

(S.S. 419.)

FOR OFFICIAL USE ONLY.

Note.—The information given in this document is not to be communicated either directly or indirectly to the press or to any person not holding an official position in His Majesty's Service.

DEFENSIVE MEASURES AGAINST GAS ATTACKS.

NOTE.—This Pamphlet cancels C.D.S. 307, S.S. 388 and S.S. 401.

I. GENERAL REMARKS.

The following notes on defensive measures against hostile attacks by gas or by gas shells have been compiled for the guidance of regimental officers in instructing their men and giving orders on this subject. They deal with the methods by which these attacks are carried out, with the preparations necessary to combat them successfully and with the action to be taken when an attack occurs. An important object of all instruction to troops in the methods of resisting gas attacks should be to inspire confidence. If the nature of the gas attack is understood and protective measures are carried out automatically as the result of effective practice, the effect of a gas attack becomes very small. It cannot be impressed too strongly on men that by moving to the rear they would move with the gas and in breathing more deeply they would run more risk of being "gassed." The protection provided by the tube helmet against all forms of gas hitherto used by the enemy is so complete, that the material effect of a gas attack will be negligible, provided that men know how to adjust their helmets and that these have been regularly inspected and kept in good order. In all gas attacks, since protection has been provided, those battalions which have been carefully instructed in the use of the helmet or respirator have come through practically unharmed, while other battalions in which this instruction has been neglected have suffered severely.

The experience of recent gas attacks has shown that in order to reduce gas casualties to a minimum, the utmost care must be taken—

- (a) In inspection of helmets.
- (b) In training all ranks in quick adjustment of the tube helmet under all conditions.
- (c) To ensure that every man, whether in front or support lines, shall be given immediate warning.

Every officer is responsible that the men under his command are properly instructed in defensive measures against gas attacks, and that standing orders on the subject are thoroughly understood.

Method of making a gas attack.

A cloud gas attack cannot take place unless the wind is in the right quarter to blow the gas in the desired direction. The gas is carried up to the trenches compressed in steel cylinders. These are dug in at the bottom of the trench and connected with pipes leading out over the parapet. When the valves of the cylinder are opened, the gas escapes with a loud hissing sound, it mixes with the air and is carried by the wind towards the opposing trenches, spreading out as it goes forward. A continuous wave of gas and air is thus formed, the colour of which may vary—

- (a) Because of the weather conditions. On a dry day the gas may appear greenish in colour while in damp weather it forms a white cloud.
- (b) Because it may be mixed with smoke of any colour.

The speed with which the gas cloud approaches depends entirely on the wind velocity. Gas attacks have been made with wind velocities varying from 3 to 15 miles per hour, i.e., from $1\frac{1}{2}$ to $7\frac{1}{2}$ yards per second. In a 9-mile wind the gas would reach trenches 100 yards distant in 20 seconds. The rapidity with which the gas cloud travels makes it essential that troops should be trained in adjusting their helmets as rapidly as possible, and their warning of an approaching gas attack should be given without any delay. The earliest warning of a gas attack is given—

- (i) By the noise of the gas escaping from the cylinders.
- (ii) By the appearance of a cloud of any colour over the enemy's trenches. If the attack takes place at night, the cloud will not be visible from a distance.
- (iii) By the smell of the gas in listening posts.

Gas attacks have been made on fronts varying from 1 to 5 miles; their effects at points several miles behind the front trenches have been sufficiently severe to make it necessary to wear helmets.

II. TACTICAL PROTECTIVE MEASURES.

It is important that all measures taken should be carried out with the utmost calm in order to avoid confusion and waste of energy.

1. Wind observation.

Wind observations will be made at regular intervals by officers of all units in the front line, so that all ranks may be warned when conditions are favourable for a hostile gas attack.

2. When the wind is favourable for a gas attack—

- (a) At night, sentries should have at least two men within reach of them, so that the alarm can be spread rapidly.
- (b) Men will be forbidden to wear macintosh sheets round their shoulders or mufflers round their necks and will have the top button of both greatcoat and tunic undone, in order to facilitate rapid adjustment of the helmet.
- (c) A sufficient number of sentries will be posted over large dug-outs, or groups of dug-outs, to ensure that all sleeping men can be roused without delay. All men within 300 yards of the enemy should sleep on the fire-step instead of in dug-outs, when a gas attack is probable.
- (d) When thought necessary, additional inspections of helmets should take place.
- (e) Sentries should be told off for warning the Company and Battalion Headquarters and the Artillery Observation Post, if there is one in the trench.
- (f) At night and at all times when a gas attack is expected, men in advanced trenches will wear the helmets rolled up on the head so that these can be pulled down and adjusted without delay.
- (g) Commanders of units in billets in rear of the trenches but within the area of danger from gas, will organize a system of giving the alarm and rousing all men in cellars or houses, on receipt of information of a gas attack.

