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CHEMICAL WARFARE BULLETIN

CONTENTS

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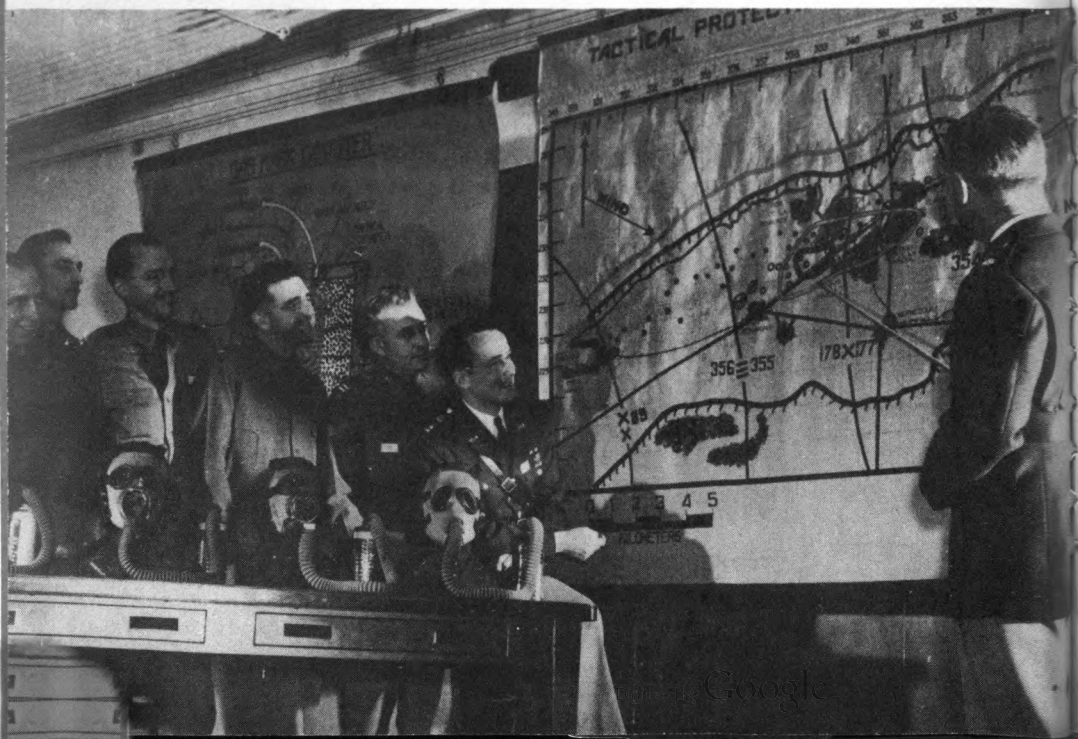
CHEMICAL WARFARE BULLETIN

Published Quarterly
by
The Chief of Chemical Warfare Service

A review of developments in the
application of chemicals
to military effort.

