To maintain an efficient standard of gas training and gas discipline, the trained soldier should be:—

- i. Practised in the action to be taken on hearing the "rattle" or the shout of "gas," and the verbal warning "spray," by means of frequent test alarms by day and by night.
- ii. Tested periodically by means of tests of elementary training (Sec. 15).
- iii. Practised in carrying out normal duties and in sleeping with the facepiece adjusted, by day and by night, for periods leading up to four or five hours.
- iv. Given confidence in his respirator by a gas chamber test at least once in every three months (Sec. 17).
- v. Practised in recognizing the direction of the wind, since it is necessary to be "wind conscious" when gas is used.
- vi. Given further occasional short talks on enemy gas preparations, and our means of countering them.

3. Junior leaders

1. *System of training.*—Officers and N.C.Os. who have qualified at the Army Gas School should be employed to train the remaining junior leaders of the unit including instructors at training centres.

2. *Standard to be attained.*—Junior officers and N.C.Os. should be trained:—

- i. As the gas instructors of their men.
- ii. To deal with the gas problems they will meet in the field.

3. *Training as instructors.*—Junior leaders should be trained to teach the ten initial lessons. (Sec. 2, para. 2.) A minimum of twenty 45-minute lesson periods is necessary for this part of the leader's training.

4. *Further lessons for junior leaders.*—Junior leaders should be taught the following further lessons:—

- i. Tests of elementary training. (Sec. 15.)
- ii. Fitting of respirators. (Sec. 16.)
- iii. Gas chamber test. (Sec. 17.)
- iv. Inspection of gas equipment. (Sec. 18.)
- v. Enemy gas weapons and gas intelligence. (Sec. 19.)
- vi. Effects of weather and ground on gas. (Sec. 20.)
- vii. Blister gases. (Sec. 21.)
- viii. Effects of gas on food and water; blister gas reconnaissance; and decontamination of ground. (Sec. 22.)

5. *Gas problems.*—Junior leaders should be given practice in dealing with gas problems introduced during outdoor exercises. For this purpose, the problems given in Secs. 29 to 40 may be useful as a guide. It is also important that junior leaders should:—

- i. Be reminded of the likely tactical employment of enemy gas weapons. (Sec. 19, paras. 9 and 10.)
- ii. Be given further practice in the recognition of blister gas on detectors, clothing, equipment, and ground. (Sec. 26, para. 1.)
- iii. Be given frequent practice in recognizing the direction of the wind.

6. *Syllabus.*—A syllabus for the gas training of junior leaders is given at Appendix D.

4. Gas officers and gas N.C.Os.

1. *Standard to be attained.*—The object of the gas officer and gas N.C.O. courses at the Army Gas School is to train selected officers and N.C.Os. of effective rank in the duties of unit gas officers and sub-unit gas N.C.Os. respectively. These duties comprise:—

- i. Training junior leaders as gas instructors of their men and teaching them how to deal with the gas problems they will meet in the field.
- ii. Inspecting gas equipment.
- iii. Fitting, disinfecting, and carrying out minor repairs to respirators.
- iv. Conducting gas chamber tests and giving instruction with actual war gases.
- v. Assisting their C.O. in the gas training of the unit as a whole, and in the gas protection of the unit in the field.

2. *Selection of students.*—Personnel chosen to receive the above specialist instruction at the Army Gas School should be carefully selected. Unless the officers and N.C.Os. sent to the School are above the average in intelligence and have already proved themselves to be instructors of ability, the unit as a whole will reap little benefit from them when they return from the course.

3. *Qualifying standards.*—Students who have attended gas officer and gas N.C.O. courses at the Army Gas School are graded as follows:—

- D. Distinguished.
- QI. First class qualification.
- QII. Second class qualification.
- F. Failed.

CHAPTER II.—INITIAL LESSONS

5. War gases

1. *Instructor's note.*—Initial Lesson No. 1. This lesson should bring out the points in the following paragraphs, and should not go beyond them.

2. *Definition of a war gas.*—The term "war gas" is applied to any substance which is used in war for its poisonous, irritant, or blistering effects.

3. *Persistent and non-persistent gases.*—For military purposes, war gases are described as "persistent" or "non-persistent":—

- i. Persistent gases are liquids which evaporate slowly.
- ii. Non-persistent gases disperse quickly when released.

4. *Recognition.*—Some gases can be seen either as a cloud or as a liquid. Some can be smelt, but others can neither be seen nor smelt. Thus for safety, any feeling of choking, irritation of the nose or eyes, any suspicious smell, any suspicious liquid, or any hostile smoke, should be treated as a war gas until proved otherwise.

5. *Protection.*—The respirator affords complete protection to the eyes, nose, throat, and lungs against all war gases, provided that it fits properly and is in serviceable condition.

6. *Classification of war gases.*—War gases are classified, according to their principal effects on the human body, into the following groups:—

- i. Choking gases.
- ii. Nose gases.
- iii. Tear gases.
- iv. Blister gases.

7. *Choking gases.*—These attack the breathing passages and the lungs, causing coughing and choking; they may cause death. The immediate adjustment of the respirator will prevent injury and give complete protection. Phosgene is the most effective of the choking gases. If the respirator is not adjusted immediately, a dangerous amount of phosgene may be breathed in, resulting in a feeling of suffocation accompanied by coughing. These symptoms may then cease, but if the lungs have been injured the symptoms may recur, often with serious results, at any time up to 24 hours.

8. *Nose gases.*—These cause sneezing, pain in the nose, throat, and chest, and aching of the teeth and head. Though causing much discomfort, nose gases are harassing only. The adjustment of the respirator will give complete protection, but the effects caused by the gas already inhaled will not subside immediately; it is important to keep the facepiece on, despite temptation to remove it. D.M. is an example of a nose gas.

9. *Tear gases.*—These cause a smarting of the eyes, and a flow of tears. They do not injure the eyes, unless liquid or solid gas enters them. The adjustment of the respirator gives

immediate relief and complete protection. C.A.P. is a non-persistent tear gas. B.B.C. is an example of a persistent tear gas.

10. *Blister gases*.—The characteristics of this group of gases, of which mustard gas is an important example, are:—

- i. They are generally liquids giving off invisible vapours.
- ii. They are persistent.
- iii. They penetrate through clothing.
- iv. They attack the skin, as well as the eyes, nose, throat, and lungs.
- v. Both liquid and vapour are dangerous.

11. *Effects of blister gas liquid*.—The liquid effects are:—

- i. In the eye.—The smallest drop will usually cause permanent blindness in that eye. Immediate and thorough washing out with water may, however, save the sight.
- ii. Taken internally.—Causes severe internal injuries.
- iii. On the skin.—No immediate effect, but causes redness after a time and blisters may develop some hours later. Immediate treatment (later lesson) will prevent these effects.

12. *Effects of blister gas vapour*.—May cause no discomfort at first, but later effects are:—

- i. The eyes.—May cause closure of the eyes after some hours, with temporary blindness for one or two weeks. The timely adjustment of the respirator will prevent these effects.
- ii. The breathing passages and lungs.—May cause serious injury to both. The timely adjustment of the respirator will give complete protection.
- iii. The skin.—After a time, redness and irritation, which may be followed by numerous small blisters in some hours. (The protection of the skin against blister gases will be dealt with in later lessons.)

13. *First-aid for war gases*.—In addition to the immediate action already referred to:—

- i. Choking gases.—If respirator lost or damaged, put wet cloth over face. A man seriously affected by the gas should be made a stretcher case, kept warm, given warm sweet tea, no alcohol, no smoking, no artificial respiration, and transferred to nearest medical post.

ii. Nose gases.—No special first aid treatment is necessary, and men affected should not be transferred to a medical post. Recovery is complete within an hour or two, even in bad cases.

iii. Tear gases.—If tear gas liquid or solid has entered the eyes wash them out thoroughly with water. Only those men whose eyes have been seriously affected by actual tear gas liquid or solid entering them will be transferred to nearest medical post.

iv. Blister gases.—If blister gas liquid has entered the eyes, after washing them out immediately and thoroughly with plenty of water, the man should then be transferred to the nearest medical post. Blister gas liquid on the skin should be swabbed off and ointment applied (later lesson). If blisters form they should not be pricked, but should be covered with a dressing. Men whose eyes or lungs have been injured by blister gas vapour should be transferred to nearest medical post.

14. *Methods of releasing gas*.—All war gases can be released from shells, bombs and other projectiles. In addition:—

- i. Nose and tear gases can be released from generators.
- ii. Blister gas can be sprayed from aircraft or applied directly to the ground.

15. *Experience of war gases*.—During later lessons, students will experience a tear gas and a nose gas in the gas chamber, and will be shown a choking gas and a blister gas in the gas compound.

16. *Conclusion*.—Remind students of the rule (when gas warfare has started) that any feeling of choking, irritation of the nose or eyes, any suspicious smell, any suspicious liquid, or any hostile smoke, should be treated as a war gas until proved otherwise.

6. Personal gas equipment

1. *Instructor's note*.—Initial Lesson No. 2. Stores required are one complete respirator, six eyeshields in case, two pairs of sleeve detectors, four capes (one rolled in haversack and one rolled on belt), two tins of ointment, two pots of ointment one oz. of cotton waste, one wallet, and one light suit with gloves and valise. An assistant (i.e. one of the students) is required who, as each of the first six items (paras. 3 to 8) is mentioned, places it in the correct place on his person. Proceed as in the following paragraphs.

2. *Individual responsibility*.—Point out that every man is responsible for his own individual protection against gas; that he is provided with the necessary equipment for this purpose; and that he must, therefore, know how to use the equipment and keep it in serviceable condition.

3. *Respirator*.—Remind students that the respirator affords complete protection to the eyes, nose, throat and lungs against all war gases, provided it fits properly and is in serviceable condition. This item is dealt with in detail in the next lesson. (Sec. 7.)

4. *Eyeshields*.—The object of the eyeshield is to prevent liquid gas entering the eyes. Point out that:—

- i. It is worn with the felt pad in contact with the forehead. The press buttons should normally be fastened and the elastic band should not be adjusted too tightly. (Demonstrate this, students then copy.)
- ii. As the result of physical exertion in warm weather the eyeshield tends to dim and vision is restricted; under these conditions an officer may give permission for the press buttons to be left unfastened. (Demonstrate this, students then copy.)
- iii. Six eyeshields are issued to each man. One to be worn normally at all times when not under cover; the remainder to be kept in their case in the front left-hand pocket of the respirator haversack.
- iv. Eyeshields should be handled with care and not discarded unless contaminated.

5. *Sleeve detectors*.—The purpose of sleeve detectors is to indicate to the man whether he has been hit with blister gas liquid. Point out that:—

- i. They are held in position on the upper arm by the shoulder strap which is passed through the tape loop.
- ii. Blister gas liquid will appear on the sleeve detectors as drops which may leave a brown or red mark.
- iii. Two pairs of sleeve detectors are issued to each man. One pair to be worn normally at all times when not under cover; the second pair to be carried in the rear pocket of the respirator haversack.
- iv. N.C.Os. wear one detector only, on the left arm; badges of rank on the right arm thereby remain visible.

v. Collective use is made of sleeve detectors, i.e. if any one detector among a group of men is hit, it must be assumed that all men in that group have been contaminated.

6. *Cape*.—The gas cape is provided to protect the body from blister gas liquid. Point out that:—

- i. The cape, when not in the worn position, can be carried in one of two rolled positions; i.e. inside the equipment haversack or attached to the belt. (Show both rolled positions and then the worn position.)
- ii. To facilitate marching or work when the cape is in the worn position, the two corners can be folded back and secured by the two press buttons provided. (Demonstrate this.)
- iii. In the worn position, the cape will afford protection for about 90 minutes if no action is taken, but if free liquid contamination is swabbed off without delay it can be retained with reasonable safety until a clean one is available. A swabbed cape should always be retained until replaced by a clean one. (Sec. 11, para. 9, iii.)
- iv. One cape is issued to each man.
- v. The upper parts of both sleeves should be painted by the unit to act as sleeve detectors, the paint being renewed as necessary.
- vi. When not in use the cape should be unrolled and hung up by the two outer loops provided; if this is not done regularly the oiled fabric will become unserviceable. (Demonstrate method of hanging up the cape.)

7. *Ointment*.—The individual issue of gas ointment is used to prevent the effects of blister gas liquid on the skin; to protect the hands when handling a contaminated article (where gas gloves are not available or are too clumsy in use); to destroy blister gas liquid on personal weapons, clothing and equipment; and to protect the exposed skin against blister gas vapour. Point out that:—

- i. Each man is issued with two pots or tins, each containing two oz. of ointment. (Show how to take ointment from the pot and tube.)
- ii. The ointment must not be applied to the skin after redness has appeared, nor after the individual has

left a vapour concentration. Ointment must not enter the eyes.

- iii. It should not be exposed to sources of heat, such as fires and hot pipes.
- iv. If in pots, the lids must be kept securely fastened but loosened periodically.
- v. To prevent the lids of the pots from sticking, a thin film of grease may be applied to the threads of the lid.
- vi. One pot or tin is carried in the front right hand pocket of the respirator haversack; the other in the pocket of the cape.

8. *Cotton waste*.—The individual issue of cotton waste is for removing liquid contamination from the skin and from the chinstrap of the steel helmet, and for removing surplus ointment from the skin; it should not normally be used for other purposes. Point out that:—

- i. One oz. of cotton waste is issued to each man and should be broken up into small swabs. (Demonstrate this.)
- ii. One half of the cotton waste is carried in the front right hand pocket of the respirator haversack and the other half in the cape pocket.
- iii. In each case about half the swabs should be placed below the ointment with the remainder on top ready for immediate use. (Demonstrate this.)

9. *Wallet*.—The object of the gas wallet is the protection of small items of value (e.g. A.B. 64) against the effects of blister gas. Point out that:—

- i. One wallet is provided for each man.
- ii. The wallet will not be carried in the respirator haversack.

10. *Light suit*.—Show the suit, but the method of wearing it will not be demonstrated until Lesson 6. (Sec. 10.) The light gas suit is issued to certain personnel who either cannot carry out their duties effectively in the gas cape, or who need the additional protection to the legs afforded by the suit. The suit consists of jacket and trousers, with the addition of three pairs of oilskin gloves or two pairs of rubber gloves. The suit gives protection against blister gas liquid for the same length of time as the gas cape; the instructions regarding swabbing also apply. The upper parts of both sleeves of the jacket should be painted by the unit to act as sleeve

detectors, the paint being renewed as necessary. When not in use the suit should be hung up; if this is not done regularly the oiled fabric will soon become unserviceable. The light gas suit is issued, in addition to the cape, among others to:—

- i. All motor-cyclists.
- ii. All transport drivers.
- iii. All personnel specially employed on A.A. duties.
- iv. All members of Bren carrier crews, who also get a valise each for the carriage of the suit. (Instructor to show the valise.)

11. *A/V battle dress*.—This dress is ordinary serge battle dress which has been specially treated to resist penetration by blister gas vapour. Point out that:—

- i. A/V battle dress affords no additional protection against blister gas liquid. (It gives no protection against lice.)
- ii. Each garment is marked on the inside with the letters "A/V".
- iii. When new, A/V battle dress has a characteristic smell which becomes less noticeable with wear.
- iv. Washing or dry cleaning of the suit destroys its gas resisting properties.
- v. If wet, the suit should not be dried close to a fire or in contact with hot pipes.

7. Description and care of respirator

1. *Instructor's note*.—Initial Lesson No. 3. Students should be seated at tables with their respirators in front of them. Stores required are a complete respirator, a damaged facepiece and container, equipment cleaner, bowl of water, and a dry brush and wet brush for cleaning. Proceed as in the following paragraphs.

2. *Protection afforded*.—Remind students that the respirator affords complete protection to the eyes, nose, throat and lungs against all war gases, provided it fits properly and is in serviceable condition. Give warning that:—

- i. With nose gases the adjustment of the facepiece does not give immediate relief, and the wearer may temporarily feel worse; the wearer, however, must keep his facepiece adjusted despite temptation to remove it.
- ii. The respirator does not give protection against carbon monoxide which is present in coal gas and may sometimes be found in large bomb craters.

3. Individual responsibility.—Emphasize that:—

- i. The respirator is a personal issue to the soldier, who is responsible for maintaining it in serviceable condition.
- ii. The respirator is fitted for the soldier's own use and should not be lent to others.
- iii. The wearing of the respirator not only protects the soldier but enables him to continue fighting efficiently.

4. Description.—Name and demonstrate the parts of the respirator, explaining briefly how it works:—

- i. Facepiece.—Headharness, air channel, eyepieces, valve holder, connecting tube. (Becket and "S" hook on long tube.)
- ii. Container.—Inlet valve, inlet slots. Point out correct alignment of container with facepiece. (Sec. 18, para. 3.)
- iii. Haversack.—Mark VI—sling, slides, cord loop, flat-spring hooks, large Ds, or rings, small Ds, S hook, eyeletted tab, whipcord, two flaps, press buttons, five compartments. Mark VII—sling, slides, cord loop, rings, whipcord, whipcord button, single flap, press buttons, five compartments, pocket for anti-dimming outfit.*
- iv. Anti-dimming outfit.—Mark V—cylinder, cloth, composition. Mark VI—tin, specially treated cloth.

5. Carriage in haversack.—Demonstrate, giving detail, the method of carrying the container in the haversack and how the facepiece is returned to the haversack (students copying) as follows:—

- i. Place the container, with the inlet slots towards the centre, in the large right hand pocket of the haversack.
- ii. Hold the facepiece in the right hand, allowing the headharness to fall inside, fold by pressing the eyepieces together and place in the large left hand pocket of the haversack, the headharness towards the centre.

6. Use of anti-dimming outfit.—To ensure clear vision, it is necessary to treat the eyepieces with the anti-dimming compound or cloth. This should be done, normally, before returning the facepiece to the haversack after use. Under gas conditions, anti-dimming should be carried out at least

* In Canada—"S" hook.

once daily. Demonstrate and explain the methods, students copying, applying anti-dim to one eyepiece only:—

- i. Mark V.—Clean eyepiece with the cloth provided. Apply compound evenly with the finger. If it is too stiff to spread easily, breathe on the eyepiece to moisten it. Spread lightly over the eyepiece with the cloth. Do not polish. Breathe on the eyepiece until it becomes clear.
- ii. Mark VI.—Wet the finger tip and moisten the inner surface of the eyepiece. Rub vigorously with the cloth provided until the surface is clear and dry. (The cloth may also be used for the treatment of spectacle lenses and eyeshields.) When not in use, the lid of the tin must be kept closed.

7. Adjustment of facepiece.—At this stage it is necessary to teach students how to adjust the facepiece. The instructor will demonstrate and explain the following:—

- i. Hold the facepiece with the thumbs under the two middle and lower elastics.
- ii. Dig the chin in and bring the headharness over the head so that the centre elastics are approximately horizontal.

8. Experience of anti-dimming treatment.—To enable students to appreciate the value of the anti-dimming treatment, they should now adjust their facepieces in the manner taught. (It will be noted that only one eyepiece has been treated with the compound or cloth.)