ALTERNATIVE METHOD OF WEARING ANTI-GAS HELMETS WHEN WIND IS FAVOURABLE FOR A GAS ATTACK (SEE II, PARA. (f))

1. Put the helmet on in the usual way. Pin the front edge of the helmet and the top edge of the opened waterproof satchel to the shirt with two safety pins in such a manner that the helmet may be readily pulled on and off the head without removing the pins, the satchel hanging loose below it.

2. Leaving the safety pins in position, remove the helmet and fold it to the usual width, keeping the valve horizontal and flat. Now roll up the helmet and tuck it inside the jacket. Cover with the waterproof satchel by pulling up the latter so that it lies in front of the helmet, and button up the jacket with the exception of the top two buttons.

3. On the gas alarm sounding, pull out the helmet, pull it over the head, and adjust in the usual manner. The waterproof bag hangs suspended by the pins and is ready for use if required.

The adoption of this method avoids the irritation of the forehead that sometimes follows wearing the helmet rolled up on the head.

3. Gas Alarm.

Appliances for giving the alarm in case of gas attack must be carefully organized in advance. These require to be of two kinds: The first in the form of gongs, rails, etc., at each sentry post, which will be beaten directly gas is detected and will arouse the men in their immediate vicinity, the signal being passed along by all sentries as soon as heard. The second kind will be for the purpose of conveying the alarm to troops in support or reserve lines, such as hooters worked by compressed air (Strombos horns), in order to supplement telephonic communication and in case the latter breaks down. No reliance can be placed on methods of communication involving the use of the lungs, e.g., bugles or whistles. Sentries must be prepared to give the alarm on the first appearance of gas, as a few seconds delay may involve serious consequences. Empty compressed air cylinders for Strombos horns should be returned for recharging to the Heavy Mobile Workshop of the Army concerned.

4. Action to be taken on gas alarm signal.

- (a) All ranks put on tube helmets (or box respirators in the case of units equipped with them).

- (b) Rouse all men in trenches or dug-outs and mine-shafts, warn officers and Artillery Observation Posts, etc.
- (c) Company Commanders call for artillery support and warn battalion headquarters and troops in rear by means of pre-arranged signals.
- (d) Infantry man parapets and bring rifle and machine gun, and where practicable, trench mortar fire to bear on the trenches whence the gas is issuing.
- (e) Let down and fix carefully the blanket curtains at entrances to dug-outs and cellars so protected.

5. General precautions during gas attack.

Officers and N.C.O.'s must not raise their helmets to give orders. The tube may be removed from the mouth, when it is necessary to give an order, but must be replaced.

Men must always be on the lookout to help each other in case a helmet is damaged by fire or accident. When a man is wounded, he must be watched to see that he does not remove the helmet; if necessary his hands should be tied.

Men must be warned that if they are slightly "gassed" before adjusting their helmets, they must not remove them. The effect will wear off.

When the cloud has passed, the men in charge of Vermorel sprayers and fans must be ready to clear the trenches of gas when ordered. When this has been done, the order to raise tube helmets will be given by the officer of N.C.O. in charge of each section of trench. Before doing this he must ascertain that the trench is free from gas by raising a little of the skirt of his helmet and smelling carefully. Men must on no account raise their helmets until the order has been given. *Helmets will then be worn rolled up on the head in case more gas is encountered.* Even when the trenches are clear of gas, dug-outs and cellars must be entered with caution, as cases of "gassing" have occurred some hours after the gas cloud has passed.

If Vermorel sprayer solution fails, and gas still hangs in trenches and dug-outs, it should be fanned out by means of fans and sandbags.

Rifles and machine guns should be cleaned after a gas attack, as the gas affects them injuriously. If ammunition boxes are kept closed and machine guns, rifles and ammunition not in boxes are kept well oiled and are fired occasionally during a gas attack, there is little risk of jamming. Oil cleaning will prevent corrosion for twelve hours or more, but the first avail-

able opportunity should be taken to dismantle the gun and clean the parts in boiling water containing a little washing soda. If this is not done, corrosion continues slowly even after the oil cleaning, and may ultimately put the gun out of action.