Strategy: ↑ Chemical Warfare School instruction: ↓ Tactical protection



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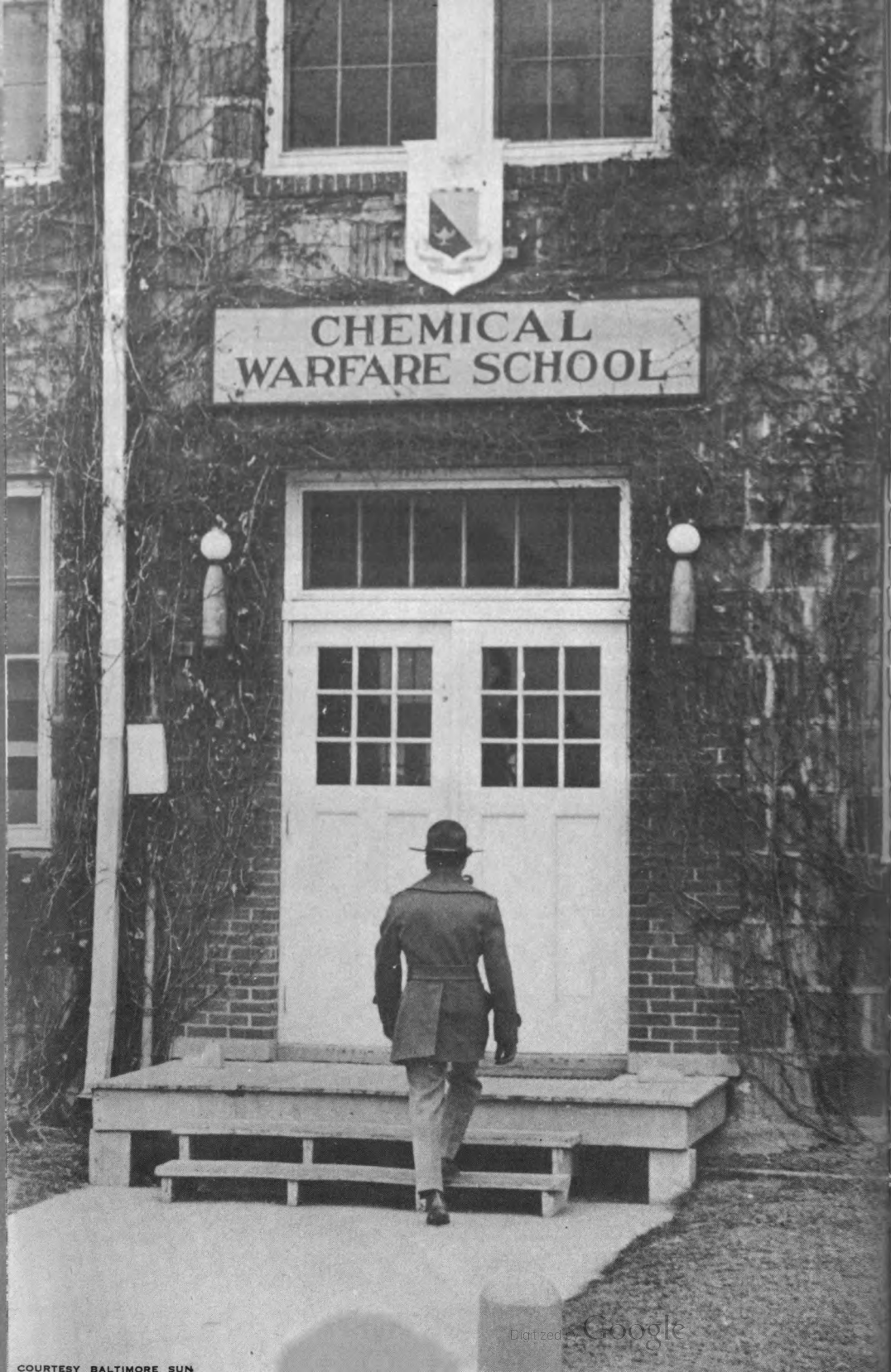
Views expressed in signed articles are those of the writers and should not be construed as official.

Original articles and discussions are welcomed.

Address all correspondence to "Editor, Chemical Warfare Bulletin, Edgewood Arsenal, Md."



COURTESY BALTIMORE SUN

TACTICAL EMPLOYMENT OF THE CHEMICAL BATTALION

Reorganization of the chemical battalion as indicated by the appended chart necessitates a complete review of previous instruction as to the employment of chemical combat units.

When the commander of a chemical unit is given the plan for employment of his unit,he makes such reconnaissance on the map and ground as time permits. Before making his reconnaissance, he must understand the plan of the tactical unit commander for the employment of the command as a whole, as well as the detailed plan for the employment of chemical troops. In the execution of his reconnaissance, as well as in the preparation of his own plan, he must keep constantly in mind the necessity for the close coordination of the operation of chemical troops with the employment of the tactical unit to which he is attached.

When a chemical unit moves to the combat zone, the march or convoy from GHQ area, or from one sector of the front to another, usually terminates in an assembly position. Assembly positions or areas are localities assigned to organizations for assembly prior to going into action. Such positions are selected so as to be screened, as far as practicable, from air and ground observation.

In occupying assembly positions, units avoid massing to insure that concentrated targets are not offered to hostile airplanes or artillery. Usually the organization to which chemical troops are attached designates the assembly position. The use of assembly positions makes it possible for all units of the column to keep in motion toward their appropriate places of employment while their respective commanders are making reconnaissance and formulating plans. When chemical troops leave the assembly area to march to the area where they will install their weapons, it is usually necessary to advance on foot. Motor transportation between the assembly position and the front lines is controlled by traffic circulation and traffic lines.