9. Removal of facepiece.—Demonstrate and explain the method of removing the facepiece (students copying) as follows:—

- i. Insert two fingers of either hand between the facepiece and chin.
- ii. Remove the facepiece with an upward and outward movement.

10. Care of respirator.—Explain that the following must be avoided:—

- i. Complete respirator.—Keeping near hot pipes and fires.
- ii. Haversack.—Using for the carriage of unauthorized articles.
- iii. Facepiece.—Stretching the elastics unduly; straining the buckles; tampering with the eyepieces; inter-

fering with the outlet valve retaining nut; folding incorrectly.

iv. Container.—Denting by rough usage; allowing water to enter.

11. *Cleaning of facepiece*.—Demonstrate and explain the correct method of cleaning the facepiece (students copying) as follows:—

- i. Wipe the inside with a cloth (e.g. handkerchief).
- ii. Treat eyepieces with anti-dimming compound or anti-dimming cloth.
- iii. If the facepiece and elastics are wet and muddy allow them to dry at normal temperature, and then brush off mud lightly while covering the outlet valve with the hand. Non-fabric covered facepieces should be wiped with a damp cloth.

12. *Cleaning of haversack*.—Explain the correct methods of cleaning the haversack:—

- i. If wet and muddy the haversack should be allowed to dry at ordinary temperature, and then brushed lightly.
- ii. The haversack should be cleaned with an equipment cleaner in powder form. (Demonstrate this.)
- iii. If the haversack is greasy it should be scrubbed with soap and warm water, and later reproofed by a thorough application of an equipment cleaner. No soda or scouring powders may be used, and the water must not be uncomfortably hot to the hand.

13. *Condensation inside facepiece*.—Explain that in hot weather some discomfort may be caused by the accumulation of condensed breath round the chin and inside the facepiece. This condition will increase, rather than diminish, the protection afforded by the facepiece, but the moisture can be removed by bending forward until the wearer is looking vertically downwards; the liquid can then be blown out through the outlet valve. (Instructor demonstrates this.)

8. Carriage of respirator

1. *Instructor's note*.—Initial Lesson No. 4. Follow the instructions given in Appendix E. Point out that the lesson deals with:—

- i. The method of carriage of the respirator from which protection can be most speedily gained, i.e. the "alert" position.

- ii. Alternative methods from which it will take longer to gain protection, but which are in certain circumstances less of a handicap to fighting efficiency, i.e. the "slung," "wading" and "carry" positions.

2. *Alert position (short tube)*.—In this position the respirator is put on before all other items of equipment. Note:—

- i. Haversack well up on chest, flap next to body with press buttons unfastened, sling down back.
- ii. With Mark VI haversack, whipcord passed through right hand small D, through sling at back and fastened tightly with slip knot to small D on left hand side.
- iii. With Mark VII haversack, whipcord passed through sling at back and fastened tightly to whipcord button on right hand side, making one and a half turns round button and securing with sharp pull.

3. *Alert position (long tube)*.—In this position the respirator is put on after all other items of equipment. Note:—

- i. Sling over right shoulder and haversack at left side.
- ii. Haversack flap next to body with press buttons unfastened.
- iii. Whipcord fastened round body, using small Ds. or whipcord button, to hold haversack steady.

4. *Slung position (short or long tube)*.—In this position the respirator is put on before all other items of equipment. Note:—

- i. Sling over right shoulder, above shoulder strap of blouse.
- ii. Haversack at left rear, just below belt.
- iii. Flap next to body with press buttons fastened.

5. *Wading position (short or long tube)*.—In this position the respirator is put on after all other items of equipment. Object is to keep haversack above water level when wading in deep water. Note:—

- i. Haversack at back of neck, flap next to body with press buttons fastened.
- ii. Sling brought over head and unbuckled belt passed through it.
- iii. Belt rebuckled and sling shortened so that respirator is held steady.

6. *Carry position (short tube)*.—In this position the respirator is put on after all other items of equipment. The position

cannot be adopted when an equipment haversack or pack is worn on the back. Note:—

- i. Sling reduced to shortest extent.
- ii. With Mark VI haversack, whipcord passed through right hand small D.
- iii. With Mark VII haversack, whipcord given one turn under the whipcord button.
- iv. Sling over right shoulder, haversack on back, flap next to body with press buttons fastened.
- v. Whipcord brought round right side of body and secured to whipcord loop with quick release bow.

9. Respirator Drill

1. *Instructor's note.*—Initial Lesson No. 5.—Follow the instructions given in Appendix E. Point out that:—

- i. The lesson deals with the adjustment of the facepiece in order to gain protection against gas, and with the method of testing for gas.
- ii. Provided both hands are free, it is possible to adjust the facepiece from an "alert" position without halting; individuals will be trained to do this. As a general rule, however, the adjustment of the facepiece should be done at the halt; this is obviously necessary when carrying weapons or other loads, and when moving across rough ground.
- iii. When protection is required, **STOP BREATHING UNTIL FACEPIECE IS ADJUSTED.**

2. *From alert positions.*—Sequence:—

- i. Stop breathing.
- ii. Place steel helmet to back of head.
- iii. Withdraw facepiece quickly from haversack.
- iv. Remove eyeshield and place in haversack.
- v. Hold facepiece with thumbs under the two middle and lower elastics.
- vi. Dig chin in and bring headharness over head so that centre elastics are approximately horizontal.
- vii. Remove any folds in facepiece or twists in head harness.
- viii. Breathe out hard, to clear gas from inside facepiece.
- ix. Replace steel helmet and adjust chinstrap.
- x. Steady long tube by attaching S hook (which is on becket of tube) to any convenient part of equipment or buttonhole of clothing.

3. *From slung position.*—Sequence:—

- i. Stop breathing.
- ii. Unbuckle belt and bring haversack to front of body.
- iii. Unfasten press buttons with sharp pull.
- iv. Obtain protection as already taught (para. 2 above).
- v. With short tube, pull left portion of sling downwards and so raise haversack on to chest. Shorten left portion of sling. Rebuckle belt, and secure haversack by passing whipcord round body, using small Ds, or whipcord button.
- vi. With long tube, return haversack to side and rebuckle belt (connecting tube outside).

4. *From wading position.*—Sequence:—

- i. Stop breathing.
- ii. Unbuckle belt to release sling.
- iii. Bring haversack to front of body.
- iv. Unfasten press buttons with sharp pull.
- v. Obtain protection as already taught (para. 2 above).
- vi. Rebuckle belt.
- vii. With short tube and Mark VI haversack, fasten S hook and eyeletted tab together, and secure haversack by passing whipcord round body, using small Ds.
- viii.* With short tube and Mark VII haversack, reduce sling to shortest extent, and secure haversack by passing whipcord round body, using whipcord button.
- ix. With long tube, adjust haversack in alert position.

5. *From carry position.*—Sequence:—

- i. Stop breathing.
- ii. Release whipcord.
- iii. Bring haversack over right shoulder to front of body.
- iv. Unfasten press buttons with sharp pull.
- v. Obtain protection as already taught (para. 2 above).
- vi. Secure haversack by passing whipcord round body, using small Ds, or whipcord button.

6. *Standard test.*—Inform students that in the gas tests of elementary training the standard time for the adjustment of facepiece from any position in which the respirator is carried is 15 seconds. Point out that within this time limit accuracy is more important than extreme speed, provided that breathing is stopped throughout the process of adjusting the facepiece. The time limit of 15 seconds does not include the replacement of the steel helmet or (where necessary) the subsequent

* Does not apply to Canadian Mark VII haversack.

adjustment of the respirator haversack. (Sec. 15, paras. 10 to 12.)

7. *Test for gas.*—At all times before removing the facepiece each individual must test for gas to satisfy himself that no gas is present. This will always be done on hearing the words "gas clear." Sequence:—

- i. Take a deep breath (to fill lungs with pure air).
- ii. Insert two fingers of either hand between facepiece and cheek.
- iii. Sniff gently (with back to the wind).
- iv. If gas present, withdraw fingers and breathe out hard (to clear gas from inside facepiece).

10. Gas cape and light gas suit

1. *Instructor's note.*—Initial Lesson No. 6. This lesson deals with the worn and rolled positions of the cape, and the worn position of the light suit. Students should form a semi-circle facing the instructor as for respirator drill. Each student requires field service marching order and a light suit with one pair of gas gloves. Instructor checks that cotton waste and ointment are in cape pocket. Remind students that the cape can be put on in the worn position or carried in one of two rolled positions. The light suit is issued to certain personnel only. (Sec. 6, para. 10.)

2. *Worn position of cape.*—Demonstrate the worn position of the cape pointing out that the use of the tapes may be dispensed with and reminding students that the corners of the cape can be fastened back to facilitate marching or work. Point out also that there may be occasions, e.g. after a shower of rain, when it is convenient to unbutton the cape from the worn position and allow it to hang down the back; this is not a normal position in which to carry the cape, but when adopted the tapes must be used. Demonstrate the use of the tapes as follows, students copying:—

- i. Bring the tapes over the shoulders:—
- ii. Pass the tapes under the arms and cross them behind the back.
- iii. Bring the tapes to the front of the body and tie them in a bow.

3. *Rolling of cape.*—Demonstrate and explain the following method of rolling the cape, for carriage either in the haversack or on the belt:—

- i. Lay the cape on the ground, inside uppermost. (For carriage in the haversack, place tapes inside the

cape; for attachment to the belt, place tapes clear of the cape.)

- ii. Fold right hand edge to centre.
- iii. Fold left hand edge to new right hand edge, at the bottom.
- iv. Fold in sleeves.
- v. Repeat ii and iii. The width of the cape should then be about 11 inches.
- vi. For carriage in the haversack, roll the cape from the neck. Stop approximately 18 inches short of the bottom and double this portion back on itself twice.
- vii. For carriage on the belt, roll the cape from the bottom.

4. *Rolled position of cape inside haversack.*—Repeat demonstration and explanation of method of rolling the cape for carriage inside the haversack, students copying. Place the rolled cape in the haversack, the doubled portion (para. 3, vi, above) being under the haversack flap and straps; students copy. Point out that:—

- i. The cape is carried in the equipment haversack either in place of the waterbottle, which should then be worn on the right side, or of the ground sheet if room can be found for this item in unit transport.
- ii. The cape is placed in the haversack on top of all other items.

5. *Rolled position of cape on belt.*—Repeat demonstration and explanation of method of rolling the cape for carriage on the belt, students copying. Demonstrate and explain, students copying, the following method of attaching the rolled cape to the belt:—

- i. Before putting on the equipment, place the rolled cape centrally on the belt, collar outside and pointing downwards, tapes clear.
- ii. Bind cape to the belt by means of the tapes, using their full length, winding them in opposite directions so that their ends may be tied together.

6. *Light gas suit.*—Remove field service marching order. Proceed as follows, demonstrating and explaining, students copying:—

- i. Put on trousers and secure at waist by tying whipcord in a bow.
- ii. Put on jacket. Pass the tape, which is found attached to the inside of the right hand panel, through the eyelet found on the left hand edge of the jacket.

iii. By means of the tape, pull eyelet to point where tape is fixed to the jacket, and secure by means of a half-bow.

iv. Fasten press buttons.

v. Adjust respirator to the alert position. (Point out that the respirator is adjusted outside because the jacket is double breasted and therefore, if adjusted inside, it would be impossible to withdraw the facepiece without first undoing the jacket. Point out also that if equipment is worn, it will be worn outside the jacket.)

vi. Adjust gas gloves. The jacket sleeves are tucked inside the gauntlets. With the oilskin pattern gloves, the gauntlets are tightened by means of the quick-release fasteners.

11. Personal decontamination

1. *Instructor's note.*—Initial Lesson No. 7. At least two periods are required to teach this lesson; the first period for Part I (paras. 2 to 5); the second for Part II (paras. 6 to 10). Respirators and steel helmets are required for the first period; field service marching order to be worn for the second period. For training purposes, actual ointment should not normally be used more than once a week. During training, cotton waste and eyeshields should be retrieved at the end of the lesson. Students form a semi-circle in front of the instructor. Check contents of respirator haversacks and cape pockets. Point out that:—

i. Blister gas liquid on the skin causes blisters of a serious nature unless action is taken quickly. On clothing it causes blisters underneath unless action is taken within 10 minutes or so.

ii. The action which will prevent blisters is personal decontamination. Every individual must be able to do this.

2. *Sequence of personal decontamination.*—Point out that there is a definite sequence for personal decontamination which can be memorized by the letters COECDO:—

C stands for cotton waste.

O stands for ointment.

E stands for eyeshield.

C stands for clothing and equipment.

D stands for detectors and weapons.

O stands for ointment.

3. *Division into two parts.*—Point out that personal decontamination is divided into two parts. Part I—COE. Part II—CDO. Explain that:—

i. In order to prevent blisters forming on the exposed skin, Part I has to be carried out without delay. It can be done on the move, if necessary, provided both hands are free. Part I occupies about five minutes.

ii. The timely carrying out of Part II prevents blistering under clothing. It also allows for the decontamination of weapons. It is done at the halt, under the control of the commander on the spot, and occupies about 15 minutes.

4. *Personal decontamination, Part I.*—Proceed as follows, demonstrating each item with detail. This will be followed by students practising Part I, first at the halt until proficient and then on the move, the instructor correcting faults:—

i. C for cotton waste.—By swabbing with cotton waste, remove all free liquid from the exposed skin and from the chinstrap of the steel helmet.

ii. O for ointment.—Rub gas ointment vigorously into the exposed parts of the skin, using both hands, for not less than 30 seconds for each part, and alternating between the face, neck and each hand (and knees, if bare). This will take about two minutes. If the ointment vanishes before the rubbing is complete more ointment should be taken. Ointment must not enter the eyes. After the rubbing is complete, surplus ointment (if any) should be removed (except from the hands). Smear more ointment on the hands, leaving a visible film.

iii. E for eyeshield.—Prepare a fresh eyeshield for use and substitute for old one. Inspect the latter and discard if contaminated.

5. *Points to note.*—Bring out the following points:—

i. Swabbing of the exposed skin should be carried out speedily as it is important to get ointment into the skin without delay.

ii. The blister gas liquid which has penetrated into the skin will not be destroyed unless the rubbing in of the ointment is done really vigorously.

iii. When Part I is carried out at the halt, contaminated cotton waste and eyeshields should normally be collected and either burned or buried.

6. *Personal decontamination, Part II.*—Point out that:—

- i. During Part I the commander on the spot will, if possible, be leading his men to clean ground (or to cover if available) where he will order Part II to be carried out.
- ii. The personal issue of cotton waste should normally be used only for the skin and for the chinstrap of the steel helmet; other material, e.g. grass, leaves, dry earth or sand, being used for swabbing boots, capes, equipment and weapons.
- iii. When swabbing boots, particular attention should be paid to seams.
- iv. Care will be taken to place weapons and equipment on clean ground.

7. *Part II—Cape rolled.*—Proceed as follows, demonstrating each item with detail, students copying:—

- i. C for clothing and equipment.—Remove equipment, blouse and helmet. Swab boots. Remove anklets. Examine trousers and blouse, apply ointment to both sides of the material wherever contamination is detected or suspected, and apply ointment to the skin (where not covered by underclothing) underneath the contaminated parts. Put on blouse. (*Note.*—If there is doubt as to whether any contamination on the blouse has not been detected and treated owing to extent of contamination, bad light, grease, dirt or rain, the blouse must be discarded and the jersey worn until a fresh blouse is available. On occasions, the commander on the spot may consider it advisable to order all blouses to be discarded.) Examine anklets and equipment, swab off any free liquid and apply ointment to both sides of the material wherever contamination is detected or suspected. Put on anklets and equipment. Remove garnish from steel helmet; swab helmet; apply ointment to both sides of chinstrap where contaminated; regarnish helmet if necessary. Put on helmet.
- ii. D for detectors and weapons.—Swab sleeve detectors and retain them for further use, but if contaminated with a large number of drops they should be discarded and the spare pair taken into use. Decontaminate weapons (taught in next lesson—Sec. 12).
- iii. O for ointment.—Swab the hands with clean cotton waste and rub fresh ointment vigorously into each hand for 30 seconds.

8. *Part II—Cape worn.*—Proceed as follows, demonstrating each item with detail, students copying:—

- i. C for clothing and equipment.—Remove cape and helmet. Swab boots. Remove anklets. Examine lower portions of the trousers, apply ointment to both sides of the material wherever contamination is detected or suspected, and apply ointment to the skin (where not covered by underclothing) underneath the contaminated parts. Examine anklets, swab off any free liquid and apply ointment to both sides of the material wherever contamination is detected or suspected. Put on anklets. Swab cape and put it on again. Remove garnish from steel helmet; swab helmet; apply ointment to both sides of chinstrap where contaminated; regarnish helmet if necessary. Put on helmet.
 - ii. D for detectors and weapons.—Ensure that all drops of liquid on detector paint on cape sleeves have been swabbed dry (any later contamination will be oily and easily recognizable). Decontaminate weapons (taught in next lesson—Sec. 12).
 - iii. O for ointment.—Swab the hands with clean cotton waste and rub fresh ointment vigorously into each hand for 30 seconds.
9. *Further points to note.*—Bring out the following further points:—
- i. When Part II of personal decontamination has been completed contaminated cotton waste and other swabs should normally be collected and either burned or buried.
 - ii. As an alternative to the removal of the cape (when in the worn position) for the purpose of swabbing it, the cape may be left on and swabbing carried out by individuals working in pairs, each swabbing the other's cape.
 - iii. Although the early swabbing of the cape will extend considerably its protective life, some of the liquid will have been absorbed into the oiled fabric. The cape must, therefore, eventually be completely decontaminated to render it perfectly safe. Nevertheless, the cape should be retained (but not brought into a room or other confined space) until it has been replaced by a fresh one.
 - iv. The risk from the continued wearing of contaminated boots increases the longer the liquid remains on them;

the necessity for the early swabbing of the boots is therefore apparent. If boots have been well dubbined, and if any liquid contamination is swabbed off within five minutes or so, the continued wearing of the boots is not likely to occasion injury.

v. Blister gas liquid (even light contamination) is a source of vapour danger. If taken into a confined space where vapour can accumulate, injuries may be caused to any men present. Therefore, an individual who, for any reason, has not carried out personal decontamination thoroughly, must not remain for more than a few minutes in a room or other confined space without removing his outer clothing (including boots) and leaving it outside.

vi. The appearance of drops of blister gas liquid on the cape, sleeve detectors, dubbined boots, clothing and equipment, will be demonstrated when students visit the gas compound. (Sec. 26, para. 1, vi.)

10. *Standard test.*—Inform students that personal decontamination is included in the gas tests of elementary training as one of the standard tests. While the whole operation will take about 20 minutes (including decontamination of personal weapon), there is no standard time for the test; the individual is tested in his ability to carry out accurately and thoroughly the whole process of personal decontamination. (Sec. 15, paras. 10 to 12).