Battery Commanders should be reminded that aiming posts are liable to be obscured by the gas cloud, and that arrangements should be made in every battery to meet this eventuality by providing gun pits with means to check the line of fire, if necessary, without depending on the use of aiming posts.

6. Fires as a protection against gas.

No reliance is now placed by the Germans on the use of lines of flame as a means of "raising" and dissipating the gas cloud. Careful experiments have proved that this method is without any real value as a defensive measure against gas attacks.

III. TECHNICAL PROTECTIVE MEASURES.

1. Tube Helmets.

The tube helmet is the main defence against a gas attack, and great care must be taken by officers to ensure that the helmets are in good order, and that the men have been trained in their use. The main point to impress on them is that the chemically-treated material acts as a filter, and that all air breathed into the lungs must pass through the flannelette. The helmet is, therefore, useless unless properly tucked in under the tunic. During its passage through the material of the helmet, all poisonous gas is absorbed by the chemicals. These chemicals, however, would be gradually destroyed by the breath or by undue exposure to the air, and the helmet is therefore provided with a valve to breathe out through. The helmet in possession of the man should be exposed as little as possible to the air, and must not be used for practice.

Both tube helmets issued to officers and other ranks are invariably to be on the individual. This refers not only to units in the trenches, but to all units and individuals when within 2 miles of the front line. They will be carried in satchels slung outside equipment and greatcoats, when these are worn, so that they can readily be got at and detached for wearing. They must be kept from exposure and wet, and only removed from their containers for inspection.

(A) *Inspection of Tube Helmets.*

Helmets must be inspected once a week, or more frequently if a gas attack is considered imminent. Attention must be paid to the following points:—

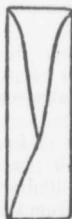
- (i) See that the satchels and containers are in good order.
- (ii) See that the helmet is properly folded with the valve flat, and no strain on the flannelette round the valve seating.
- (iii) Valves. The two parts of the valve screw together. The joint should be tight and should grip the flannelette. The mouthpiece should be horizontal. See that the rubber valve is fastened securely to the metal. Each man must test the valve of his helmet by breathing through it. He should not be able to breathe *IN* easily through the valve. The valve rubber sometimes becomes hard; this can be remedied by breathing out through the valve for about a minute at each helmet inspection.
- (iv) Eyepieces. These should be screwed up tightly from the inside, and should grip the flannelette. Screw threads must not be crossed. The glasses must not be cracked or loose.
- (v) There must not be the smallest hole through which gas might enter. Particular attention must be paid to the flannelette round the eyepieces and valve seating.
- (vi) Dating. It is most important that the date of issue should be entered on each helmet in indelible pencil. Helmets deteriorate slowly, and will be withdrawn after a certain period which will be notified from time to time. If at any inspection the date is found to be indistinct, the helmet must be remarked with the original date.
- (vii) Wet tube helmets are effective against gas if they have been kept in the containers and satchels and these have been kept in good condition and well fastened up. If, however, they become so **SODDEN** with water that it is impossible to breathe through them, they must then be condemned.
- (viii) During hot weather helmets may become so dry as to diminish in efficiency. Under these circumstances, when units come back into rest billets, the men will be paraded by companies and the helmets inspected and,

if necessary, sprayed under arrangements by the Divisional Gas Officer, plain water from Vermorel sprayers being used for the purpose. On no account will Vermorel sprayer solution be used.

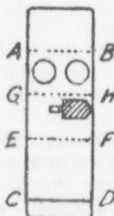
Do not hesitate to condemn helmets of which the defects cannot be immediately rectified.

(B) *Instructions for folding the Tube Helmet.*

- (i) Lay helmet down, with window underneath, and fold over the sides as shown in Fig. 1.
- (ii) Turn over helmet and arrange valve as shown in Fig. 2.
- (iii) Fold down top along line A—B, Fig. 2, as shown in Fig. 3.
- (iv) Fold back the bottom along C—D, Fig. 2.
- (v) Fold up bottom again along E—F, Fig. 2, so as to cover valve as shown in Fig. 3, taking care that valve is quite flat.
- (vi) Fold along G—H in Fig. 3.



1.



2.



3.