In combat it is mandatory that the number of men and vehi-

**Compiled from Chemical Warfare School instructional notes.*

cles of any unit brought under fire be reduced to the minimum necessary for the efficient service of chemical weapons. Accordingly, when the time element warrants, the personnel and activities of chemical troops are divided into forward and rear echelons.

Forward echelons comprise such personnel, material and equipment of units as are located at the positions of chemical weapons and at observation posts, command posts,and ammunition distributing points.

The battalion ammunition distributing point is a place where ammunition is issued to weapons companies from the battalion ammunition train. It may be established as far forward as the line which sets the limit of wheeled traffic by night. This line is usually designated by higher authority. If the situation permits, trucks are dispatched from the battalion ammunition train direct to the company distributing points. In this case the battalion distributing point is located where the battalion munitions officer divides the ammunition train and sends individual or groups of trucks to the company distributing points.

A rear echelon or motor park should be sufficiently in rear of the front lines to be beyond the reach of other than long-range guns. At this position will be found all personnel, material, and administrative and supply services which are not needed at the mortar positions, observation posts, and command posts.

These echelons should be easily accessible for supply, preferably on main roads. The sites selected should be convenient to good water,should provide concealment from air observation, and should be sufficiently large to permit dispersion of men and vehicles to minimize losses in case of aerial attack. The vehicles remain in charge of the battalion supply officer; or, if the unit is a company operating alone, in charge of the lieutenant with the rear echelon of the company. This motor park or bivouac area may often be part of the motor park area of the unit to which the chemical troops are attached and controlled by higher authority.

Since supply to forward units is generally carried out by night, special care must be exercised in the organization of rear echelons to provide for the proper rest for men and to insure that food and water can be delivered without interruption.

As soon as the plan of operation is known,the chemical battalion commander and his staff, together with the company commanders, go forward in passenger cars or reconnaissance trucks to make their reconnaissance. In some situations reconnaissance within range of enemy light artillery will be made only by motorcycle or on foot, as the area to be reconnoitered may be in front of the line which limits motor traffic by day.

As soon as the plan of the battalion is known,the battalion commander turns over his unit to his executive officer and with his reconnaissance detail and his intelligence officer, plans and training officer,communications officer, and company commanders, precedes his command on reconnaissance. The battalion commander from his map and personal reconnaissance selects an area (unless such area has been definitely designated by higher authority) for his battalion as a whole and assigns company areas within the battalion area to each of his companies. He assigns specific targets to each of his companies and gives the necessary instructions regarding communication and ammunition supply. In short, he will issue a definite order for the operation of his unit.

In addition to the detailed instructions for the operation of the subordinate elements of his command, the battalion commander will arrange communication and liaison with the command that he is supporting, for the installation and operation of his command post, including such observation as may be necessary, and for the general supervision of the operations of his battalion.

When the battalion commander has selected his command post, the battalion reconnaissance trucks proceed to this point with the command post and communications equipment. As soon as the command post is established the trucks are placed nearby under cover. While the battalion commander and company commanders are absent from their units on reconnaissance, the battalion executive officer and the second in command in the companies lead their respective units either to the assembly positions or to the areas from which they operate.

After receiving the necessary instructions from the battalion commander, the company commander leaves with his command car, motorcycle messenger, and company reconnaissance truck, for the position or area his company is to occupy, the platoon leaders following in their reconnaissance trucks. In most cases before reaching their destination they will be required to detruck.

When the platoon leaders receive the company order, they advance as far as possible in their reconnaissance trucks. Normally this reconnaissance must be made on foot and under cover and concealment as much as possible. Meanwhile, the company commander establishes his command post,locates his observation post, and establishes communication. After the reconnaissance is completed the company and platoon leaders, if reconnaissance trucks are forward, send these trucks to the rear to join the rear echelon or motor park. In certain situations they might be parked several thousand yards in rear of the mortar position.