12. Decontamination of weapons and vehicles

1. *Instructor's note.*—Initial Lesson No. 8. The preliminary arrangements and stores necessary are:—

i. *Weapons.*—Rifles are required by instructor and students. Suitable swabs, other than cotton waste, to be at hand. Some blister gas training mixture.

ii. *Vehicles.*—Requirements are a truck with driver, with gas gloves at hand, some blister gas training mixture, and the following stores and equipment on the vehicle:—2 gallon tin of petrol (water for instructional purposes), 2 gallon tin of water, 7 lb. or 2 lb. tin of bleach (dry sand may be used to simulate bleach during training), g.s. shovel, 4 oz. tin of detector paint, paint brush and sandbags or rags.

2. *Decontamination of rifle.*—Point out that all ranks are responsible for the decontamination of the weapons on their charge, that the decontamination of the rifle will be taught

and that the same principles apply to all weapons. Proceed as follows, demonstrating and explaining:—

- i. Rub gas ointment into the hands, leaving a visible film on the hands to give protection when handling contaminated articles. (This will have been done during personal decontamination Part I.)
- ii. Unless the sling is heavily contaminated it should be left on the rifle, all free liquid being removed with a swab. Rub ointment into both sides of the affected parts of the sling.
- iii. Remove, by careful swabbing, all free liquid from the rifle. Apply ointment to all contaminated parts, rubbing it well into the woodwork.
- iv. Remove ointment from the metal parts of the rifle with a swab, and re-oil. Do not remove ointment from the woodwork.
- v. Wipe off surplus ointment from the hands with cotton waste and then rub more ointment vigorously into each hand for 30 seconds. (This is done at the end of personal decontamination Part II.)

3. *Practice.*—Students practise decontamination of their rifles, the instructor having first applied a number of drops of the training mixture to represent blister gas contamination. The instructor gives the detail and corrects faults as necessary.

4. *Decontamination of guns.*—The following further details relate to the decontamination of these larger weapons:—

- i. Remove rubber eyepiece. Replace with fresh one if available, taking care that it is not contaminated in so doing.
- ii. Remove such parts as padded seat covers.
- iii. Swab metal parts with which contact is likely, using a sandbag or rag moistened with petrol or paraffin.
- iv. Remove visible contamination from non-metallic parts with which contact is likely, using dry swabs, and then apply ointment if available. (Note that dubbin on the leather parts renders the removal of blister gas liquid much easier.)

5. *General points.*—Bring out that:—

- i. The personal issue of cotton waste should not normally be used for the decontamination of weapons.
- ii. The personal issue of ointment may be used for the decontamination of personal weapons.

- iii. For anti-tank rifles, all types of machine guns and the 2-in. and 3-in. mortars, there is a special issue of 8 ozs. of ointment per weapon.

6. *Decontamination of vehicle.*—Point out that:—

- i. All drivers are responsible for the decontamination of their vehicles.
- ii. Blister gas itself will not prevent a vehicle being driven.
- iii. If the driver has been contaminated, his first action will be personal decontamination.
- iv. Decontamination of the vehicle should be carried out at the first opportunity. It is important to attend to those parts with which personnel or stores are likely to come in contact.

7. *Light contamination.*—Point out that, in the case of spray or similar light contamination:—

- i. The swabbing of those portions of the vehicle which the driver or other personnel are likely to touch (e.g. steering wheel, controls, starting handle, door handle, tailboard) will generally suffice.
- ii. The patch of detector paint should be swabbed and, at the first opportunity when the engine is cool, repainted with the paint carried on the vehicle. (If a brush is not available the paint can be applied with a rag.)

8. *Heavy contamination.*—Point out that in the case of heavy contamination, such as may be caused by the nearby burst of a projectile, some or all of the actions enumerated below will be taken, depending on the military situation. To teach these actions the instructor will apply a small quantity of the blister gas training mixture to a portion of the woodwork (e.g. tail-board), mudguard, hood and tire of the vehicle. The driver will then examine his vehicle, locate the contamination, remove his decontaminated stores from the vehicle, put on his gloves and proceed to decontaminate the vehicle as follows:—

- i. Deal first with the woodwork, swabbing of the free liquid using a sandbag or rag moistened with petrol. Mix on the shovel a small quantity of bleach paste to a thick creamy consistency and apply it to the affected portion by means of a sandbag or rag.
- ii. Deal next with the mudguard, swabbing off the free liquid using a sandbag or rag moistened with petrol. No bleach paste on metal parts.

- iii. Free liquid (if any) on the hood and tire should be swabbed off using a sandbag or rag moistened with petrol, the remainder being left to weather.
- iv. If the seats are contaminated they should be swabbed and then either turned upside down or covered with a cape.
- v. Finally, burn or bury the used swabs.

13. Blister gas detectors and gas warning signs

1. *Instructor's note.*—Initial Lesson No. 9. The stores required are a smooth board or metal sheet about 18 ins. by 18 ins. painted with detector paint (for use as a spray detector), a tin of detector paint, a pad of ground detector paper and three gas warning signs.

2. *Spray detectors.*—Explain that:—

- i. The object of a spray detector is to indicate that blister gas spray has fallen.
- ii. Blister gas spray will appear on the detector paint as oily drops which may leave a brown or red mark.
- iii. Spray detectors are used in camps and bivouacs. They are put out in the open about 200 yds. apart in irregular lines.
- iv. An older pattern of spray detector consists of nine metal frames (each 6 ins. by 6 ins.) with slits at the corners for the insertion of detector paper. The nine frames are laid out to form an 18 in. square. When stocks of these frames are exhausted they will be replaced by single metal sheets (each 18 ins. by 18 ins.) to be painted with detector paint by the unit.

3. *Detector paint on vehicles.*—The detector paint is applied to the bonnet in an irregular shape. It should cover an area equivalent to about 18 ins. by 18 ins. and must be visible to the driver. (Forward control vehicles are provided with a special tray, to be treated with detector paint.)

4. *Ground detectors.*—Explain that:—

- i. The object of ground detectors is to confirm the senses of sight and smell when detecting blister gas liquid on the ground.
- ii. The ground detector is used on a bayonet or stick and pressed on the suspected area for at least 10 seconds. After a further 30 seconds wipe off any dirt and also the liquid, under which a red stain will be seen on the paper if contaminated.

iii. Ground detectors are issued in pads of 25 sheets, one pad to every officer, warrant officer and N.C.O.

5. *Detection of liquid only.*—Emphasize that detector paint and ground detectors (as well as sleeve detectors) are for the detection of blister gas liquid and not vapour.

6. *Gas warning signs.*—Explain that:—

- i. The object of gas warning signs is to give warning of the presence and extent of contaminated ground left to weather, and to mark dumps of contaminated stores and material.
- ii. They are small triangular metal sheets, yellow on one side and white on the other, bearing the word "gas" in black letters on both sides.
- iii. When marking contaminated ground, gas warning signs should be placed or hung about 20 yds. from the edge of the contamination with the yellow side towards the contamination.
- iv. They should always be marked with the time and date when placed in position.

7. *Demonstrations.*—Inform students that the appearance of blister gas on detector paint and ground detectors will be demonstrated when they visit the gas compound. (Sec. 26, para. 1, vi.) Demonstrate now:—

- i. The lay-out of spray detectors.
- ii. How to use ground detectors. (Students practise.)
- iii. How to use gas warning signs.

14. Gas alarm system and gas duties of sentries

1. *Instructor's note.*—Initial Lesson No. 10. Students should wear field service marching order with eyeshields adjusted. The stores required are a gas rattle, spray detectors and an electric torch. Point out that:—

- i. The responsibility for protecting himself against gas lies on the individual.
- ii. As a collective measure of protection, however, certain gas alarms are in force. The correct use of these alarms will depend on sentries being thoroughly trained in their gas duties.
- iii. There are two gas alarms, each one requiring a different action. They are the rattle or shout of "gas," and the verbal warning "spray."

2. *Gas rattle or shout of "gas."*—Show and sound the rattle and point out that when no rattle is available the shout of "gas" will be used instead. Explain that:—

- i. This warning is given when the immediate action required is the adjustment of the respirator facepiece. Therefore, the rattle or shout of "gas" denotes the presence of any gas other than blister gas spray.
- ii. Every individual hearing the rattle or shout of "gas" will immediately stop breathing, adjust the facepiece and continue work.
- iii. Blister gas from ground burst missiles endangers, initially, the eyes and breathing passages. This is due to the shattering of a portion of the liquid gas into a fine mist which is dangerous. The immediate adjustment of the respirator facepiece is necessary if serious injury is to be prevented. The gas alarm in this case is, therefore, the sounding of the rattle or the shout of "gas." Subsequently, personal decontamination by those individuals contaminated by the liquid will be necessary to minimize casualties resulting from skin injury, and should be carried out with the minimum of delay.

3. *Removal of the facepiece.*—Explain that when the commander on the spot is satisfied that there is no longer any necessity to continue wearing the facepiece, he will cause the words "gas clear" to be passed by word of mouth; all ranks will then test for gas and, if satisfied that gas is clear in their area, they will remove their facepieces and pass on the words "gas clear."

4. *Practice.*—Practise students in the action to be taken on hearing the gas rattle or the shout of "gas," and on hearing the words "gas clear."

5. *Verbal warning "spray."*—Point out that the other method of giving warning of the presence of gas is the verbal warning "spray." Explain that:—

- i. This warning is given when the immediate action required is Part I of personal decontamination. Therefore, the verbal warning "spray" denotes that blister gas spray has fallen.
- ii. Blister gas released from containers carried by aircraft, or by means of air burst missiles (e.g. air burst bombs and air burst shell), is classified as spray. From this form of attack there is no danger to the breath-

ing passages and therefore the respirator plays no part in protection against it, but personal decontamination is necessary to minimize casualties among individuals contaminated by drops of this spray. The gas alarm in both these cases is, therefore, the verbal warning "spray."

- iii. Every individual in the open who hears the verbal warning "spray" will immediately carry out Part I of personal decontamination.

6. *Practice.*—Practise students in the action to be taken on hearing the verbal warning "spray."

7. *Other warnings.*—Point out that overseas and in certain other areas a syren or horn may be used to denote the approach of a gas cloud. The syren or horn demands instant alertness for gas. The rattle will be sounded or the shout of "gas" given immediately the presence of gas is recognized.

8. *Sentries.*—Explain that special gas sentries are not provided and that the duties of every sentry include the ability to recognize the presence of gas and to give the appropriate gas alarm. A sentry must therefore be provided with a gas rattle, and (by night) a torch for the examination of spray detectors.

9. *Gas duties of sentries, other than for spray.*—Explain that gas other than spray may be recognized by the senses of sight or smell (i.e. any suspicious liquid or hostile smoke, or any suspicious smell), or by the initial effects on the body (i.e. any feeling of choking or irritation of the nose or eyes). Demonstrate, employing one of the students, and explain the following action to be taken by a sentry on recognizing any form of gas attack other than spray:—

- i. Stop breathing.
- ii. Sound the rattle.
- iii. Adjust facepiece.
- iv. Sound the rattle again, this time for at least 30 seconds.

10. *Gas duties of sentries, hostile smoke.*—Point out that gas may be used under cover of smoke; it is therefore necessary for hostile smoke to be treated as a war gas until it is proved otherwise. In the presence of hostile smoke, or when a hostile smoke cloud is about to envelop him, the sentry will act as in para. 9 above. (When inside the cloud, the commander on the spot will give "gas clear" if he is satisfied that gas is not

present, or that the smoke will not cause distress. Some screening smokes may be sufficiently irritant to make the wearing of respirators useful.)

11. *Gas duties of sentries, for spray.*—Remind students of the purpose of spray detectors and point out that in order to ascertain if spray has fallen and to be able to give timely warning, a sentry must visit each detector for which he is responsible at intervals of not more than 10 minutes. Demonstrate, employing one of the students, and explain the following action to be taken by a sentry on noticing that spray has fallen:—

- i. Shout "spray".
- ii. Carry out Part I of personal decontamination.
- iii. Warn the guard commander, who will arrange for spray detectors to be swabbed or renewed.
- iv. On relief (the guard commander should arrange this as soon as possible) carry out Part II of personal decontamination.

12. *Gas alarms when troops are at rest.*—Emphasize that troops at rest are highly vulnerable to gas attacks. It is the normal practice to post double sentries at night, and also by day when troops are sleeping. Point out that:—

- i. In the case of gases other than spray.—The rattle may not wake heavily sleeping troops. One of the two sentries on each post must therefore enter billets, bivouacs or shelters and rouse troops as quickly as possible. Speed in the adjustment of respirator facepieces is essential when a choking gas has been used.
- ii. In the case of spray.—When sleeping troops are under cover it will be unnecessary to take special steps to rouse them when spray has fallen provided the standing order that helmets, eyeshields, capes and boots are worn when leaving cover for any purpose, is enforced; the sentry will, however, give the verbal warning "spray" in order to warn any individuals who may be about in the open.

13. *Gas alarms, restricted use.*—Point out that although all ranks must immediately take the appropriate action on hearing the sound of a rattle or the verbal warning "spray", a sentry will not immediately sound his own rattle and adjust his facepiece, or repeat the verbal warning "spray". He should be at once alert for gas and will sound his rattle or give the verbal warning "spray" when he recognizes the presence of gas. Failure

to observe this rule may result in the unnecessary adjustment of facepieces by troops in an area of considerable extent, even though gas may be present in only a small part of that area. Consideration of wind direction may save much unnecessary disturbance to rest.

CHAPTER III.—FURTHER LESSONS FOR JUNIOR LEADERS

15. Tests of elementary training

1. *Instructor's note.*—Junior Leader Lesson No. 1. Students require field service marching order and should form up in two ranks facing inwards. A list of oral test questions and a watch with a second hand are required. Proceed as in the following paragraphs.

2. *Objects of tests.*—Explain that the objects of tests of elementary training are as follows:—

- i. To ensure that individuals have reached an efficient standard.
- ii. To ensure that trained soldiers retain their efficiency.
- iii. To prevent any detail of elementary training being overlooked, while avoiding unnecessary repetition.
- iv. To enable officers charged with the preparation of individual training programs to see in which subjects further instruction is required, and so to make the best use of the time available.

3. *Testing.*—Remind students of the importance of not confusing teaching with testing. In the former the men are instructed by explanation and demonstration followed by execution, while in the latter men are questioned or ordered to carry out a certain test without any demonstration or assistance. They must then pass or be put back for further instruction. The conditions of each test will be explained to individuals before it is carried out.

4. *Tests.*—Explain that the tests are divided into:—

- i. Oral tests, when the men are asked simple direct questions, the answer to which should be more than "yes" or "no".
- ii. Inspection tests, when the men are tested in the carriage of the respirator and cape, and in testing for gas.
- iii. Standard tests, when the men are tested in their ability to gain protection against gas.

5. *Further procedure.*—Inform students that the rest of the lesson period will be devoted to teaching them how to conduct gas tests of elementary training.

6. *Oral tests.*—Demonstrate the conduct of oral tests by asking individual students in one rank questions on the under-mentioned subjects. Follow this by asking individual students in the other rank whether they consider the questions were answered correctly:—

- i. War gases (Sec. 5).
- ii. Use and care of items of personal gas equipment, other than the respirator (Sec. 6).
- iii. Care and cleaning of the respirator, including anti-dimming (Sec. 7).
- iv. Gas alarm system and gas duties of sentries (Sec. 14).

7. *Note on oral tests.*—Point out that the qualifying standard is that three out of four questions should be answered correctly.

8. *Inspection tests.*—Field service marching order will be worn when carrying out these tests. Demonstrate the conduct of inspection tests by calling upon individual students in one rank to perform the following actions. Follow this by asking individual students in the other rank whether they consider the actions were performed correctly:—

- i. Place the respirator in a carriage position, the actual position required to be ordered by the examiner. (Sec. 8).
- ii. Test for gas. (Sec. 9, para. 7.)
- iii. Place the cape in a rolled position, the actual position required to be ordered by the examiner. (Sec. 10, paras. 4 and 5.)

9. *Note on inspection tests.*—Point out that any man who makes serious mistakes in the above three tests will fail.

10. *Standard tests.*—Field service marching order will be worn when carrying out these tests. Emphasize the importance of the standard tests, since they are designed to ascertain the ability of the individual to avoid becoming a gas casualty. Point out that accuracy is more important than extreme speed, provided that breathing is stopped throughout the process of adjusting the facepiece. Demonstrate the conduct of standard tests by calling upon individual students in one rank to take action on hearing the following gas alarms. Follow this by asking indi-

vidual students in the other rank whether they consider the actions taken would, in fact, have prevented the individual from becoming a gas casualty:—

i. The rattle or shout of "gas" (the student will have placed his respirator in an alert, slung, wading or carry position as ordered by the examiner, and adopted the prone position armed with a rifle). The accurate adjustment of the facepiece from any position (alert, slung, wading or carry) must be carried out within 15 seconds. This time limit does not include the replacement of the steel helmet or (where necessary) the subsequent adjustment of the respirator haversack.

ii. The verbal warning "spray" (the cape will be in the worn position or in a rolled position as ordered by the examiner). Part I of personal decontamination will occupy about five minutes. Part II will take about 15 minutes.

11. Notes on standard tests.—Point out that:—

i. On the sound of the rattle or shout of "gas", breathing must be stopped throughout the process of adjusting the facepiece and that, when adjusted, the facepiece must be gas tight. The examiner will satisfy himself that this is so and that vision is clear.

ii. On the shout of "spray," Part I of personal decontamination must be carried out immediately, i.e. all the exposed skin must be swabbed with cotton waste, gas ointment rubbed vigorously into all parts of the exposed skin—30 seconds on each part—and eyeshields changed; this must be followed by Part II.

iii. Any man who does not correctly carry out the required actions (within 15 seconds when the action demanded is the adjustment of the facepiece) will fail.

12. Conclusion.—Impress on students the value of the tests. The more frequently these tests are carried out the higher the standard of gas discipline will be. The N.C.O. in command of a section or detachment, and the officer in command of a troop or a platoon, will have many opportunities (10 to 20 minutes on suitable occasions during the week) for carrying out the tests.

16. Fitting of respirators

1. *Instructor's note.*—Junior Leader Lesson No. 2. For this lesson, have as many different kinds and sizes of facepieces as are available. Draw on the blackboard beforehand

a number of simple diagrams to show the position of the wearer's eyes when the right and wrong sized facepieces are issued. Explain that:—

i. The respirator will not give protection unless a proper fit is obtained.

ii. The facepiece will be uncomfortable if worn for long periods unless it fits properly.

iii. The better it fits, the less will be the reduction in the wearer's efficiency.

2. *Marks and sizes available.*—Inform students that the following marks and sizes of facepieces are supplied (exhibit those available):—

i. Mark IV.—Small, normal, large.

ii. Mark IV Special T Mic.—Extra small, small, large, extra large.

iii. Mark IV Special T.—Small and large.

iv. Mark V.—Normal.