- (vii) To avoid fraying of material round the valve-seating or eyepieces, see that the material is *folded loosely without unnecessary strain.*

(C) *Drill.*

Tube Helmet drill should be carried out frequently by all ranks. It should aim at teaching the quick adjustment of helmets under all conditions, accustoming men to wearing them for a long time and taking exercise in them. Drill must be carried out both with and without greatcoats and equipment, and by night as well as by day.

Men must not use their own helmets for drill purposes. Helmets marked "drill" will be kept by all units for training while in rest billets.

The following points are to be noted:—

- (i) Men must be timed against a watch in removing the helmet from its container, getting it over the head and gripped at the neck with one hand so that the material is tight all round. This should take less than 10 seconds and the importance of continual carrying out of this practice cannot be too strongly emphasized. Men should be taught to hold the breath while putting on the helmet, as a few breaths drawn in concentrated gas may be followed by serious results. The remainder of the adjustment is to be completed with the free hand before the hand below the chin is removed. Officers should turn up the collars of their coats after the skirt of the helmet has been tucked in, fixing them in front by means of a safety pin carried for the purpose, or by a special button. Many cases of "gassing" have been caused by helmets not being tucked in properly under the tunic.
 - (ii) It must be seen that every man is breathing out through the valve.
 - (iii) Men must be warned that during a gas attack, the smell of the chemical on the helmet becomes stronger and causes slight irritation of the eyes, nose and throat, and that this smell does not indicate that the gas is coming through the helmet.
 - (iv) Practice in simple movements in helmets, physical drill, including arm and leg exercises, leap-frog and doubling. The time of practice should not exceed 15 minutes at first and should be gradually extended.
- Men must be accustomed to wearing their helmets for at least one hour.
- (v) Men should advance with the helmet rolled on the top of the head. At a given signal, the helmets should be pulled down and tucked in and the advance continued on rough ground.
 - (vi) Men must be taught that misty eyepieces can be cleared by rubbing against the forehead.
 - (vii) Practice in bombing, rapid loading and aiming, judging distance and range practice should be carried out while men are wearing the helmets.

- (viii) Telephone operators must be specially practised in using their instruments when wearing tube helmets. the headpiece of the receiver will be worn over the helmet. The buzzer should be used when the helmet is worn unless a message is urgent.
- (ix) Men will be practised in changing from one helmet to another without drawing breath in the process.
- (x) When used for instruction, the rubber covering of the mouthpiece should be removed. Medical Officers in care of units will arrange for the sterilization of the mouthpiece after use by means of chemical disinfectant of a suitable strength.
- (xi) Men must swallow their saliva from time to time when wearing the helmet and not allow it to drain out over the lips or through the valve.
- (xii) Officers and N.C.O's will receive the same training as the men and in addition will be practised in giving orders whilst wearing their helmets.

2. Vermorel Sprayers and Syringes.

During an attack the gas sinks into the trenches and dug-outs and remains there after the cloud has passed. Vermorel sprayers and syringes are provided for clearing out the gas when the attack has ended. They should be distributed at easily accessible points in or near the trenches and protected from shell-fire. Sprayers must be kept one-third full of water. Six gallons of the following solution for use in the sprayers must be kept in corked rum jars or other closed receptacles close to each sprayer; it must not be kept in the sprayers, owing to its corrosive nature:—

Water, 3 gallons (one large bucket).

Sodium Thiosulphate (hypo) $1\frac{1}{2}$ pounds ($\frac{3}{4}$ mess tin).

Sodium Carbonate (washing soda) 3 pounds ($1\frac{1}{2}$ mess tins).

Three rum jars are required to hold the above quantity and the necessity for keeping them corked must be impressed on the personnel responsible for it.

Each Company should have a squad of men in charge of the Company Gas N.C.O. trained in the care and use of sprayers. On taking over trenches, this N.C.O. will take over the outgoing Gas N.C.O. and will see that each sprayer is in good order and provided with solution. A man will be told off to each sprayer; he will be responsible for testing it every day and in case of gas attack he will stand by to use it when

ordered. Every Company Commander must be held responsible that all the above measures are properly applied from the moment he takes over a sector of trench.

3. Anti-Gas Fans.

Anti-gas fans will be provided for clearing trenches and dug-outs. As many men as possible should be trained in their use.

4. Gas Shell Attacks.

The Germans frequently use "gas," "lachrymatory" or "tear" shells and trench mortar bombs. The purpose for which these shells are generally employed is to produce a barrage to prevent the bringing up of supports.