Responsibility for signal communication is a function of command. Each tactical commander is responsible for the in-

stallation, operation and maintenance of all agencies of signal communication which form the signal system of his own unit. For purposes of coordination and technical control, he exercises supervision over the signal systems of all subordinate units of his command. The chemical battalion commander, therefore, is responsible for the installation, operation and maintenance of his battalion signal system and for supervision over the signal systems of his weapons companies.

The establishment and maintenance of signal communication between subordinate and superior units is the responsibility of the superior commander; between adjacent units, as directed by their common superior. Hence, the chemical battalion commander is responsible that telephone wire is laid to each of his four weapons companies from his command post switchboard. If he deems it necessary to have lateral wire communication between the companies, he will designate the method or procedure, whether wire will be laid by companies from left to right or reverse.

A unit which supports another unit by fire is responsible for the establishment and maintenance of signal communication with the supported unit; hence, the battalion commander is responsible for the laying and maintenance of telephone wire to the unit to which his battalion is attached or supporting.

The chemical battalion, completely motorized, is the normal operating unit for attachment to divisions. It has the fire power of 96 mortars. It consists of a headquarters and headquarters company and four weapons companies with organic facilities for normal transportation, supply and communications requirements.

Although chemical troops are trained in the employment of all special chemical weapons,the mortar is the one weapon that can be employed most generally for situations within its range. The organization of the chemical battalion is therefore built around this weapon and is based primarily on the requirements of personnel to maintain 96 4.2-inch mortars.

The weapons company is composed of a company headquarters and two platoons. Each platoon has its headquarters and two sections of three squads each. The mortar squad, the basic fire unit, is manned by the mortar corporal and eight men, and is armed with two 4.2-inch chemical mortars.

The distribution of fire units provides fire power for the weapons company to a maximum of twenty-four mortars, and is sufficiently flexible to meet varying missions from small smoke screening operations in support of assault battalions to a large-scale operation for a division.

Each mortar is transported from the forward limit of truck transportation on a hand cart (total weight 491 pounds) by the four members of its squad. There is no separate ammunition-carrying cart accompanying the mortar. However, for the dis-

tance travelled by handcarts and foot (normally from one to five miles), there will usually be sufficient time to move ammunition by one of a number of methods.

Assume that ten rounds per mortar will be required for one mission. For relatively short distances where roads or trails are favorable, but time is limited, ten rounds of ammunition may be brought up with each mortar on the cart or by loading three boxes (six rounds of shell), on each cart with the mortar and four rounds (two ammunition carrier back loads) on the backs of two members of the mortar crew. (During halts these carrier loads could be shifted to the backs of the other two members of the mortar crew.) If time permitted, the mortars could be drawn from the detrucking point to the firing position on the first trip without ammunition.

In each mortar section (three squads and six mortars) there are 27 men exclusive of corporals and chauffeurs. The corporals and 11 men, including the gunners, could be left at the positions to emplace and lay the weapons; while 16 men drawing four carts could be sent to the battalion distributing point to bring up the required ammunition. If each cart carried 15 rounds (gross weight 650 pounds), the necessary 10 rounds of 4.2-inch shell for each mortar of the section could be transported to the firing position on one trip.

In considering the above methods of forward ammunition supply, only mortar squad personnel was assumed to be available. However in certain situations preparatory to firing important missions, other personnel of the company would be released by the company commander to assist in this work. In fact, this would be necessary if a greater ammunition expenditure was planned for any shoot, or if time was limited, or if multiple missions from nearby positions were contemplated. Headquarters personnel of the company and both platoons, normally required to man observation posts during daylight firing, could also be spared for this purpose.

Individual mortars of the squad, section, or platoon can be dispersed laterally or in depth along the front and emplaced on ground offering natural cover or defilade. The maximum height of the weapon where installed for firing is about three and a half feet. It is therefore possible to fire it from concealment afforded by small gulches or folds in the ground and from positions closely in the rear of steep ridges or high trees.

In planned large-scale operations, reconnaissance parties of the companies and platoons normally locate firing positions and stake out lines of fire for each mortar during daylight hours well in advance of the arrival of the firing squads. With such detailed preliminary preparations the mortar can be installed during hours of darkness and be made ready for firing within ten minutes after its arrival at the position. Not

all the members of the mortar crew are necessary to perform this duty. Under the supervision of the squad leader, an average of two men per weapon provides sufficient personnel.