3. *Fitting the respirator.*—Demonstrate procedure by fitting a student as follows:—

i. Take a normal size facepiece and slacken off the elastic bands. (Majority of individuals will take a normal size.)

ii. Get the student to put on the facepiece.

iii. Tighten the elastic bands in pairs. (Do not pull them too tight as this may prevent the facepiece from taking the shape of the face and thereby cause a leak.)

iv. See that the bands are all exerting an even pull and are just sufficiently tight to hold the facepiece stable on the face without causing discomfort.

v. Examine the facepiece for size. If the eyes are much above the centre of the eyepieces, the facepiece is too small; if much below the centre, it is too large; if approximately central, the size is correct. In making this examination the instructor's eyes should be at the same level as those of the student. (Illustrate the result of correct and incorrect sizes by reference to the diagrams on the blackboard.)

vi. Examine round the edges of the facepiece, particularly under the chin, to ascertain that the facepiece is firmly on the face. (The wearer's chin must fit closely into the chin of the facepiece.)

4. *Test for gas tightness.*—Carry out a test for gas tightness as follows:—

- i. Squeeze the connecting tube so that no air can pass through it.
- ii. Tell the wearer to attempt to breathe in.
- iii. If the wearer is unable to breathe in and the facepiece is drawn on to the face, the fit is good.
- iv. If air gets in through the sides of the facepiece, further fitting will be necessary.

5. *Fitting a man who wears spectacles.*—Point out that:—

- i. Personnel who wear spectacles must obtain those with metal frames of the approved type. They are issued on payment to officers and free to other ranks. No other pattern may be worn with respirators.
- ii. Only facepieces Mark IV Special T, Mark IV Special T Mic, or Mark V may be worn with these spectacles. The facepieces have a special contour near the temple which presses the flattened side member of the spectacles against the face of the wearer and ensures a gastight fit.
- iii. The flattened side members should be just out of contact with the skin of the face, particularly near the eyes. Where necessary they should be bent or slightly twisted to ensure this.
- iv. With the Mark V facepiece, the buckle at the temple may have to be bent slightly outwards to prevent it pressing against the spectacle frame.
- v. Spectacles, when worn with respirators, should be treated with the anti-dimming compound or cloth on both sides of the glasses.

6. *Special cases.*—Inform students that special cases with facial deformities, scars and outsizes should be reported through the usual channels to formation headquarters, so that special fittings can be arranged. (Three facepieces are made, retained one by man, one by unit, and one by R.A.O.C.)

7. *Practice in fitting.*—Students should now form two ranks facing inwards and practise fitting facepieces to their opposite numbers, the instructor correcting faults as necessary.

8. *Gas chamber test.*—Point out that this test should take place as soon after fitting as possible. (Sec. 17.)

17. Gas chamber test

1. *Instructor's note.*—Junior Leader Lesson No. 3. This lesson will be given at the gas chamber where the method of conducting the test will be detailed while the students themselves actually go through the test. While in the chamber, demonstrate and explain the method of putting up the required concentration. Stores required in the chamber are C.A.P. capsules, heater and improvised fan. Point out that:—

- i. The gas chamber test is necessary to confirm the correctness of the fit of the facepiece and to give confidence to the wearer that this respirator will give him complete protection.
- ii. The test should take place as soon after fitting as possible and thereafter at least once in every three months.

2. *C.A.P. capsules.*—Explain that:—

- i. C.A.P. (tear gas), used for the chamber test, is supplied in capsules, two capsules being required for every thousand cubic feet of space in the chamber. To keep up the concentration, further capsules will be used for subsequent squads as required. C.A.P. generators will not be used in a gas chamber. (Show tin of capsules.)
- ii. Before use the capsules should be broken at the stem by pliers, tip-breaker or other means. Place the capsules on a metal dish and heat with a spirit lamp or candle. Prevent grease or wax from coming into contact with the metal dish. Do not allow the dish to become red-hot. Use an improvised fan to distribute gas evenly in the chamber. (Demonstrate method of breaking off stem of capsule.)
- iii. The solid contents of C.A.P. capsules should not be allowed to come into contact with the skin, as slight irritation may result. If irritation is experienced, wash affected part with soap and water.

3. *Before entering the chamber.*—Carry out the following procedure:—

- i. Parade men upwind of the chamber with their respirators in an alert position.
- ii. See that each man has his own respirator.
- iii. Explain the object of the test (para. 1, i, above).
- iv. Emphasize that any man feeling the effect of the gas will on no account remove his facepiece, but will hold up his hand.

- v. Order facepieces to be adjusted.
- vi. Inspect each man, carry out the test for gas tightness and make any necessary adjustments of headharness.
- vii. Leave a qualified N.C.O. outside to carry out any adjustments required as a result of the chamber test.

4. *Inside the chamber.*—Carry out the following procedure:—

- i. Keep men in single file. The number of men undergoing the test at one time will thus depend on the size of the chamber.
- ii. Inspect each man at intervals.
- iii. If a man is affected send him out to the N.C.O. for further fitting and, if necessary, examination of respirator.
- iv. After about three minutes, order men to shake their heads and to bend down quickly, to ensure stability of the facepiece.
- v. Move out of the chamber.

5. *After leaving the chamber.*—Carry out the following procedure:—

- i. Parade men upwind of the chamber, but downwind of other men waiting to be tested.
- ii. Order removal of facepieces and examine each man for severe pressure marks on his face. If any man has such marks it indicates that the headharness is adjusted too tightly.
- iii. Send the men through the chamber unprotected to demonstrate the protection afforded by the respirator. (This is only necessary on the occasion of the individual's first chamber test.)

18. Inspection of gas equipment

1. *Instructor's note.*—Junior Leader Lesson No. 4. Stores required are damaged or unserviceable items of personal gas equipment, with additional sets (if available) for practice purposes. Demonstrate and explain the procedure for inspecting gas equipment, as given in the following paragraphs; students should then be practised in it. Begin the lesson by pointing out that:—

- i. All items of personal gas equipment should be inspected regularly, respirators at least once a week.
- ii. Presence of owner is necessary for testing respirator valves.

iii. Any repairs necessary to gas equipment should be reported at once, for action by the sub-unit gas N.C.O.

iv. Emergency repairs when in action (such as plugging a punctured connecting tube with any available means) will be a matter for commonsense.

2. *Facepiece.*—Taking each part in turn:—

- i. Headharness.—Elastic bands not unduly weak; head pad sound; buckles, tags and loops firmly attached and functioning correctly.
- ii. Facepiece.—Material neither torn nor perished.
- iii. Eyepieces.—Not damaged, screwed tight.
- iv. Metal valve holder.—Not damaged, securely bound.
- v. Outlet valve.—Guard not damaged, nut and split pin or captive nut in position.

3. *Connecting tube.*—Sound, no holes, securely attached at both ends. If container attached at wrong angle, connecting tube may twist and facepiece will not stay on face properly. Hold facepiece up by valveholder, letting container hang freely in order to see that container is in correct position relative to facepiece, i.e. when facepiece is adjusted, container hangs as follows:—

- i. In the case of the short tube, with the air inlet slots towards the wearer's left.
- ii. In the case of the long tube, with the air inlet slots towards the wearer's body.

4. *Container.*—Without holes or heavy dents. (Dents ringed with white paint have been passed by R.A.O.C.) Reasonably well protected by paint and free from rust. Neck securely attached to body. Piece supporting liner slot present. Slight looseness of contents unaccompanied by heavy denting not serious, but such containers should be replaced at first opportunity.

5. *Inlet valve.*—To test inlet valve, adjust respirator and close outlet valve by pressing a cloth over valve guard. Breathe out strongly. Defective inlet valve indicated by leakage through container. Always possible to force air to escape between edge of facepiece and face, but defective inlet valve will allow air to escape before this lifting of facepiece occurs.

6. *Outlet valve.*—To test outlet valve, adjust respirator, close connecting tube by pinching it, and test for leakage by

attempting to inhale. Ensure no sign of leakage through valve. See that it is possible to breathe out through valve.

7. *Haversack*.—No holes in canvas, and all components securely in position and undamaged. Anti-dimming outfit present and not exhausted. Check marking on haversack with that on fibre disc on tube. Care must be taken to replace container in haversack in the correct way so that facepiece can be adjusted without twisting tube (Sec. 7, para. 5, i).

8. *Eyeshields*.—Should be flexible; and without cracks, perished elastics, or broken clips or press buttons.

9. *Sleeve and ground detectors*.—Flaking of paint, brittleness, or marked discoloration indicates unserviceability.

10. *Cape and light suit*.—Should not have developed tackiness ("primary tackiness" in new garments will disappear in use). Examine for damaged oil film, tapes torn off, damaged press buttons, tears, painted sleeves and badges of rank.

11. *Ointment*.—Smell of bleach when rubbed on skin and absence of marked crumbling and shrinkage in pots indicates ointment is still serviceable.

12. *Wallet*.—Tackiness and oil film as for cape. Check marking on flap.

19. Enemy gas weapons and gas intelligence

1. *Instructor's note*.—Junior Leader Lesson No. 5. Begin the lesson by pointing out that:—

- i. A large part of the value of gas is surprise. The more that is known of the way in which the enemy may use gas the less will be its danger.
- ii. The first part of the lesson (paras. 2 to 10) will be devoted to a general review of gas weapons and tactics with particular reference to those the enemy is thought likely to use. (Remind students that there may be other weapons, and that tactics are never stereotyped.)
- iii. The remainder of the lesson (paras. 11 to 14) is designed to give junior leaders the information they require on the subject of gas intelligence. (Stress that we do not intend to use gas until its use by the enemy has been confirmed; that confirmation takes time, and that the first intelligence must come from

junior leaders. Retaliation will be delayed if they do not at once pass on information with the necessary details.)

2. *Mortars*.—The mortar is one of the most common gas weapons, for it combines high rate of fire with a fairly good gas capacity. The Germans fire:—

- i. Tear gas from their infantry mortars.
- ii. Other chargings from the larger mortar with which their special gas troops are armed. This larger mortar has a range of 3,000 to 6,000 yards.

3. *Rockets*.—The main characteristics of this weapon are:—

- i. To be effective they must be used in large salvos, all rockets arriving nearly simultaneously on the target.
- ii. They can be readily distinguished in flight.
- iii. At night, the flash of discharge is unmistakable.
- iv. German rockets have a range of over 6,000 yards. A second salvo can be fired 90 seconds later.

4. *Gas shell*.—These may be fired from many types of guns, and may contain many types of chargings. There are:—

- i. Shell charged blister gas, with a small bursting charge, for ground contamination.
- ii. Shell bursting in the air, with a small bursting charge, giving an effect like spray. (No German shell of this type is known as yet.)
- iii. Shell charged choking, tear, nose or blister gas with a large H.E. effect. This is a favourite German type. (Para. 9 below.)

5. *Contamination weapons*.—All charged with blister gas. Mortars, rockets and artillery can be used to contaminate ground. Direct ground contamination weapons may be:—

- i. Bulk contamination vehicles.
- ii. Portable sprayers (used to contaminate ground inaccessible to the bulk contamination vehicle).
- iii. Purely static weapons, such as chemical mines and ground bombs, with a small bursting charge.

6. *Generators*.—The use of these depends entirely on the direction of the wind. They may be used to give off clouds of nose and tear gas.

7. *Hand grenades*.—These may be carried by enemy infantry. They may be charged with:—

- i. Tear gas, for immediate effect in the assault.
- ii. A non-persistent choking gas, for use against tanks.

8. *Air weapons*.—Spray and bombs. The Germans:—

- i. Pay particular attention to blister gas spray from low altitudes.
- ii. Have bombs charged blister gas for ground contamination.
- iii. Have bombs charged with choking gas.
- iv. Have bombs which burst in the air and so give the effect of heavy spray.

9. *Mixed gas and high explosive*.—The enemy pays particular attention to concealing his use of gas under cover of high explosive. Therefore, once gas warfare has started, any very intense bombardment (apparently with high explosive only) must be suspected of including gas. The enemy may fire gas and high explosive projectiles at the same time. He has also shell, mortar bombs, rockets and aircraft bombs, in which a liquid gas and a high explosive charge are in the same case; note that, with this type of projectile:—

- i. The violent burst sounds like an ordinary H.E. shell.
- ii. The H.E. charge not only splinters the case but also shatters the liquid gas into a fine mist.
- iii. The fine mist, which is difficult to detect, is likely to injure the lungs and eyes.
- iv. The gas may also be a blister gas, when men near the burst may be splashed and will have to decontaminate themselves; but the first and main protection against this type of attack is the respirator.

10. *Enemy gas tactics*.—The probable gas tactics of the enemy may be summarized as follows:—

- i. A fierce bombardment lasting not more than two minutes is likely to contain gas, and to be the beginning of an attack. The enemy's object will be to attain the maximum surprise.
- ii. Long harassing bombardments at a slow rate of fire, designed to lower morale and gas discipline. At any time the enemy may try a surprise shoot as in i above.
- iii. Small amounts of tear gas shell over long periods, designed to lower gas discipline. This, too, may be followed by a surprise shoot of great intensity

when the enemy expect casualties among men who no longer trouble to adjust their respirators quickly.

iv. Contamination of ground in defence. Belts of contamination are unlikely to be deep. By good observation (especially since the enemy uses large amounts of gas which can readily be seen) it should often be possible to pick a fairly clean way through, and if men do not lie down, but carry out personal decontamination afterwards, they will often suffer no injury. The enemy will put down contamination as late as possible. Fake contamination may be used.

v. Gas mixed with smoke. Hostile smoke should therefore be treated as gas until proved otherwise.

11. *Intelligence*.—Information on the enemy's weapons and tactics is always required. In all units certain personnel are charged with the duty of collecting, sifting and distributing all information gained. In a battalion, for example, the intelligence section performs these duties. All ranks must, however, be taught that the collection of information is not the business only of the special intelligence personnel. Every individual soldier must be restlessly inquisitive in the quest of information and must report anything he observes. The use of gas by the enemy is one of the many items about which information is required.

12. *Gas intelligence*.—In order to guard against surprise, accurate and timely information of the enemy's intention to use gas is of the utmost importance at any time. Any information that establishes the enemy's first use of gas, or the suspected use of a new gas, will be treated as the most urgent intelligence. Reports on the subsequent use of gas will be a routine matter.

13. *Intelligence reports*.—Gas intelligence reports should include:—

- i. Place and time of gas attack.
- ii. Gas weapon used.
- iii. Type of gas.
- iv. Casualties.
- v. Conditions of weather and ground.

14. *Intelligence materials*.—The following materials are required for examination:—

- i. Generous samples of contaminated material.
- ii. Specimens of our own respirators or protective equipment if they appear to fail or give unexpected results.

- iii. Fragments of gas projectiles. Unexploded projectiles will be reported but not moved.
- iv. Enemy respirators and protective equipment.

20. Effects of weather and ground on gas

1. *Instructor's note.*—Junior Leader Lesson No. 6. Begin the lesson by pointing out that:—

- i. Gas and smoke are more affected by conditions of weather and ground than other weapons.
- ii. In spite of this, conditions will rarely be so unfavourable that no kind of gas can be used; it is necessary, therefore, to be on the lookout for gas whatever the conditions.
- iii. A general knowledge of how the weather and ground do affect the use of gas is, however, necessary for leaders, so that they can appreciate what the possibilities are in their own area.

2. *Effects of weather on the use of non-persistent gases.*—The chief weather factors affecting non-persistent gases are the direction and speed of the wind, and the turbulence of the atmosphere:—

- i. Wind direction.—Projectile weapons are not likely to be used against forward enemy troops when the wind is likely to blow the gas back, so as to be dangerous to friendly troops. (Generators can, of course, be used only when the wind is blowing from the point of release towards the target.)
- ii. Wind speed.—Strong or gusty wind causes gas to disperse; on the other hand, if there is no wind the gas will tend to stay in one place, and this is not always desirable. Generally speaking, the ideal is a light or gentle breeze (as a guide, one which is just strong enough to keep leaves and twigs in constant motion).
- iii. Turbulence.—On hot, sunny days the hot air near the surface of the earth is constantly rising while cold air from above is falling. This effect of turbulence causes gas to disperse rapidly, and sunny days are therefore bad for the use of non-persistent gas. On cold, clear nights the cold air near the surface of the earth has no tendency to rise, and this condition is the best for the use of non-persistent gas. Intermediate conditions, such as cloudy nights, overcast days, and times round about dusk and dawn are fairly good.

3. *Effects of ground on the use of non-persistent gases.*—Built-up areas, woods, valleys, hollows in the ground, and enclosed spaces generally are the best targets for non-persistent gas attack, as will be seen from the following facts:—

- i. Open country.—Not usually very good for non-persistent gases released from projectiles, as the gas will disperse comparatively quickly. (Clouds released from generators will, however, travel well over open country especially if the ground is not very broken.)
- ii. Valleys.—Gas clouds tend to follow valleys, and, in the absence of wind, may hang about for a considerable time.
- iii. Built-up areas, woods, and enclosed spaces.—These provide good targets for non-persistent gas projectiles, since the gas is released within the area and tends to hang about. (On the other hand, they are not very good targets for generator attacks, since gas clouds travelling with the wind tend to rise over obstacles, such as buildings or woods, when they meet them.)

4. *Effects of weather on the use of persistent gases.*—It must first be understood that conditions which favour great persistence do not favour a high vapour concentration; similarly, conditions which favour a high vapour concentration do not favour great persistence. The chief weather factors which influence persistence and vapour concentration are:—

- i. Wind.—A strong wind causes liquid gas to evaporate more quickly, and so reduces the time of persistence. This does not mean that a strong wind increases the vapour concentration, since the vapour, though produced more quickly, is dispersed more by the wind.
- ii. Temperature.—High temperature increases the rate of evaporation and reduces the persistence. The high vapour concentration which results from high temperature is offset to some extent on sunny days by the turbulence of the atmosphere.
- iii. Rain.—Rain tends to slow down the rate of evaporation, and so to release the vapour concentration. (Heavy rain, falling on a hard surface which has been contaminated, will wash away some of the gas which may still be dangerous at the place to which it is removed.)

5. *Effects of ground on the use of persistent gases.*—On dry, porous ground the liquid tends to sink below the surface and thus persistence is increased while vapour concentration is decreased. On hard ground, liquid tends to stay on the surface and to evaporate more quickly; thus the time of persistence is shorter but the vapour concentration is greater.

21. Blister gases

1. *Instructor's note.*—Junior Leader Lesson No. 7. Begin the lesson by pointing out that:—

i. Junior leaders require additional knowledge of blister gases because they are likely to be used on the widest scale, and because of the difficulties of recognizing and dealing effectively with them.

ii. Blister gases are used to handicap the enemy either by causing casualties or by imposing precautionary measures to prevent them. Gas training is designed to ensure that the handicap the enemy aims to impose on us is as small as possible.

iii. The tactical situation will frequently demand the acceptance of certain risks with blister gas, as is the case with other weapons of war. In appreciating what risks are involved in any particular set of circumstances, and in deciding which to accept, junior leaders must be prepared to use their military and gas knowledge and their common sense.

2. *Two-fold danger of blister gas.*—These gases can cause casualties either as a result of contamination by the liquid, or as a result of exposure to the vapour. The respirator does not supply the complete answer, for both the liquid and the vapour attack all parts of the body; and the respirator only gives protection to a part of it. The protective action taken when contamination by the liquid has occurred differs from that required as a result of exposure to the vapour. It should be borne in mind, however, that serious casualties can result from the action of blister gas vapour on the eyes and breathing passages unless prevented by the timely adjustment of the respirator.