The liquid contained in these shells is converted into a dense white cloud of vapour by the explosion. This causes intense irritation and watering of the eyes, and is often sufficiently concentrated to irritate the throat and cause coughing and ultimately vomiting. Sufficient liquid may remain about the shell-holes to cause discomfort for a number of days. Men should be told that no effects other than transitory sickness or discomfort have hitherto been caused by "tear" shells.

It should be remembered that a bombardment with gas shells, not necessarily lachrymatory, may take place, whatever the direction of the wind.

Goggles are being provided for the protection of the eyes. If the gas gets so concentrated that the nose or lungs also are affected, the tube helmet should be put on over the goggles.

Care and Use of Anti-Gas Goggles.

Goggles for use against gas shells will be carried in the helmet satchel by all ranks. They should be inspected weekly with the tube helmet, attention being paid to the following points:—

- (i) Windows should be unbroken.
- (ii) A piece of flannelette should be kept between the windows to prevent loss of transparency through rubbing.
- (iii) The wire should be unbroken.

Troops should be warned to put on goggles at the first sign of the presence of "tear" gas. They should be practised in the rapid adjustment of the goggles. The joint between the goggles and face must be made as tight as possible by moulding closely to the nose the wire which is present in most types of goggles.

Ordinary Vermorel sprayer solution is of little use against lachrymatory gas, but the following measures can be carried out to moderate the discomfort caused after a bombardment with lachrymatory shells:—

- (i) Keep the entrances to dug-outs closed by means of wet cloths or blankets. (See under "Protection of Dug-outs.")
- (ii) Cover up shell-holes and the ground round them with fresh earth.

Recent experience shows that while the tube helmet stops the constitutional action of lachrymatory shells, it permits enough of the irritant substance to pass to cause watering of the eyes and difficulty in "sighting" the guns in the case of artillery. In the case of infantry, goggles can be worn under the helmet, thus avoiding lachrymation. This cannot be done by artillery, as the second glass makes it difficult to see the dial readings on the sights. Special P.H.G. helmets with rubber sponge goggles which are held closely to the eyes by an elastic head band are being issued to overcome this difficulty. These will ultimately be provided for infantry also.

Glasso for Anti-Gas Goggles.

To prevent dimming from condensation of moisture, Glasso is issued to be applied to the inner surface of the windows, and also to the eyepieces of rubber sponge goggle helmets (P.H.G.) and to the rubber sponge goggles issued with box respirators. It is not intended for use with P.H. tube helmets, except when they are fitted with rubber sponge eyepieces.

A little of the paste should be applied with a dry rag to the inside of the eyepiece, rubbing it hard into the glass or film. Then polish off as much as possible with a dry rag, leaving the glass quite clear. This process must be repeated at each weekly inspection and after the goggles have been worn.

5. BOX RESPIRATORS.

Box respirators are meant for issue to selected persons and units. They furnish prolonged protection for the lungs against all poisonous substances likely to be used by the enemy, whether in the form of a gas cloud or in shells or trench mortar bombs. A pair of rubber sponge goggles is issued with each box respirator. As goggles and box respirator can be worn separately or together and put on in any order, protection is afforded

against either a gas cloud or a gas shell bombardment, or against a combination of the two, no matter which starts first.

Description.

The respirator consists of a box, packed with chemicals, connected by means of a flexible rubber tube with a face-piece. The inspired air enters through valves in the bottom of the box; the expired air is expelled through a valve just outside the face-piece. The wearer breathes *in and out* through the mouthpiece; breathing through the nose is prevented by a noseclip inserted in the face-piece.

The face-piece is soaked in chemicals and is sufficiently large to enable the wearer to take the mouthpiece from his mouth in order to speak.

General Instructions.

(i) Every one who has a box respirator will carry one tube helmet in addition. In the case of a gas attack, the box respirator will be used first.

(ii) Box respirators will be taken into the trenches and brought away from them on relief.

(iii) Box respirators will be carried or kept close at hand, at all times.

(iv) Every one having a box respirator will practice wearing it, especial attention being paid to the rapidity of adjustment. The time for which each box respirator is used for drill purposes must not usually exceed a total of one hour.

Directions for Using the Box Respirators.

(i) When in use, the haversack containing the box is to be carried on the chest, with the hook at the back tucked into the belt, and with the strap round the neck.