3. *Mustard gas.*—This is an important example of a blister gas. The characteristics of mustard gas may be summarized as follows:—

i. Pure mustard gas is colourless. The crude substance as used in war may vary in colour from light brown to nearly black.

ii. Both pure and crude mustard gas give off an invisible vapour which has a slight smell resembling onions, horseradish or garlic. With continued breathing of the vapour the smell becomes less noticeable and the fact that the gas cannot be smelled does not mean that it is not present.

iii. A danger of mustard gas lies in the fact that neither the liquid nor the vapour produce any immediately painful effects, and untrained men may become unnecessary casualties through not taking the proper action when exposed to the vapour or contaminated by the liquid.

iv. Mustard gas dissolves in spirits, petrol, oils and fats.

v. The liquid is quickly destroyed by gas ointment, and also by bleach ("chloride of lime"). Bleach paste rubbed into the skin for one minute, and then swabbed off, is an effective substitute for gas ointment.

4. *Blister gas liquid released in the form of spray.*—Spray from containers fixed to aircraft may be released effectively from any height. Spray from airburst bombs or shell may also be effective. A low flying spraying aircraft is very vulnerable to small arms fire, and in this case the first action should be to reply with fire. Protection against the effects of spray is given by personal decontamination. The gas cape or light gas suit play an important part in preventing contamination of clothing by spray (the drenching effect of low spray should be noted especially). The cape should not be adjusted over contaminated clothing as this will create a dangerous vapour concentration.

5. *Blister gas liquid from ground burst projectiles.*—In the case of ground burst projectiles, the immediate adjustment of the facepiece is necessary to give protection to the eyes and breathing passages against the fine mist caused by the burst of the projectile. Personal decontamination should be carried out subsequently by those individuals who were near the burst and splashed with the liquid.

6. *Blister gas liquid on the ground.*—It is a desirable precaution whenever the military situation permits, to avoid liquid contamination. Blister gas liquid on the ground must not, however, be treated as an obstacle; it will frequently be necessary in the field for troops on foot to cross such ground, more especially the leading troops. Even so, little if any significant liquid contact need be made in daylight pro-

vided that care is used, long grass and bushes are avoided and troops do not lie down. When such precautions are not possible or desirable (e.g. at night or under aimed fire or when troops are forced to lie down) capes should be worn, ointment used to protect the exposed skin, obvious liquid avoided, and personal decontamination carried out at the earliest opportunity—particularly the swabbing of boots.

7. Handling of articles contaminated with blister gas liquid.—Contaminated articles can be handled with reasonable safety provided ointment is first rubbed into the hands (including ointment underneath the finger nails) and a visible film of it is thereafter maintained until the danger of contamination is over. After handling contaminated material in this manner, the ointment should be wiped off with cotton waste and fresh ointment rubbed into the hands. (The cape or light gas suit should be worn when there is danger of contaminated articles coming into contact with clothing.)

8. Blister gas vapour.—The smell of blister gas is an unreliable guide to the degree of vapour danger present, and it is possible that blister gas having little or no smell will be used. For these reasons it is necessary to teach that the respirator will be adjusted, not only when blister gas is smelled, but also when in an area contaminated with suspicious liquid (Sec. 5, para. 4). When the tactical situation demands that troops remain in a dangerous vapour concentration, the ultimate effects may be largely reduced by adopting the following procedure:—

- i. Troops wearing A/V clothing.—Adjust respirator and rub ointment into all exposed skin. It is also an advantage to tie a handkerchief between the neck and the collar, and to tuck in the cuffs of the blouse. (The cape or light gas suit should not be worn unless there is danger of contact with the liquid.)
- ii. Troops not wearing A/V clothing.—As for i above, but such of these troops as remain in the dangerous vapour concentration for more than an hour or so (less on a hot day) are likely to sustain vapour burns (ultimately) underneath the clothing. On leaving the area, outer clothing should be removed and aired for as long as possible, or until the smell of the vapour has disappeared. Washing the body all over with soap and water may also be of value.
- iii. Under supervision, respirators may be removed for a few minutes when it is necessary for men to eat or drink.

22. Effects of gas on food and water; blister gas reconnaissance; and decontamination of ground

1. Instructor's note.—Junior Leader Lesson No. 8. The lesson comprises three parts. The stores required for the respective parts are:—

- i. Effects of gas on food and water.—A few empty food tins and wooden boxes of various sizes, some water (to simulate petrol), a bucket of bleach paste (or mixture of sand and water to simulate bleach paste), a few sandbags or rags for use as waste, a gas warning sign, an A.F. A2028, and some blister gas training mixture.
- ii. Blister gas reconnaissance.—Field service marching order with rifles for five students, three pairs of overboots, eight sandbags for use as improvised overboots, pad of ground detectors, some gas warning signs, and some blister gas training mixture.
- iii. Decontamination of ground.—Two buckets containing dry bleach (or dry sand to simulate bleach), two g.s. shovels, two pairs of overboots, and some blister gas training mixture.

2. Effects of gas on food and water.—Point out that all war gases in liquid or solid form make both food and water dangerous and unfit for human consumption. Blister gas vapour is absorbed by fatty and oily foods and will make them dangerous. Other gases in vapour or smoke form do not make food or water dangerous, but may make them unpalatable. The main danger is from blister gas liquid. The following points should be explained:—

- i. Protection of food.—Food must be stored and cooked under cover. This can be provided for by the use of tarpaulins and ground sheets. The field service ration is available in tins of various sizes which give complete protection, and these should be retained for the storage of further supplies after having been emptied.
- ii. Detection of contamination.—Spray detectors should be placed round food supplies and cookhouses and regularly inspected. When contamination is suspected or confirmed the food must not be used until it has been passed as fit for consumption by the unit gas officer in consultation with the medical officer; any case of doubt will be referred to the nearest supply officer. Contaminated supplies must be

separated and marked with gas warning signs or contamination labels (A.F. A2028).

iii. Decontamination of food supplies.—Canned food supplies are safe, but the outside of the cans should, if not required at once, be swabbed with a sandbag or rag moistened with petrol and set aside in a free current of air; if wanted for early use, they should be smeared with bleach paste and left as long as possible before rinsing in water and wiping dry. Wooden cases must have their contents turned out and examined. If not badly contaminated, wooden cases may be temporarily rendered safe to handle by applying bleach paste, but the cases must subsequently be burnt. Wrapped and open foodstuffs must be laid aside for inspection. (Demonstrate these actions, using two of the students.)

iv. Water.—Water contaminated with liquid or solid gases must not be used. Advice must always be obtained from the medical officer before water which is suspected of being affected is used or put into water carts. Chlorination of water is not sufficient.

3. *Blister gas reconnaissance*.—This part of the lesson should be mainly a demonstration; utilize five of the students for this purpose. Overboots to be worn by three students and sandbags by two, with capes in the worn position when there is a risk of bodily contact with the liquid contamination, e.g. bushes. Spread some blister gas training mixture on to part of a road or track and on the ground on either side, including hedge and bushes if these exist. Proceed as follows:—

i. Explain that leading troops on foot have advanced along the road (or track) and encountered blister gas contamination. Point out that the contamination will have been put down with the object of delaying them or of forcing them into ground where they will be more exposed to small arms fire. Leading troops should not allow themselves to be delayed by contamination; they should normally push straight through, avoiding obvious liquid, and sending back a report giving the location of the contamination. A detailed reconnaissance of the area will be carried out later by a gas reconnaissance party provided by a reserve sub-unit.

ii. The five selected students will now be employed to demonstrate the action of a gas reconnaissance party, the instructor giving the detail as follows: The leader on reaching the site details two men to

go on each side of the road. Each pair is given a few gas warning signs and a supply of ground detectors. They will depend mainly on their senses of sight and smell to find the extent of the contamination, confirming where necessary with ground detectors. (Note that with blister gas training mixture a red stain will not show on the detector.) On finding contamination one man should move outwards till clear of the contamination and then place gas warning signs in position, approximately 20 yds. from the contamination. The gas warning signs will be timed and dated. As soon as a clear way round has been found the leader should improvise route direction signs, e.g. marking trees, using sticks, or cutting arrows in the ground with the entrenching tool. When the clear route cannot be marked men may have to be posted to guide oncoming troops, but it must be stressed that this method is uneconomical in men and should not be adopted unless necessary.

iii. Draw attention to the dress of the gas reconnaissance party, pointing out that sandbags should be worn when overboots are not available. Respirators to be adjusted when working downwind. Capes or light gas suits should not be worn unless there is danger of contact with the liquid. Remind students of the other precautions to be taken against vapour (Sec. 21, para. 8).

4. *Decontamination of ground*.—This part of the lesson should be mainly a demonstration, utilizing two students, wearing overboots, to assist. Proceed as follows:—

i. Point out that the decontamination of ground is a laborious process which is rarely resorted to in the field. When it is essential, the aim will be to make the surface safe for use. For this purpose it is not necessary or practicable to destroy every trace of contamination.

ii. Explain that enough dry bleach should be used to give a white surface. As a rough guide, 1 lb. of bleach is required for each square yard of heavy contamination, or one heaped g.s. shovelful for 3 to 4 sq. yds.

iii. Remind students that dry bleach in contact with blister gas liquid causes it to burst into flame and give off blister gas vapour. Personnel immediately downwind should, therefore, be moved beforehand or should adjust their respirators.

- iv. Place some blister gas training mixture on the ground to represent contamination. Use the two students to demonstrate the method explained in ii, above; they should work from the upwind edge.
- v. Remind students of the precautions to be taken (para. 3, iii, above), pointing out that vapour danger can be avoided by working from the upwind edge.

CHAPTER IV.—TRAINING EXPEDIENTS

23. Choking gas expedients

1. **Phosgene in small cylinders.*—Small cylinders containing phosgene are provided for use at gas compounds (Sec. 28). Their purpose is to give individuals an opportunity to recognize this gas. The following instructions apply:—

- i. Phosgene cylinders will be used under the supervision of an officer who has qualified at the Army Gas School.
- ii. In cold weather, the bottom half of the cylinder should be placed in a bucket of warm water for about 15 minutes before use, to ensure vaporization.
- iii. Personnel should be upwind of the cylinder until the gas is released, and should then pass in single file through the gas.
- iv. When phosgene is used all personnel in the vicinity will carry respirators.
- v. The instructor in charge will have a rattle in his possession which he will sound in the event of a dangerous concentration being inadvertently released.

2. *C.A.P. generators.*—These generators, although producing a tear effect only, are used during training to represent a choking gas, since exposure to the gas necessitates the immediate adjustment of the respirator. The following instructions apply:—

- i. The generator is set in operation by removing the tear-off strip in order to expose the emission holes, removing the adhesive tape and lid, and striking the match composition with the striker supplied. When ignited it should be held vertically with the ignition pellet at the bottom. The generator is then placed

*In Canada—Chlorine is used.

on the ground upright with the ignition end downwards. After a few seconds' delay a cloud of tear gas is evolved from the emission holes.

- ii. The cloud from a single generator continues for about one and a half minutes, and is an effective harassing agent for a distance which depends upon the weather conditions (Sec. 20). In average conditions, a single generator will be effective if operated about 100 yds. upwind of troops.
- iii. The wind direction should be noted and generators should be placed in such a position that the resulting cloud will be carried over the objective. If it is desired to use a number of generators, they should be placed in a line at right angles to the wind, and at least 1 yd. apart so that should any burst into flame they will not set fire to others. Under these conditions, the greater the number of generators employed, the greater will be the width of the cloud and its effective distance of travel.
- iv. Care should be taken to ensure that the gas does not travel over public roads or dwellings. The distances downwind for the gas to produce no perceptible effect vary according to weather conditions (Sec. 20). In average conditions a single generator is not likely to inconvenience unprotected persons more than half a mile downwind. Special care should be exercised at night.
- v. The generators will not be used inside buildings or in confined spaces.

24. Nose gas expedients

1. *D.M. ampoules.*—These are used to produce a concentration of D.M. in a gas chamber. All officers and other ranks will experience this gas at least once, so that they may be enabled to recognize nose gas when they meet it in the field and appreciate its delayed action effects. The following instructions apply:—

- i. This gas training will be conducted by an officer or N.C.O. who has qualified at the Army Gas School.
- ii. D.M. ampoules contain a solution of D.M. in liquid, each ampoule being sufficient to give a concentration of D.M. for a 1,500 cu. ft. gas chamber.
- iii. The ampoule is opened by moistening the neck, scratching it sharply with the glass cutter provided, and then snapping off the tip.

- iv. An iron dish or tin lid is warmed gently, but not allowed to become red hot. The dish is then removed clear of any flame or heater and the contents of the ampoule are poured into it. (Separate dishes will be used for D.M. and C.A.P.)
- v. The dish is then heated gently until the liquid has evaporated, leaving a solid residue of D.M. If a naked flame is used the dish should be held a few inches above it since the liquid is inflammable.
- vi. When the liquid has evaporated, the temperature is increased by moving the dish nearer to the source of heat and the solid residue is scratched with a nail or other suitable instrument, with continued heating, until no more D.M. is seen to come off. If the source of heat is a flame, the dish should be moved about over it in order to ensure even heating of the bottom of the dish.
- vii. The contents of the chamber are then thoroughly mixed by fanning.
- viii. Personnel will enter the chamber wearing facepieces, and keep them on for two minutes to prove that their respirators give complete protection. Facepieces will then be removed in the chamber and personnel will remain in the gas for a further two minutes without protection. Facepieces will then be adjusted, and one minute later personnel will leave the chamber and move about at a marching pace for ten minutes before removing their facepieces.
- ix. Provided that the correct number of ampoules for the size of the gas chamber have been used, the concentration should be adequate for three parties, after which the chamber should be cleared completely of gas and a fresh concentration of D.M. put up, using the same amount of solution as before. This procedure should be repeated for every three parties. It is not permissible to augment in any way the D.M. concentration in the chamber.
- x. No officer or other rank should be required to experience D.M. more than once in the gas chamber.

2. *D.M. generators.*—These training generators are used for producing a nose gas cloud for use during outdoor exercises. No restriction should be imposed on exposure of

troops to their effects under normal training conditions (compare para. 1, x, above). The following instructions apply:—

- i. The generator is set in operation by removing the tear-off strip at the base so as to expose the emission slots, removing the adhesive tape and lid, and striking the match composition with the striker provided. The generator is then placed on its side, with the ignition end to the rear. After a few seconds delay a cloud of D.M. is evolved from the emission slots.
- ii. The cloud from a single generator continues for about two and a half minutes, and is an effective harassing agent for a distance which depends upon the weather conditions (Sec. 20). In average conditions a single generator will be effective if operated about 100 yds. upwind of troops.
- iii. The wind direction should be noted and generators should be placed in such a position that the resulting cloud will be carried over the objective. If it is desired to use a number of generators, they should be placed in a line at right angles to the wind, and at least 5 yds. apart. Under these conditions, the greater the number of generators employed, the greater will be the width of the cloud and its effective distance of travel.
- iv. Care should be taken to ensure that the gas does not travel over public roads or dwellings. The distances downwind for the gas to produce no perceptible effect vary according to weather conditions (Sec. 20). In average conditions a single generator is not likely to inconvenience unprotected persons more than half a mile downwind. Special care should be exercised at night.
- v. The generators will not be used inside buildings or in confined spaces.

25. Tear gas expédients

1. *C.A.P. capsules.*—These are used to produce a concentration of tear gas in a gas chamber in order to confirm the correct fit of the respirator and to give the wearer confidence in it when exposed to actual gas. Instructions for the use of C.A.P. capsules are given in Sec. 17.

2. *B.B.C.*—This persistent tear gas, when supplied for training purposes, will usually be stored at gas compounds (Sec. 28). The following instructions apply:—

- i. *B.B.C.* will be used under the supervision of an officer or N.C.O. who has qualified at the Army Gas School.
- ii. Whenever handling *B.B.C.*, the operator will wear eye-shields or the respirator to prevent the liquid from entering and consequently injuring the eyes. (Liquid *B.B.C.* on the skin should be swabbed off and the affected parts washed with soap and water; gas ointment is of no value against persistent tear gas.)
- iii. A suitable method of using *B.B.C.* at gas compounds, to demonstrate an example of a persistent tear gas, is to sprinkle a small quantity on to sacking.

26. Blister gas expedients

1. *Mustard gas in pint pots.*—Mustard gas, in stoneware bottles holding approximately 1 pint, is kept at gas compounds (Sec. 28) for the purpose of familiarizing troops with the appearance and action of blister gas. The following instructions apply:—

- i. Demonstrations with mustard gas will be conducted by officers and N.C.Os. who have qualified at the Army Gas School. (See also para. 3 below.)
- ii. In a gas compound, a small quantity of mustard gas will be poured out on to the concrete surface, and during pouring the pot should be held close to the surface. Personnel will note the appearance and smell, by passing downwind. The concrete surface will be decontaminated, using dry bleach, the attention of personnel being drawn to the flames caused by this action.
- iii. In cold weather, in order to produce a noticeable smell, a small quantity of mustard gas should be poured into a shallow metal receptacle and heated over a spirit stove. The metal receptacle will be decontaminated subsequently, using dry bleach.

- iv. A grass sod, and later some loose earth, should be placed on the concrete surface and the appearance of mustard gas on them demonstrated; the sod and earth being subsequently placed in the mustard gas pit. (Sec. 28, para. 1, iii) and covered with dry bleach.
- v. The appearance of drops of the liquid on sleeve detectors, spray detectors, ground detectors, detector paint, cape, dubbed boots, clothing and equipment will be demonstrated. An unserviceable boot, and small pieces of unserviceable serge clothing, gas cape, and web equipment will be used for the demonstration.
- vi. Confidence in the efficiency of gas ointment and practice in its proper use will be given by placing a large drop of mustard gas on the bare forearm of each man. He will then swab it off and apply gas ointment, as in personal decontamination. The opportunity will be taken to emphasize that a blister will result unless the ointment is well rubbed in for 30 seconds.
- vii. Similar demonstrations may be given in an improvised unit gas compound. (Sec. 28, para. 5.)
- viii. When empty, pint pots should be immersed in water, which is then boiled, in order to decontaminate them, but not placed directly into boiling water.

2. *Venting of pint pots of mustard gas.*—All pint pots will be vented at intervals of not more than six months in order to release any pressure formed. The gas which escapes during the process of venting is not mustard gas, but a product of its decomposition. The following instructions apply:—

- i. The operation will be carried out under the supervision of an officer or N.C.O. who has qualified at the Army Gas School.
- ii. The operator should be dressed in a light gas suit, with the respirator adjusted. Gas gloves should be worn.
- iii. Slowly loosen the stopper until a hiss indicates an escape of gas.
- iv. Allow to stand until hissing ceases.

- v. Repeat slow releasing of pressure until the stopper can be removed completely.
- vi. Insert a thin piece of stick into the liquid to release any excess dissolved gas. Violent frothing may occur when the stick enters the liquid, and the operator should ensure that the open end of the pot is pointing away from him.
- vii. Carefully remove the stick when the gas has ceased to be given off and place it in the mustard gas pit.
- viii. Replace stopper.
- ix. Wipe off any contamination from around the stopper with dry cotton waste.

3. *Precautions when demonstrating mustard gas.*—When demonstrating the gas, undue precautions on the part of the demonstrator are to be avoided as being likely to teach a false lesson; he will therefore wear no protective equipment apart from eyeshields and an application of gas ointment. All ranks present will wear eyeshields.

4. *Blister gas training mixture.*—This is used to represent blister gas. It is harmless to the skin and clothing, and has no harmful effects on ground or vegetation, thus allowing of its unrestricted use. The following instructions apply:—

- i. It can be used as issued, care being taken to shake the container well to ensure thorough mixing.
- ii. Before use in cold weather, the container should be partly immersed in a bucket of warm water for about 15 minutes.
- iii. When used from a stirrup pump, to simulate spray, the mixture should be diluted with its own volume of water.

27. Gas chambers

1. *Purposes.*—Gas chambers are used in training for the following purposes:—

- i. By means of tear gas, to confirm the fit of the respirator, and to give the wearer confidence in it when exposed to actual gas. (Sec. 17.)
- ii. To give personnel experience of the effects of nose gas. (Sec. 24, para. 1.)

2. *Choice and siting.*—Any reasonably air-tight room, tent or other enclosed space of moderate size can be used as a gas chamber provided that it is subsequently cleared of gas and unoccupied for 24 hours. When gas chambers are sited within 100 yds. of any road or dwelling, the gas should be allowed to disperse gradually, i.e. by the opening of one door or one window.

28. Gas compounds

1. *Description.*—A gas compound is a place set apart for the purpose of providing troops with an opportunity of encountering actual war gases. It comprises an area 50 yds. square, enclosed by a double-apron barbed wire fence and contains:—

- i. A gas chamber.
- ii. A concrete surface (on which actual mustard gas may be used), and other typical road surfaces (on which blister gas training mixture may be used).
- iii. A mustard gas pit for the disposal of contaminated material.

2. *Stores available at gas compounds.*—The following stores are provided for gas compounds:—

Phosgene.
Mustard gas.
B.B.C.
D.M. ampoules.
Bleach.
Ground detectors.
Spray detectors.
Gas rattle.
Gas warning signs.
Spirit stove.

3. *Stores to be taken to gas compounds.*—Units will take with them any other stores that may be required, such as:—

C.A.P. capsules.
Blister gas training mixture.
Cotton waste.
Sleeve detectors.
A smooth board or piece of metal painted with detector paint.
Stirrup pump.
Buckets.
Shovels.

4. *Use of gas compound.*—Within the compound, the following can be demonstrated and details of procedure will be found in the relevant sections:—

- i. Phosgene. (Sec. 23, para. 1.)
- ii. D.M., in the gas chamber. (Sec. 24, para. 1.)
- iii. C.A.P., in the gas chamber. (Sec. 25, para. 1.)
- iv. B.B.C. (Sec. 25, para. 2.)
- v. Mustard gas. (Sec. 26, paras. 1 to 3.)
- vi. Blister gas training mixture. (Sec. 26, para. 4.)

5. *Improvised gas compounds.*—Units may draw phosgene, B.B.C. and mustard gas from the nearest compound to enable demonstrations to be given without the necessity of men under instruction going each time to a gas compound. The following instructions apply:—

- i. The unit will improvise a compound consisting of an area approximately 5 yds. square, enclosed by a single-apron barbed wire fence having a gate (which can be secured by a padlock), and marked with a gas warning sign.
- ii. Within the compound, a slab of concrete or sheet of metal will be provided on which to pour small quantities of mustard gas. A mustard gas pit will be dug within the enclosure for the disposal of contaminated material.
- iii. The instructions given in Sec. 23, para. 1; Sec. 25, para. 2; and Sec. 26, paras. 1 to 3.
- iv. The gases will be kept by the unit in the improvised compound shaded from the direct rays of the sun.
- v. When empty, the containers will be returned to the compound from which they were drawn.

CHAPTER V.—SUITABLE OUTDOOR PROBLEMS

29. Action when choking gas is encountered

1. *Object of problem.*—To practise leaders and men in the correct action to be taken when choking gas is encountered.
2. *Stores required.*—C.A.P. generators, to represent choking gas released by means of ground burst projectiles. Thunderflashes, to represent the noise of bursting projectiles.
3. *Situation.*—A sub-unit at work (e.g. digging, wiring, A.F.V. maintenance, manning guns or searchlights) is subjected to an attack with choking gas, either by day or by night.

4. *Action by umpire or director.*—Cause C.A.P. generators and thunderflashes to be ignited upwind of the sub-unit, and then note:—

- i. Position of sentry.—That he has been correctly posted upwind of the sub-unit.
- ii. Action of sentry.—That he sounds the rattle, adjusts his respirator facepiece, and then sounds the rattle again for at least 30 seconds.
- iii. Action of all ranks.—That respirator facepieces are adjusted immediately, and work in progress continued.
- iv. Action of commander on the spot.—That, after adjusting his respirator facepiece, he tests for gas to determine the type of gas being used and informs his immediate superior. That he satisfies himself that none of his men has been affected by the gas (if they have, he must test respirator fitting after the exercise). That he tests for gas every few minutes until satisfied that gas is no longer present.
- v. Action when "gas clear" is given.—That, after the commander on the spot has given "gas clear", all men test for gas before removing their respirator facepieces.

5. *Remarks.*—This or a similar problem should be introduced frequently during training. Note precautions to be observed (see Sec. 23, para. 2).

30. Action when nose gas is encountered

1. *Object of problem.*—To practise leaders and men in the correct action to be taken when nose gas is encountered.
2. *Stores required.*—D.M. generators, to represent nose gas released by means of ground burst projectiles. Thunderflashes, to represent the noise of bursting projectiles. Smoke generators, to represent screening smoke.
3. *Situation.*—As for Sec. 29, para. 3.
4. *Action by umpire or director.*—Cause D.M. generators and thunderflashes to be ignited upwind of the sub-unit. As a variation, smoke generators can be ignited beforehand to conceal the nose gas. To note action as for Sec. 29, para. 4, and, as regards smoke, as for Sec. 14, para. 10.
5. *Remarks.*—Note precautions to be observed (see Sec. 24, para. 2).

31. Offensive action in the presence of gas

1. *Object of problem.*—To practise leaders and men in taking offensive action in the presence of gas.

2. *Stores required.*—As for Sec. 29, para. 2. In addition, two men (concealed) will be required with rifles and blank ammunition to represent enemy using small arms fire from a distance of about 200 yds.

3. *Situation.*—A sub-unit (e.g. an infantry section) advancing on foot in daylight, encounters choking gas and small arms fire simultaneously.

4. *Action by umpire or director.*—Cause C.A.P. generators and thunderflashes, to be ignited upwind of the advancing sub-unit. The two concealed men, representing the enemy, to open fire when the gas reaches the advancing sub-unit. To note adjustment of respirator facepieces while sub-unit is:—

- i. Deploying into a fire position, and subsequently engaging the enemy with fire, or
- ii. Continuing forward movement under cover.

5. *Remarks.*—Selection of suitable ground, wind direction and location of representative enemy are important considerations. Note precautions to be observed (see Sec. 23, para. 2).

32. Blister gas from ground burst projectiles

1. *Object of problem.*—To practise leaders and men in the correct action to be taken when attacked by ground burst projectiles charged with blister gas.

2. *Stores required.*—Thunderflashes and some blister gas training mixture.

3. *Situation.*—A sub-unit in action, halted, either by day or by night.

4. *Action by umpire or director.*—Cause thunderflashes to be ignited just upwind of the troops and blister gas training mixture sprinkled in the occupied area. If necessary, the umpire should announce "these explosions represent gas shell". Then note:—

- i. As soon as it is appreciated that gas is being released from ground burst projectiles the sentry should sound the rattle. All facepieces should be adjusted immediately, those men contaminated by the liquid carrying out personal decontamination Part I as early as possible.

ii. Personal decontamination Part II, as necessary, including decontamination of weapons, should be carried out. This should be organized by the commander on the spot, due attention being paid to the execution of the task in hand.

iii. The commander on the spot should report the incident and the situation to his immediate superior.

iv. If a picture has been given of effective ground contamination, precautions should be taken to protect the skin against vapour. (Sec. 21, para. 8). Alternatively, if the nature of the task permits, troops should be moved clear of the vapour danger.

5. *Remarks.*—To add more realism, a few drops of blister gas training mixture should be placed on the clothing, weapons and exposed skin of individuals.

33. Blister gas spray when on the move

1. *Object of problem.*—To practise leaders and men in the action to be taken when contaminated with blister gas spray when on the move.

2. *Stores required.*—A bucket of blister gas training mixture and a stirrup pump.

3. *Situation.*—A sub-unit marching along a road, either by day or by night.

4. *Action by umpire or director.*—Cause the blister gas training mixture to be sprayed, from behind cover, on to the marching troops. To note:—

- i. Verbal warning "spray" given by the commander on the spot.
- ii. The action required by Part I of the sequence of personal decontamination should be carried out by every individual immediately on hearing the verbal warning "spray". (See para. 5 below on the subject of offensive action.)
- iii. Umpires should satisfy themselves that the ointment is rubbed really vigorously into the exposed skin, for not less than half a minute on each part.
- iv. Before Part II of the sequence of personal decontamination is carried out, the commander on the spot should lead his men to "clean ground".

5. *Remarks.*—When air co-operation is obtainable, blister gas training mixture can be sprayed from aircraft and the use

of the stirrup pump dispensed with. Whenever the spraying aircraft is within range, the first action is to engage it with controlled fire from all available small arms weapons; subsequently the commander on the spot will give the verbal warning "spray".

34. Blister gas spray when at rest

1. *Object of problem.*—To practise leaders and men in the action to be taken when blister gas spray is used against troops who are at rest.

2. *Stores required.*—Spray detectors and some blister gas training mixture.

3. *Situation.*—A sub-unit at rest, either by day or by night. Spray detectors have been put out and sentries posted.

4. *Action by umpire or director.*—Cause a few drops of blister gas training mixture to be placed unostentatiously on one or more spray detectors, at a moment when a number of men are in the open. To note:—

- i. Detectors have been suitably placed and orders to sentries correct, including capes in worn position.
- ii. Correct action by sentry who discovers that spray has fallen, i.e. the verbal warning "spray". (Note that with blister gas training mixture a red stain will not show on the spray detectors.)
- iii. All ranks in the open carry out Part I of personal decontamination immediately. If suitable cover is available, but not where men sleep, Part II should be done under cover.
- iv. Relief of sentries by guard commander to enable them to carry out Part II of personal decontamination.
- v. Arrangements made by guard commander to renew, or swab and subsequently repaint, contaminated spray detectors.
- vi. Exposed food and drinking water should be declared unfit for consumption. This should bring out the importance of keeping food and water covered.

5. *Remarks.*—When sleeping troops are under cover it will be unnecessary to take special steps to rouse them when spray has fallen, provided the standing order that helmets, eyeshields, capes and boots are worn when leaving cover for any purpose, is enforced; the sentry should, however, give the verbal warning "spray" in order to warn any individuals who may be about in the open. Actual spraying by aircraft

should be arranged whenever such co-operation is obtainable.

35. Work on ground contaminated by blister gas

1. *Object of problem.*—To practise leaders and men in the action to be taken in order to minimize gas casualties when working on ground which has been contaminated with blister gas.

2. *Stores required.*—Assault bridge. Four sandbags a man. Blister gas training mixture. Ground detectors. Gas warning signs.

3. *Situation.*—A sub-unit is detailed as carrying and launching party of an assault bridge at X, either by day or by night. On reaching the bridge forming point the commander on the spot is told that the site has been contaminated, but cannot now be altered.

4. *Action by umpire or director.*—Ensure that the bridge site is contaminated on both banks with blister gas training mixture just before the sub-unit reaches it. Arrange for sandbags to be available if asked for, but keep them out of sight. To note:—

- i. The commander on the spot should not be given sandbags unless he asks for them. If he does so, see that these are efficiently tied on.
- ii. Capes in worn position with corners fastened back. Ointment rubbed into all exposed skin (leaving a visible film on the hands) to give protection from vapour, and to give protection to the hands against liquid. Respirators adjusted when gas is smelled.
- iii. Avoidance of obvious liquid as far as possible.
- iv. No unnecessary sitting down or kneeling.
- v. Personal decontamination as necessary, and marking of area when task is completed.

36. Handling of stores contaminated by blister gas

1. *Object of problem.*—To practise leaders and men in handling and dealing with food stores contaminated by blister gas.

2. *Stores required.*—A dump of stores comprising filled sandbags (representing sacks of flour or sugar), sealed tins (representing tins of butter or jam), wooden boxes (containing

tins representing tins of condensed milk and tins of vegetables). Blister gas training mixture. Four sandbags a man. Ground detectors. Gas warning signs. 15-cwt. truck with the following stores on the vehicle: 2-gallon tin of petrol (water for instructional purposes), 2-gallon tin of water, 2-lb. or 7-lb. tin of bleach (sand may be used to simulate bleach during training), g.s. shovel, and some sandbags or rags.

3. *Situation*.—A sub-unit is detailed (in daylight) to collect contaminated stores left behind in a recent move.

4. *Action by umpire or director*.—Ensure that the dump of stores is contaminated with blister gas training mixture. There should be a small heavily contaminated bomb crater just upwind of the dump. Arrange for sandbags to be available if asked for, but keep them out of sight. When contamination is discovered, point out to the commander on the spot what the stores represent. To note:—

- i. As for Sec. 35, para. 4, i to v.
- ii. Doubtful if any food in small sacks can be rendered safe for consumption, but this will depend on degree of contamination of sack.
- iii. Loose sealed tins can be rendered safe to handle by removing the contamination with swabs moistened with petrol. Contents will be unaffected and will be safe for consumption.
- iv. Lightly contaminated boxes containing sealed tins will be safe to handle if covered with bleach paste. If heavily contaminated the boxes should be broken up and burnt. The sealed tins can be handled separately.

37. Action of a gas reconnaissance party

1. *Object of problem*.—To practise leaders and men in the duties of a gas reconnaissance party.

2. *Stores required*.—Blister gas training mixture. Ground detectors. Gas warning signs. Four sandbags for each member of gas reconnaissance party.

3. *Situation*.—By day, during a pursuit or advanced guard operation, leading troops have met blister gas contamination and have gone ahead but have sent back a report giving the location of the contamination. A party, e.g. an infantry section, has been detailed from a reserve sub-unit to delimit the contaminated area and mark a clear route.

4. *Action by umpire or director*.—Select a suitable defile and put down some blister gas training mixture in it, and for a short distance to either flank. Explain to the leader of the gas reconnaissance party the nature of his task. Note action taken, which should be in accordance with Sec. 22, para. 3, ii.

5. *Remarks*.—A variation of this problem could be as follows: A sub-unit is detailed to take up a position in the vicinity of ground suspected of blister gas contamination. The sub-unit commander sends a gas reconnaissance party ahead to mark out contaminated areas.

38. Choking gas against moving tanks

1. *Object of problem*.—To practise crews in the immediate adjustment of respirators, when choking gas is encountered while vehicles are moving.

2. *Stores required*.—C.A.P. generators, to represent choking gas released by means of ground burnt projectiles. Thunderflashes, to represent the noise of bursting projectiles.

3. *Situation*.—Tanks advancing (into the wind) are bombed with choking gas from aircraft.

4. *Action by umpire or director*.—Arrange for C.A.P. generators (in depth) to be ignited upwind of the advancing vehicles and, just before the cloud reaches them, thunderflashes to be burst just ahead of the vehicles. Umpires in each vehicle to note:—

- i. Adjustment of facepieces (without breathing in) within 15 seconds of detecting gas.
- ii. Minimum interference with speed of vehicle and duties of crew.

5. *Remarks*.—Vehicles must be moving into the wind. C.A.P. generators should be in depth, e.g. at 50 yds. distance; they should also be set out at intervals to cover the frontage on which vehicles are deployed. Note precautions to be observed (see Sec. 23, para. 2).

39. Blister gas against moving tanks

1. *Object of problem*.—To practise crews in the action to be taken in order to minimize delay and subsequent casualties, when individuals and the interior of vehicles are contaminated while vehicles are moving.

2. *Stores required*.—Some blister gas training mixture and a thunderflash, for each vehicle. The thunderflash should be tied to the outside of the turret.

3. *Situation*.—Tanks on the move are bombed with blister gas from aircraft.

4. *Action by umpire or director*.—When tanks are on the move, umpires in each vehicle to ignite the thunderflash and then sprinkle the blister gas training mixture inside the vehicle and on to individuals. To note:—

- i. Part I of personal decontamination should be an immediate action.
- ii. Part II of personal decontamination should include the removal of contaminated overalls or blouses, which should then either be tied to exterior of vehicle or, if this is not possible, jettisoned.
- iii. As gas will be smelled, respirators should be adjusted and ointment applied to exposed skin (leaving a visible film on the hands).
- iv. Contaminated controls, instruments, equipment, weapons and ammunition should be swabbed.

5. *Remarks*.—Decontamination of those external parts of the vehicle which individuals are likely to touch, and more thorough decontamination of the interior, will be necessary when halted.

40. Blister gas against halted tanks

1. *Object of problem*.—To practise crews in the action to be taken in order to minimize subsequent casualties, when halted crews and vehicles are attacked by blister gas shell or bombs.

2. *Stores required*.—Blister gas training mixture and thunderflashes.

3. *Situation*.—Tanks in harbour are bombed with blister gas from aircraft.

4. *Action by umpire or director*.—While maintenance is in progress, ignite thunderflashes and spread blister gas training mixture on outside and inside of vehicles (unless covered by tarpaulins), on dismantled parts, loose tools and on a number of individuals. Put down a few small pools of the liquid to represent effective ground contamination. To note:—

- i. Adjustment of respirators to give protection against initial cloud of fine mist.
- ii. Those individuals near the burst and who have been splashed by the liquid, to carry out personal decontamination.

iii. Owing to the vapour danger, respirators to remain adjusted and ointment applied to exposed skin (leaving a visible film on the hands).

iv. Outside contaminated parts of the vehicle likely to be contacted by individuals getting in and out, to be swabbed (preferably with rags moistened with petrol). Interior contamination to be swabbed likewise.

v. Decontamination of contaminated dismantled parts and loose tools.

vi. Completion of maintenance work, care being taken to avoid obvious contamination on the ground.

vii. When work completed, crews should be moved upwind of contamination.

5. *Remarks*.—Whether or not vehicles should be moved clear of the liquid and vapour danger, will depend on the tactical situation.

APPENDIX A

GAS TRAINING INSPECTIONS

(Some suggestions which may be of use to senior officers when carrying out inspections in units.)

1. *Sentries*.—Check written orders for sentries in regard to gas. See whether sentries understand the action to be taken in the event of:—

i. Spray having fallen (Sec. 14, para. 11).

ii. Other forms of gas attack (Sec. 14, para. 9).