(ii) When the box respirator is to be used, take the face-piece out of the front pocket of the haversack but leave the tin box in its place in the other pocket.

(iii) Put the end of the mouth-tube in the mouth, with the rubber valve pointing downwards and the elastic bands on top. Close the lips round it and begin at once to breathe *in and out* through this tube; you are then protected from the poisonous gas.

(iv) While holding the tube in the mouth, place the lower edge of face-piece under the chin and pull the elastic bands

up over the head so that one is nearly on the top of the head and the other one is just above the back of the neck.

(v) Open the noseclip at the top of the face-piece by pulling on the two tabs and fit it on the lower part of the nose, so that the nostrils are closed by it, and push the top of the face-piece up under the goggles if these are being worn.

If either elastic band is loose, it can be tightened by means of the hooks at the back.

(vi) Put on your goggles if they are not already being worn.

(vii) While wearing the respirator the saliva must be swallowed from time to time to prevent moisture from accumulating in the valve or face-piece.

(viii) If it is absolutely necessary to speak while wearing the respirator, take hold of the metal mouth-tube and draw it forward clear of the mouth **WITHOUT DISTURBING THE FACE-PIECE**. When it is desired to speak, a long breath will be taken through the tube before removing it from the mouth. *Speak only while breathing out.* Put the tube back in the mouth before the next breath is drawn in. The box respirator gives complete protection as long as the breathing tube is used, but tear-gases can sometimes penetrate during speaking, if the breath is drawn in without the tube. Do not speak for longer than is absolutely necessary, and put the tube back into the mouth as soon as you have finished speaking.

Care and Inspection.

(i) Box respirators must be kept dry, and must not be subjected to rough usage.

(ii) They must be inspected once a week, attention being paid to the following points:—

(a) Face-piece, noseclip and elastic in good order.

(b) Face-piece firmly attached to mouthpiece.

(c) Rubber tube intact and firmly attached to box and mouthpiece.

(d) The expiratory valve should be tested by clipping the rubber tube, and seeing that the valve allows air to pass freely out and not in.

(e) See that the box is not damaged.

(f) See that the goggles are in order.

(iii) The eyepieces of the goggles should be rubbed with "Glasso" at each inspection to prevent dimming with moisture. Apply a little of the paste to the inside of the glass eyepiece, rubbing it hard into the glass. Then polish off as much as possible with a dry rag, leaving the glass quite clear.

6. Protection of Dug-outs.

This is desirable in the case of battalion or brigade headquarters, artillery and signal offices and any place where work has to be carried on during a gas attack, but not in the case of shelters for troops, which should be vacated at such times.

In order to protect dug-outs against gas, the entrances must be closed with well-fitting doors, or by blankets moistened with water or Vermorel Sprayer solution. Trials have shown that little gas passes through a wet blanket and the protection depends on getting a good joint at the sides and bottom of a doorway so as to stop all draughts. This can be effected by letting the blanket rest on battens fixed, with a slight slope, against the door frame. The blankets should overlap the outer sides and a fold should lie on the ground at the bottom. Types can be seen at Divisional and Army Anti-Gas Schools. If two blankets can be used with an air-space of not less than 3 feet between them, complete protection can be obtained and the entrance can be used without admitting large quantities of gas.

When not in use, the blankets should be rolled up and held so that they can be readily released, and should be sprayed occasionally with a little Vermorel Sprayer solution.

Blankets must be dropped immediately the gas alarm is given and as little movement as possible should take place in and out of a dug-out during a gas attack. Men going in or out should close one blanket carefully before raising the other and pass through very quickly.

If the blankets become stiff from a deposit of chemicals, they should be sprayed with water.

IV. LIQUID FIRE ATTACKS.

The German FLAME PROJECTOR, used against us hitherto, consists of a cylinder containing oil and compressed nitrogen, which can be carried on a man's back. The compressed gas is used to force out the oil, which ignites at the jet and spreads out in a broad cone of flame and smoke. This covers about 6 yards of front when stationary and has an extreme range of only 30 yards and a duration of ONE MINUTE. Instruments of a longer range will probably be used in the future.

The smoke is very dense and black, the flames are a yellowish red and there is a loud roaring noise. The moral effect is

liable to be great unless men are instructed in the limitations of the instrument.

The heat developed by the flames is great, but all the burning takes place in the air and the jet cannot be directed downwards owing to the upward current of air caused by the heat. A man crouching down on the firing-step or just inside a dug-out, should be quite safe from the flames, while any non-inflammable overhead cover gives perfect protection.