2. *Respirators*.—Cause the gas rattle to be sounded or the shout of "gas" given. See whether facepieces are adjusted in accordance with the tests of elementary training (Sec. 15, para. 10, i; and para. 11, i and iii). See whether eyepieces show signs of clouding over within a few minutes. See whether the elastic of the headharness has become slack, thus causing a gas leak. Have selected respirator haversacks examined to see whether they contain cotton waste, ointment, eyeshields, anti-dimming outfit and spare sleeve detectors; also ground detectors, in the case of officers, warrant officers and N.C.Os.

3. *Personal decontamination*.—Cause the verbal warning "spray" to be given and see whether all ranks in the open carry out Part I of personal decontamination immediately (Sec. 11, para. 4). Cause a few drops of blister gas training mixture to be placed on the boots, clothing, equipment and weapons of a few men—indicate this to the junior leader—and note action taken under Part II of personal decontamination (Sec. 11, paras. 6 and 7).

4. *Capes*.—Order capes to be put on in the worn position. See whether they are serviceable. See whether the shoulders have all been painted with detector paint, and whether badges of rank have been added where applicable (Sec. 18, para. 10).

5. *General points*.—The following are some further points:—

i. Where is the gas chamber? (Sec. 27, para. 2).

ii. When were respirators last tested in the gas chamber? (Sec. 17, para. 1, ii).

iii. How many men have experienced D.M.? (Sec. 24, Para. 1).

iv. Where is the nearest gas compound? Has the unit improvised one? (Sec. 23, para. 5).

v. How many men have smelled phosgene? (Sec. 23, para. 1).

vi. How many men have seen and smelled mustard gas, and have had a drop on their forearm? (Sec. 26, para. 1).

vii. Has the unit been subjected to practise air spray attack?

viii. Does every man know how to decontaminate his own weapon and vehicle? (Sec. 12).

ix. Are gas situations introduced into exercises, and how is this done? (Sec. 1, para. 10).

x. What shortage of unit gas officers and sub-unit gas N.C.Os.? (Sec. 1, para. 6).

xi. Has the C.O. attended a Commanding Officers' Course at the Army Gas School?

xii. Are the medical officer and intelligence officer trained in gas?

xiii. Have all junior leaders received the appropriate gas training? (Sec. 3 and Appendix D).

xiv. Are the regimental stretcher bearers trained in first aid for gas casualties?

xv. What shortage of gas training expedients? (Sec. 23 to 26).

APPENDIX B

NOTES ON THE GAS FILM

1. *Details of the film.*—This is a military training film entitled "Gas." It is available in the 35 mm. and 16 mm. sizes. There is no silent version, and the 16 mm. sound film cannot be shown on a 16 mm. silent projector. The approximate time taken to show the film is 45 minutes. The catalogue numbers are:—

- i. 35 mm. size..... B163
- ii. 16 mm. size..... C163

2. *Points to note when showing the film.*—The instructor should make himself familiar with the film so that he can answer questions and comment on any details of teaching which may have changed since the production of the film. Time should be allowed immediately after the showing of the film for comments and questions. Individuals should be given an opportunity to see the film again at a later date. The instructor should bear in mind that the film is an aid to other training and while it can be of considerable value it does not by itself form a complete method of instruction.

3. *Comments to be made.*—The instructor should make the following comments immediately after the showing of the film:—

- i. In the film, choking gas was represented by smoke. Choking gases are generally invisible.
- ii. Carriage of the cape. The cape can now be carried in one of two rolled positions, namely, inside the equipment haversack or attached to the belt.
- iii. Situations were depicted in which the cape was required in the worn position. This does not mean that the cape will always be in the worn position when on service.
- iv. Gas ointment, to be effective, must not merely be applied to the affected part, but must be rubbed in really vigorously for at least 30 seconds.
- v. The early removal, by careful swabbing, of all free liquid from the boots is necessary. This must be done in Part II of personal decontamination.
- vi. Ointment should be applied to both sides of serge clothing wherever contamination can be located and wherever it is suspected. This should be done in preference to cutting out contaminated portions.

APPENDIX C

SYLLABUS FOR THE GAS TRAINING OF RECRUITS

Serial No.	Subject	45-minute periods
A.—Introductory		
A1.	Respirator fitting. (This should be carried out when the respirator is issued).....	—
A2.	Gas film. (Appendix B)	1
B.—Initial lessons		
B1.	War gases (Sec. 5)	1
B2.	Personal gas equipment (Sec. 6)	1
B3.	Description and care of respirator (Sec. 7)	1
B4.	Carriage of respirator (Sec. 8)	1
B5.	Respirator drill (Sec. 9)	3
B6.	Gas cape and light gas suit (Sec. 10)	1
B7.	Personal decontamination (Sec. 11)	3
B8.	Decontamination of weapons and vehicles (Sec. 12)	1
B9.	Blister gas detectors and gas warning signs (Sec. 13)	1
B10.	Gas alarm system and gas duties of sentries (Sec. 14)	1
C.—Further training		
C1.	Gas chamber test. (This should be carried out as soon as the individual has been taught respirator drill) (Sec. 17)	1
C2.	Gas compound (Sec. 28)	2
C3.	Short talk on enemy gas weapons (Sec. 19)..	1
C4.	Gas film. (This second showing of the film should come at the end of the individual's gas training). (Appendix B)	1

D.—Tests and further practice

D1. Gas tests of elementary training (Sec. 15)	2
D2. Individuals should be practised, at least once a week, in the action to be taken on hearing the gas rattle or shout of "gas" (while in the prone position), and the verbal warning "spray." (About 20 minutes should be allowed for the thorough carrying out of personal decontamination)	—

Total number of 45-minute periods 22

APPENDIX D**SYLLABUS FOR THE GAS TRAINING OF JUNIOR LEADERS**

Serial No.	Subject	45-minute periods
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A.—Introduction

A1. A short introductory talk to explain the object of the course and the programme, followed by an inspection of the personal gas equipment of the students	1
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B.—Training as instructors

B1. War gases (Sec. 5)	2
B2. Personal gas equipment (Sec. 6)	2
B3. Description and care of respirator (Sec. 7) ..	2
B4. Carriage of respirator (Sec. 8)	2
B5. Respirator drill (Sec. 9)	2
B6. Gas cape and light gas suit (Sec. 10)	1
B7. Personal decontamination (Sec. 11)	4
B8. Decontamination of weapons and vehicles (Sec. 12)	2
B9. Blister gas detectors and gas warning signs (Sec. 13)	1
B10. Gas alarm system and gas duties of sentries (Sec. 14)	2

C.—Further lessons for junior leaders

C1. Tests of elementary training (Sec. 15)	2
C2. Fitting of respirators (Sec. 16)	1
C3. Gas chamber test (Sec. 17)	1
C4. Inspection of gas equipment (Sec. 18)	2
C5. Enemy gas weapons and gas intelligence (Sec. 19)	2

Serial No.	Subject	45-minute periods
C6.	Effects of weather and ground on gas (Sec. 20)	1
C7.	Blister gases (Sec. 21)	1
C8.	Effects of gas on food and water; blister gas reconnaissance; and decontamination of ground (Sec. 22)	1

D.—How to deal with gas problems

D1.	Practice in dealing with gas problems introduced during outdoor exercises (Secs. 29 to 40)	5
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E.—Revision and examinations

E1.	Revision	5
E2.	Students examined as instructors in respirator drill and personal decontamination	3
E3.	Students examined orally on the subject matter taught throughout the course	2

F.—Conclusion

F1.	Concluding talk (preferably by the C.O. or unit training officer) to indicate the lessons to be taught by the junior leader to his men, to emphasize the importance of keeping gas equipment in serviceable condition, and to stress the need for vigilance and to maintain gas discipline at all times in order to guard against surprise	1
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Total number of 45-minute periods..... 48

Notes

1. The syllabus has been drafted as a guide.
2. Best results are likely to be obtained when the number of students does not exceed 16 to each N.C.O. instructor.
3. Each period of 45 minutes allows 35 minutes for the actual lesson, five minutes for questions, and a five-minute break during which students move to the next place of work.
4. Serial Nos. B1 to B10 comprise the ten initial lessons for the individual soldier. Where more than one period has

been shown for each lesson, the first period should be devoted to a demonstration lesson, given by the instructor to the students (who, for this purpose, act as private soldiers) with the object of showing how the lessons should be taught. The remaining periods are intended for mutual instruction, i.e. the students themselves practise teaching the lesson.

5. Serial No. C1 to be conducted by instructors, not for the purpose of testing students, but with the object of teaching and practising them in the method of conducting gas T.O.E.T. The students, as trained soldiers, will have passed the tests beforehand.

6. The instruction under Serial Nos. C5 to C8 should be given by the unit gas officer.

7. Serial No. D1 is, probably, the most important part of the junior leader's gas training. The outdoor problems given in Secs. 29 to 40 may be useful as a guide. It is recommended that at least two periods be devoted to night exercises.

8. Serial No. E1 should include two periods at a gas compound (Sec. 28); discussions (especially on C5, C7 and D1); and the Gas Film (Appendix B).

9. Serial Nos. E2 and E3—For N.C.O. students, oral examinations are recommended in preference to a written paper.

10. A course of 48 periods, at nine periods a day, would occupy five full days, with three periods (the oral examination and concluding talk) on the final morning, e.g. Monday to Saturday.

APPENDIX E

NOTES ON RESPIRATOR CARRIAGE AND DRILL

The positions in which the respirator may be carried, and the drills for obtaining protection from them, are dealt with in Secs. 8 and 9 (Initial Lessons No. 4 and No. 5). Details of the positions and drills vary with the type of connecting tube (short or long) and the type of haversack (Mark VI or Mark VII). The following instructions should be observed:—

A.—General

1. Numbers under instruction not to exceed 16 to each instructor.
2. Field service marching order is required when teaching respirator carriage and drill.
3. Those under instruction to form a semi-circle facing the instructor.
4. Respirators to be inspected at the beginning of each lesson period to ensure that they are serviceable for drill purposes.

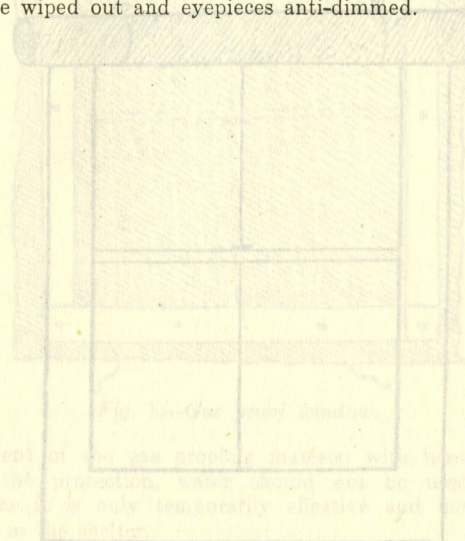
B.—Carriage of respirator

1. When teaching the positions in which the respirator may be carried, the object is to ensure that the position adopted is correct. Respirator carriage is therefore not taught as a drill.
2. The positions in which the respirator may be carried should be taught in the following sequence:—
 - i. Instructor states the position to be taught.
 - ii. Instructor adopts position without giving any detail.
 - iii. Instructor brings out points in lesson.
 - iv. Students adopt position, instructor correcting faults in final adjustment.

C.—Respirator drill

1. To obtain protection by adjusting the facepiece, accuracy and speed are essential. When testing for gas, speed is not important, but a correct sequence is necessary. Both are therefore taught as drills.
2. Drill teaching must not be hurried.

3. Before teaching a drill, ensure that respirators are carried in the appropriate position.
4. Respirator drills should be taught in the following sequence:
 - i. Instructor states the drill to be taught.
 - ii. Instructor demonstrates actions, explaining as he does so.
 - iii. Students imitate instructor, the instructor giving details and performing movements with students.
 - iv. Students practise as individuals, instructor correcting faults.
 - v. Instructor interrogates students.
 - vi. Repetition. Students carry out the drill on word of command of instructor.
5. Whenever the facepiece is removed (and before it is returned to the haversack) the eyeshield and helmet should be replaced in position on the head.
6. At the end of each drill lesson period, the inside of facepiece should be wiped out and eyepieces anti-dimmed.



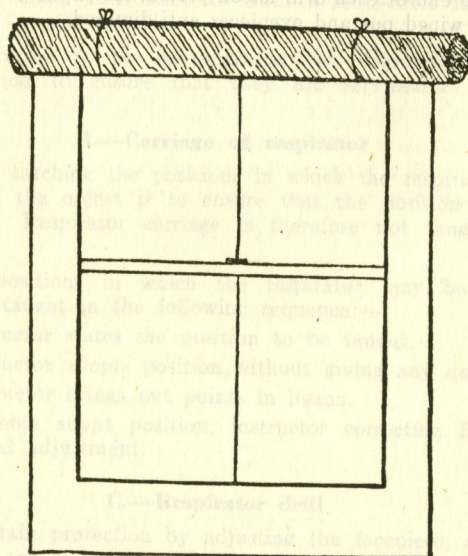
APPENDIX F

METHODS OF GAS PROOFING

1. *General*.—When an air attack is imminent, shutters, where provided, will be fixed in window frames. Complete protection against the entry of any type of gas can be obtained by the gas proofing methods described below. Should a gas proof room be holed by blast or splinters, it may be possible to preserve the gas proofing by the use of extra material held in readiness inside the building. Should this be impossible respirators should be used to give protection.

2. *Windows*.—As windows should be opened the provision of inside gas proofing is necessary.

A.—Curtain rolled.



NOTE.—Battens and nails, for sides and bottom, placed inside rolled blanket.

Fig. 1 shows one method. Gas proofing material (cloth, union, anti-gas; blankets; closely woven carpets; cotton or linen sheets backed with strong brown paper, etc.) of a size to overlap the whole window should be held in place at the top by a wooden batten. When not in use the curtain may be rolled up to this batten and held in place by strings. Spare battens cut to size with the necessary screws or nails should be available for holding the bottom and sides of this curtain against the window frame.

In the case of iron framed windows, the bottom and sides of the curtain when in use should be fixed to the wall with adhesive tape 2 in. to 4 in. wide.

B.—Curtain in position.

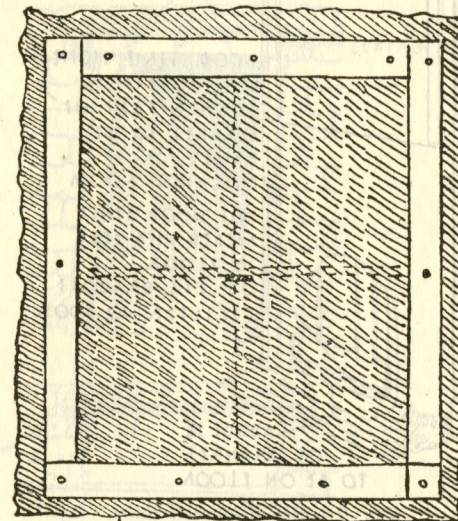


Fig. 1.—Gas proof window.

Treatment of the gas proofing material with heavy oil will increase the protection, water should not be used for this purpose as it is only temporarily effective and increases the humidity in the shelter.

Improved protection against both gas and glass splinters is given by a frame of iron or wood which will fit accurately on the inside of the window. Over this frame may be placed galvanized iron sheeting, ply wood, or blanket material supported on both

sides by small mesh wire netting. The frame should be provided with strips of felt or other material to ensure close contact with the window frame. Wedges or bolts with butterfly nuts should be available for fixing this frame quickly in position.

3. *Doors.*—Doors may be rendered gas proof by fixing strips of suitable material (felt, rubber, baize, blanket) all round the edge of the door or door frame; a wooden strip may be necessary in addition at the bottom of the door.

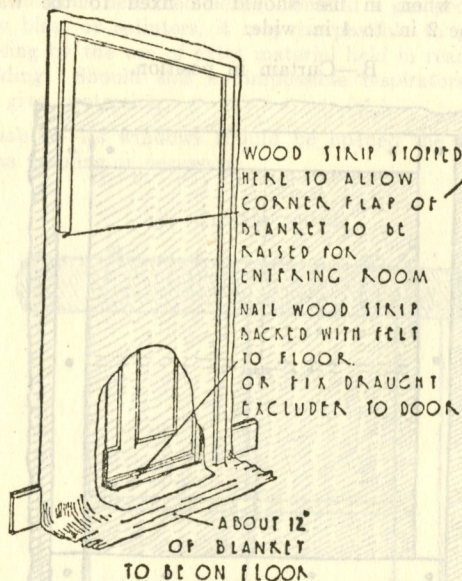


Fig. 2.—Gas protected door.

Alternatively doors may be treated in a way similar to that recommended for windows, with the following modifications:—The gas proof curtain should be outside the door; the batten on the handle side of the door should end about 5 feet from floor level to allow the blanket to be raised by a person using the door; about 1 foot of blanket should be left trailing on the floor and a weight should be fixed to bring the blanket back into place after the door has been used. In cases where the door opens outwards, the material forming the curtain should be increased to allow for this (see Fig. 2).

4. *Air locks.*—In all gas proof shelters entrances which may have to be used during an air raid should be fitted with "air locks." These are compartments with two gas proof doors or curtains through which a person entering or leaving the shelter must pass. By having one or other of these doors closed the direct passage of air from outside into the shelter can be prevented. Gas entering the air lock will be diluted to such an extent that when the inside door is opened, any gas entering the shelter will be so weak as to be harmless. For this reason, the larger the space inside the air lock the greater the protection it will give.

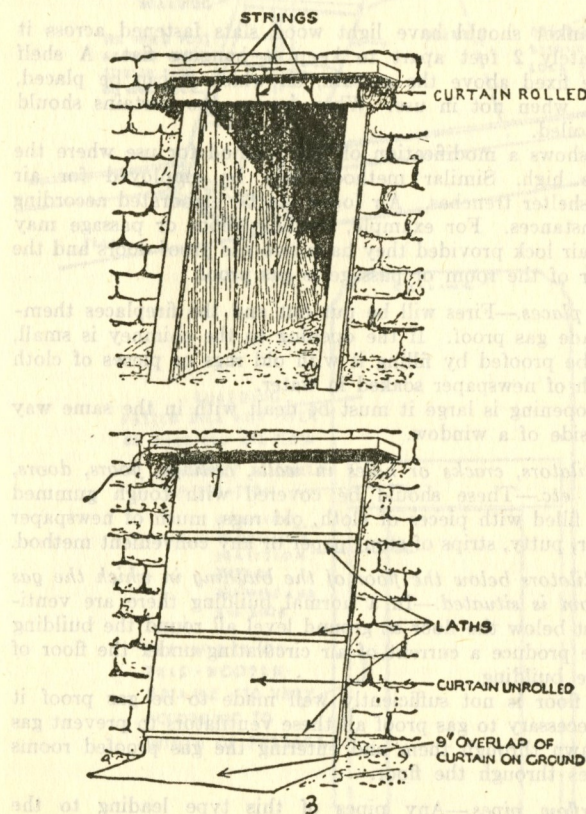


Fig. 3.—Air lock.

Fig. 3 shows one method of construction, by setting up two blanket curtains across the entrance passage. The curtains should be at least 4 feet apart; 10 feet should be aimed at to give greater protection and to allow for a stretcher case with bearers to enter. The best arrangement is for the blankets to rest on inclined frames to ensure a close fit.

NOTE.—Frame 4 in. by 1 in. timber covered with anti-gas material sloping at 20 degrees from the vertical.

Laths on the underside 1 ft. shorter than those on the front. Lowest laths 4 in. from the ground.

Any wires or pipes to pass through the frame and made gas tight.

The blanket should have light wood slats fastened across it approximately 2 feet apart to keep it hanging flat. A shelf should be fixed above the curtain, on which it can be placed, rolled up, when not in use. When in use the curtains should be kept oiled.

Fig. 4 shows a modification of this method for use where the ceiling is high. Similar methods may be employed for air locks in shelter trenches. Air locks can be elaborated according to circumstances. For example, a whole room or passage may form an air lock provided they have two gas proof doors and the remainder of the room or passage is gas proof.

5. *Fire places.*—Fires will be put out and the fireplaces themselves made gas proof. If the opening to the chimney is small, this can be proofed by filling it with old rags or pieces of cloth or a mush of newspaper soaked in water.

If the opening is large it must be dealt with in the same way as the inside of a window.

6. *Ventilators, cracks or holes in walls, ceilings, floors, doors, keyholes, etc.*—These should be covered with tough gummed paper or filled with pieces of cloth, old rags, mush of newspaper and water, putty, strips of stout paper or any convenient method.

7. *Ventilators below the floor of the building in which the gas proof room is situated.*—In a normal building there are ventilators just below the floor at ground level all round the building and these produce a current of air circulating under the floor of the whole building.

If the floor is not sufficiently well made to be gas proof it will be necessary to gas proof all these ventilators to prevent gas being drawn through them and entering the gas proofed rooms themselves through the floor.

8. *Overflow pipes.*—Any pipes of this type leading to the outside should be plugged.

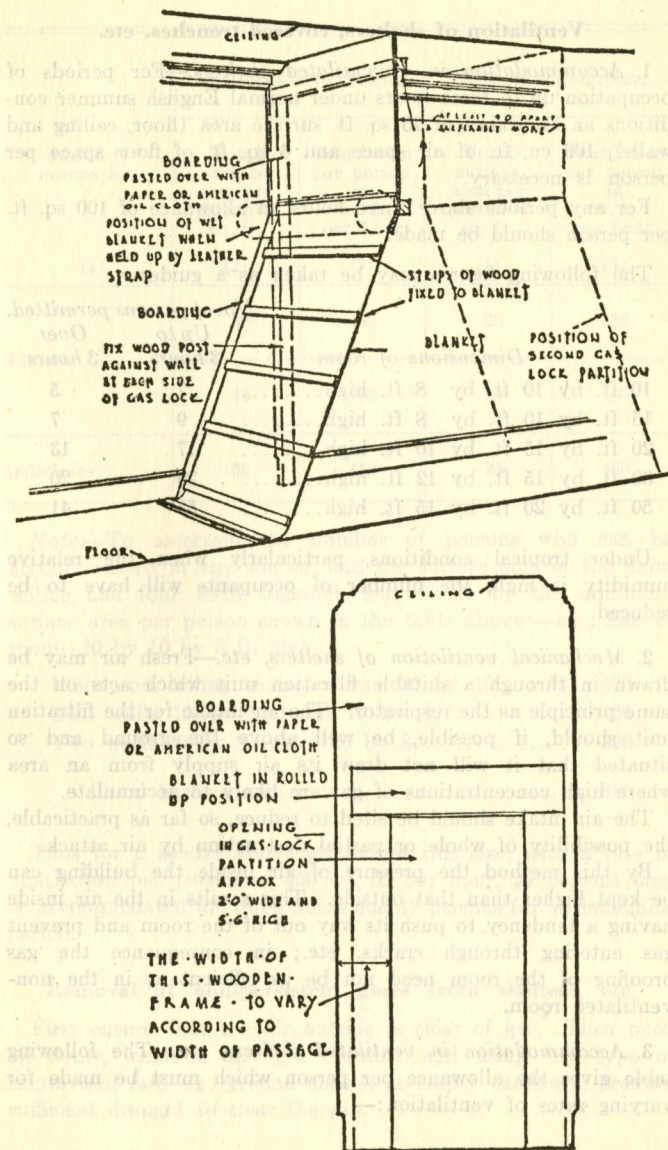


Fig. 4.—Air lock constructed with blanket screens. Sketch (above) and Elevation (below).

Ventilation of shelters, covered trenches, etc.

1. *Accommodation in unventilated shelters.*—For periods of occupation up to three hours under normal English summer conditions an allowance of 75 sq. ft. surface area (floor, ceiling and walls), 160 cu. ft. of air space and 6 sq. ft. of floor space per person is necessary.

For any periods above three hours an allowance of 100 sq. ft. per person should be made.

The following figures may be taken as a guide:—

Dimensions of room	No. of persons permitted.	
	Up to 3 hours	Over 3 hours
10 ft. by 10 ft. by 8 ft. high.....	7	5
15 ft. by 10 ft. by 8 ft. high.....	9	7
20 ft. by 15 ft. by 10 ft. high.....	17	13
30 ft. by 15 ft. by 12 ft. high.....	26	20
50 ft. by 20 ft. by 15 ft. high.....	55	41

Under tropical conditions, particularly when the relative humidity is high, the number of occupants will have to be reduced.

2. *Mechanical ventilation of shelters, etc.*—Fresh air may be drawn in through a suitable filtration unit which acts on the same principle as the respirator. The air intake for the filtration unit should, if possible, be well above the ground and so situated that it will not draw its air supply from an area where high concentrations of gas are likely to accumulate.

The air intake should be sited to reduce, so far as practicable, the possibility of whole or partial destruction by air attack.

By this method the pressure of air inside the building can be kept higher than that outside. This results in the air inside having a tendency to push its way out of the room and prevent gas entering through cracks, etc.; in consequence the gas proofing of the room need not be as efficient as in the non-ventilated room.

3. *Accommodation in ventilated shelters, etc.*—The following table gives the allowance per person which must be made for varying rates of ventilation:—

Period of occupation	Shelters above ground		Shelters underground	
	Total surface area per person in sq. ft.	Ventilation per person in cu. ft. per hour	Total surface area per person in sq. ft.	Ventilation per person in cu. ft. per hour
(1)	(2)	(3)	(4)	(5)
3 hours.....	30	450	20	450
	40	150	20	150
Indefinite.....	50	450	25	450

Note.—To ascertain the number of persons who can be accommodated in any shelter, add the surface area of the floor, ceiling and four walls together, and divide by the minimum surface area per person shown in the table above:—e.g., Size of room—20 by 10 by 8 ft. high.

Floor and ceiling surface=twice 20 by 10.....	400
Two walls 10 by 8=twice 10 by 8.....	160
Two walls 20 by 8=twice 20 by 8.....	320
Total surface area.....	880

Thus for a shelter above ground of this size, with a rate of ventilation per person of 450 cu. ft. per hour, 29 persons may be accommodated for three hours and 17 persons for an indefinite period.

Removal of non-persistent gases from shelters, etc.

First ensure that the air outside is clear of gas. Then open all doors, windows and gas curtains, and using any type of improvised fan, e.g., ground sheets, or empty sandbags, produce sufficient draught to clear the gas.

In deeper forms of dugouts some type of fire, e.g., a brazier, is the best method of clearing out the gas. If there is only one exit, the fire should be placed about one-third of the distance from the bottom of the exit. If there are two or more exits, first find, by means of burning paper, which entrance tends to take the air in and which tends to take the air out, then place the fire in the latter. The object of the fire is to heat the air which then rises drawing after it the air and gas in the dugout itself.

APPENDIX G

GAS CLEANSING CENTRES

1. *General.*—They are intended to be places where unwounded and contaminated personnel can be treated and where washing and clothes-changing facilities are available.

While the principles laid down are applicable to any such centres, the arrangements that can be made in the field will necessarily be less elaborate. This is offset by the fact that in the field every officer and other rank has the means of carrying out his own personal decontamination.

In rear areas and rest billets it may be possible to allot a room in which contaminated clothing may be changed, and bleach baths and shower baths given. In the case of deployed units, however, it will seldom be practicable to do more than decentralize the reserve clothing to sub-units. In static conditions there may be circumstances in which unwounded men contaminated by blister gas vapour may be sent to a point where clothes can be changed, and where it may sometimes be possible to provide facilities for them to wash with soap and water. Such a point would be in fact a simple gas cleansing centre.

It would be impracticable to provide a fully equipped centre within ten minutes' reach of every individual, so that even if facilities for changing clothes and washing were provided as outlined above, it cannot be too strongly emphasized that the responsibility for his own personal decontamination from liquid blister gas would still rest upon every unwounded officer and other rank.

The gas cleansing centres must not be confused with that portion of every regimental aid post in which contaminated *wounded* men are cleansed before receiving medical treatment.

2. *Organization.*—It is designed to accept contaminated personnel at one entrance, to pass them through a series of rooms where they are cleansed and to evacuate them, ensuring throughout the procedure that no man can be subject to further contamination.

The following is an outline of the procedure:—

i. *Dumps for arms, steel helmets and equipment.*—Dumps for arms, steel helmets and equipment will be established outside the entrance to the centre. Here arms and equipment (military units only) and steel helmets will be deposited before entering.

- ii. *Entrance*.—Boots will be removed in the area allocated for this purpose.

No person is allowed to enter the verandah until this has been carried out, thus ensuring that no free liquid blister gas is carried into the centre on the boots.

- iii. *Verandah*.—Inside the entrance there should be a verandah or covered space, open to the air at the sides; where a suitable covered area is not available, a space in the open should be fenced off.

Here cases which are seen to be heavily contaminated should be segregated from those lightly contaminated.

Valuables should be placed in specially numbered bags provided at the centre, the owner being given a tally with a number corresponding to that on the bag, to facilitate return later.

Each individual, after rubbing anti-gas ointment well into the skin of his hands, will here remove respirator or eyeshields, and outer clothing. To prevent a concentration of gas vapour, free air circulation must be assured and the clothing, particularly heavily contaminated pieces, should be placed in bins or anti-gas bags at the earliest opportunity.

To facilitate the return of clothing and other articles to their owners some system of identification must be adopted.

- iv. *Undressing rooms*.—In these rooms all underclothes will be removed and placed in bins. Undressing rooms should be well ventilated to obviate any danger from vapour.

- v. *"Clean and dirty line"*.—To prevent the spread of contamination to those who have already been cleansed, a "clean and dirty line" must be clearly marked between the undressing and cleansing rooms; no person will be permitted to pass this line until completely undressed.

- vi. *Cleansing rooms*.—In the cleansing room there will be two alternative types of treatment. Those previously segregated as being heavily contaminated will bathe in bleach paste of a creamy consistency rubbing it well into the skin, and then wash off the bleach under a shower, eyeshields being worn to prevent the bleach entering the eyes.

If, nevertheless, bleach has entered the eyes, it must be washed out with clean cold water and an eye douche should be provided for this purpose.

The remainder will wash thoroughly with soap and water under the shower. There must be good control to prevent delay; a maximum of two minutes use of the shower by each man should be sufficient.

- vii. *Dressing rooms*.—In the dressing room clean clothing, respirators, eyeshields and anti-gas ointment will be issued.

- viii. *Action after cleansing*.—In the case of military personnel, men, after being cleansed, will rub ointment thoroughly into their hands and then collect and decontaminate their arms.

Rifle slings will be deposited in the equipment area. Men carrying out this decontamination work will remain on the side opposite to the entrance pen to avoid contaminated ground.

Fresh equipment will be issued to them from the unit reserve as soon as the situation allows, the contaminated equipment being collected for decontamination.

- ix. Valuables will be returned at the first opportunity under unit or establishment arrangements.

3. *Construction and fittings*.—The following instructions should be noted with regard to construction and fittings:—

- i. *Protection*.—Cleansing Centres should be splinter proof.

- ii. *The area for arms, equipment and boots*.—This should be marked by wire. The fencing should not be higher than 2 ft. 6 ins.

- iii. *Floors and interior walls*.—Should be made of material which does not readily absorb blister gas and is easily decontaminated. Where possible a building should be chosen with rooms which approximate to the arrangement and dimensions given at page 100. In many cases improvised partitions made of material such as three-ply wood or canvas will have to be used. Verandah walls and those of the undressing and cleansing rooms should if possible be faced to a height of 4 ft. with some impermeable material which can be easily decontaminated.

- iv. *Drainage*.—The verandah and the undressing and cleansing rooms should be provided with runaways to carry away used water; as this water may be contaminated, the runaways should lead to drainage sumps which can be decontaminated with bleach.

- v. *Ventilation*.—Good ventilation is essential.
 - vi. *Pens for contaminated clothing*.—Rabbit wire or similar material may be used to form the outside of these pens.
 - vii. *Bleach bath*.—For the bleach treatment in the cleansing room one long cement trough or baths, made of any material not liable to corrosion by bleach, may be used. The baths should be covered with wooden lids when not in use.
 - viii. *Showers*.—Any available piping fitted with sprays (whether improvised or otherwise) will be suitable for equipping the shower baths. No sides to the baths are necessary. When possible a warm water supply for the shower baths should be provided.
 - ix. *Tables and chairs*.—Should be covered with nonabsorbent material such as American cloth.
 - x. *Notices*.—To prevent confusion notices should be displayed indicating each stage of the process. It is essential that all personnel should be trained in the procedure in peace time.
 - xi. *General*.—In many cases, however, existing buildings of varying sizes will have to be used and the lay-out modified accordingly.
The essentials are that the "clean and dirty" line is clearly marked and provision made for a separate entrance and exit.
4. *Staff*.—The normal staff of a gas cleansing centre will consist of a non-commissioned officer or responsible official and four men. Their duties will be as follows:—
- i. *The N.C.O. or official in charge*.—Is responsible at all times during a state of emergency that the centre is fully equipped and prepared for use. During an air raid he will be clothed in a light anti-gas suit, rubber knee boots, gloves and respirator. The respirator will be worn in the alert position unless gas is smelt. Whilst the centre is being used he will supervise generally the "dirty" side of the "clean and dirty" line. He will detail each person for the requisite treatment, and ensure that contaminated clothes are placed in anti-gas bags as soon as possible. After the centre has been used he will arrange for the despatch of clothing and equipment to be decontaminated and for the return of valuables to

- their owners. He will supervise the decontamination of the centre, replacement of necessary clothing and equipment and replenishment of bleach paste in baths, etc.
- ii. *Reception*.—One man whose place will be on the verandah will be clothed in the same way as the N.C.O. in charge. His duties are to receive personal belongings, place them in a bag and to give the owner a duplicate tally number.
- iii. *Cleansing room*.—One man wearing eye-shields and equipped in a light anti-gas suit or coat, and rubber boots, with his respirator near at hand, is responsible for supervision of the bleach treatment and shower baths. A second man similarly dressed, but without eye-shields, will issue towels and give eye douche treatment.
- iv. *Dressing room*.—One man in ordinary clothes, with respirator near at hand, is responsible for the issue of clothing, respirators, eye-shields and ointment.

5. *Women*.—Similar centres with female staffs will be provided for women.

Gas defence centres

1. *Object*.—In every area there will be one or more gas defence centres, the number depending on the size of the area. These centres are the headquarters from which the decontamination squads will operate, and at which their anti-gas clothing and the tools and material required will be stored. In addition, bathing facilities will be provided for decontamination squads and other personnel of the P.A.D. services (except first aid and medical personnel) who have been working in contaminated areas.

2. *Organization*.—

- i. Where possible the building should be splinter proof.
- ii. It should be centrally placed and in communication with the headquarters of the unit.
- iii. Cleansing arrangements, construction and fittings should be on the lines of those for a gas cleansing centre.
- iv. In the dressing room, pegs or hanging cupboards will be provided for each member of the decontamination squads, where clothing and equipment is held in readiness. Cupboard accommodation will also be required for storing clean clothing for other members of P.A.D. services.

v. A store for the tools and equipment of decontamination squads will be required in the building or in the immediate vicinity.

3. *Procedure for cleansing.*—The procedure for cleansing personnel is similar to that carried out at a gas cleansing centre. As personnel will normally have been wearing anti-gas clothing, the main object of cleansing is for hygienic purposes. Should anti-gas clothing have been torn, blister gas may have penetrated and a bleach bath will be necessary. In all other cases the use of soap and water is all that is required.

Normally personnel will undress themselves, first removing anti-gas gloves, then rubbing ointment thoroughly into their hands and finally removing the remainder of their outer clothing. These outer garments will be placed in the outside pen for decontamination later. Assistance may be necessary if a man is exhausted.

Decontamination squads, after bathing, will dress again, in the clothes which they removed before putting on anti-gas clothing. Other P.A.D. personnel will be provided with clean clothing as at the cleansing centre.

4. *Staff.*—The normal staff of a gas defence centre, apart from decontamination squads based on the centre, will consist of a N.C.O. or responsible official and three men.

i. *The N.C.O. or official in charge* of the centre will carry out duties similar to those of the N.C.O. in charge of a gas cleansing centre. He will wear a light anti-gas suit and gloves, rubber knee boots and respirator. His respirator will not be adjusted in the gas position unless gas is smelt.

ii. *Cleansing room.*—One man will supervise the cleansing room. He will assist in bleach treatment, give any necessary first aid required and issue clean towels. He will wear ordinary clothes, rubber knee boots, and a waterproof apron, keeping his respirator near at hand.

iii. *Dressing and waiting room.*—One man will supervise procedure and issue the necessary clothes. He will wear ordinary clothes and carry his respirator.

iv. *Equipment store.*—One man will act as storeman for decontamination tools and material. He will wear ordinary clothes and carry a respirator.

Decontamination squads

1. *Organization.*—Each squad will consist of a N.C.O. and five men and should be chosen from personnel who have not previously been seriously affected by blister gas.

Each unit will have one or more squads, the number depending on the size of the area to be covered.

2. Duties.

i. Decontamination squads must be available for duty at all times. Sufficient personnel must therefore be trained to allow for reliefs.

ii. Immediately the air raid warning is sounded, squads detailed for duty will report at the gas defence centre where they will remain until the "All Clear" has been sounded unless called on for duty.

If given a task they will dress in the underclothes and anti-gas clothing held in readiness for them. The leader of each squad will ensure that personnel are properly dressed.

iii. Tasks will be allotted by the P.A.D. officer and squads will normally proceed thereto in vehicles detailed for this purpose.

iv. The following are duties which squads may be called on to perform:—

(a) Contaminated areas and buildings will be railed off, marked with warning signs and left to weather. Where necessary personnel down wind of such areas or inside contaminated buildings will be evacuated temporarily.

(b) Contaminated areas or buildings of vital importance will be decontaminated, unless their size is too great for decontamination to be practicable.

(c) Where a large number of blister gas bombs have fallen in an area, through which pedestrian or vehicular traffic is necessary, safe routes will be marked or roped off.

v. On completion of their tasks squads will return to the gas defence centre.

vi. Personnel will undress and bathe, carrying out personal decontamination if necessary.

vii. As soon as the situation allows the N.C.O. will supervise the decontamination of all tools and stores and their return to store.

GAS CLEANSING CENTRE