(S.S. 128.)

O.B. 492.

(Crown Copyright Reserved.)

ANTI-GAS DUTIES WITHIN AN INFANTRY BATTALION.

(To be modified for other Units to suit their organization and duties.)

1. The Commanding Officer will be directly responsible for all measures of defence against gas attacks.

2. Company Commanders will be responsible to the C.O. for all anti-gas measures within their companies.

3. In each Company, one N.C.O. who has been trained at an Anti-Gas School and who has been recommended by the Divisional Gas Officer as suitable for duty as "Company Gas N.C.O." will be specially detailed to assist the Company Commander in anti-gas measures. At least one other similarly trained and recommended N.C.O. will be immediately available to take the place of the Gas N.C.O. in case of need.

4. A similarly trained Gas N.C.O. will be detailed to Battalion H.Q. for duty with H.Q. details.

5. The duties of Gas N.C.O.'s will be definitely laid down in Battalions. Other duties may, however, be performed, provided that these do not interfere with the gas duties laid down.

6. In order to secure the necessary training in all matters pertaining to defence against gas attacks, the following officers and N.C.O.'s will attend a course at the Divisional Anti-Gas School as soon as circumstances permit.

(a) Officers.

(i) The Commanding Officer or Second in Command.

(ii) All Company Commanders.

(iii) Other officers and warrant officers if and when possible.

(b) N.C.O.'s.

(i) Two per Company and per Battalion H.Q.

(ii) Supplementary N.C.O.'s to be trained whenever possible so as to have a reserve from which to draw to replace Gas N.C.O.'s in case of need.

7. The selected N.C.O.'s who attend the Divisional Anti-Gas Schools will be reported on by the Divisional Gas Officer as follows: At the end of the course the Divisional Gas Officer will, if the N.C.O. is, in his opinion, suitable for duty as "Company Gas N.C.O.," notify the C.O. concerned to this effect. The latter will then cause the words "Passed Anti-Gas School" to be entered in his pay book. Only N.C.O.'s who have been thus reported on favourably will be detailed for duty as Company Gas N.C.O.'s.

8. The Divisional Gas Officer will keep in constant touch with units in order to advise Commanding Officers on all technical questions relating to anti-gas defensive measures and for the purpose of inspecting anti-gas appliances of all kinds.

9. A N.C.O. from the Divisional Gas School will visit the trenches once a week to inspect anti-gas appliances and test the pressure of the Strombos Horn cylinders. He will report the results to the Company Commander.

10. After a gas attack, all information and samples which have been collected will be forwarded at once to the Divisional Gas Officer.

DUTIES OF COMPANY GAS N.C.O.'S.

1. They will assist officers at the inspection of gas helmets, box respirators and goggles and in making such local repairs as are possible. They will assist in training men in the use of anti-gas appliances.

2. Under the Company Commander they will have charge of all anti-gas trench stores as follows:—

(a) **Strombos Horns and other gas alarm devices.**—Inspect daily and see that sentries posted to them know how they should be used.

(b) **Gas-proof Shelters.**—See that the blanket doorways fit and are kept in good order.

(c) **Anti-Gas Fans.**—See that they are in their proper position and in serviceable condition.

(d) **Vermorel Sprayers.**—Maintain in working order.

(e) **Gas Sampling Apparatus.**—Have charge of the vacuum bulbs and gas-testing tubes. Keep a stock of corked bottles and small tins with well-fitting lids for collecting samples of earth and water after a gas shell attack.

3. On relief they will assist the Company Commander in taking over all anti-gas trench stores. The Company Gas N.C.O. should accompany the advance party and take over anti-gas trench stores (by daylight if possible).

4. They will make wind observations every three hours, or more frequently if the wind is nearing a dangerous quarter, and will report any change of wind to the Company Commander.

5. During a gas cloud attack they will take gas samples by means of the vacuum bulbs.

6. During or after the attack the N.C.O. should note down in writing as much information regarding the attack as possible.

7. As soon as possible after the conclusion of a gas shell bombardment, the gas N.C.O. must fill his bottles and tins (2 (e) and take samples of water, mud, or earth from those parts of the line which are smelling most strongly of shell gases.

8. As soon as possible after a gas attack, all samples and notes will be handed in to the Company Commander for transmission to the Divisional Gas Officer.

September, 1916.