The 4.2-inch chemical mortar has greater fire power for the firing of chemicals than any other mobile weapon. It can be fired for short periods at the rate of 20 rounds per minute. The combined fire power of the 96 mortars of the chemical battalion makes it possible to cover an area approximately 460 by 460 yards in 30 seconds of firing. If fired under favorable wind conditions, an area of equal size immediately downwind will also be affectively covered.

Should it be necessary to employ the weapons company in support of a rapid advance, it may be quickly reorganized into a six-mortar organization (three mortars per platoon), the remaining 18 mortars being placed in a dump or sent to the battalion rear echelon, and the 18 carts being made available to carry into action 180 rounds of ammunition or 30 rounds per mortar.

Under average wind conditions three mortars on a chemical platoon can screen a front of from 600 to 800 yards, which is the normal action frontage of an infantry battalion. Thirty rounds of ammunition are sufficient, under normal conditions, to maintain a screen of this width for approximately 12 minutes, thus giving the Infantry in most situations smoke support for that length of time after first encountering hostile armed fire.

* * * * *

When a nation shows a civilized horror of war, it receives directly the punishment of its mistake. God changes its sex, despoils it of its common mark of virility, changes it into a feminine nation and sends conquerors to ravish it of its honor.

- Cortes

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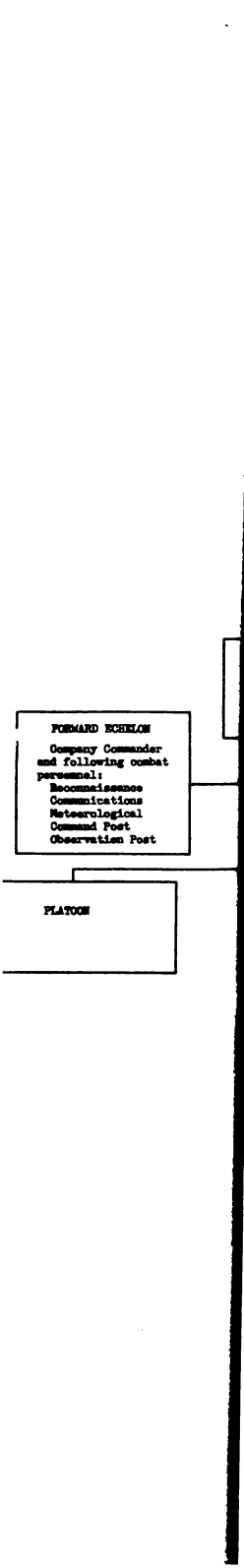


INTERNATIONAL NEWS PHOTO

Australian troop maneuvering in North Africa preparatory to seizing the initiative in Libya

A MNEMONIC METHOD OF LEARNING BASIC CHEMICAL WARFARE

Capt. Robert J. Martin, 260th CA (AA)

Since an important purpose of chemical warfare, particularly the use of nonpersistent agents, is to harass the enemy either by the causing of casualties or reducing his efficiency by forcing him to mask, it is important that all troops be taught to recognize the chemical agents most likely to be encountered in the field. To prevent effective use of chemical agents by the enemy, our troops must be made to recognize the capabilities of the various agents. They must become familiar with the odor, color (if any), physical state, and conditions under which various agents are likely to be projected, and must be prepared at all times to take precautions to prevent a successful chemical attack by the enemy.

The device suggested in this article* is a combination of the tables found in Texts I & II of the Chemical Warfare School. It gives the name, symbol, most important characteristics, effect, treatment and method of projection, of the 15 chemical agents most likely to be employed in modern warfare. It includes vesicants, irritant and screening smokes, incendiaries, and agents used only for causing temporary diminution of physical efficiency.

The device shows by means of the color of ink used in presenting the data for the individual agent, the color markings adopted by the Chemical Warfare Service for distinguishing the various agents. These markings are used both on the container (shell, grenade, bomb or candle), and on the packing case. Frequent reference to the device will familiarize the student with the agent and the color used to indicate its tactical employment.

The following 15 agents most likely to be encountered in the field, are selected for this method of presentation on the accompanying chart: HS, CG, WP, CN, CN-DM, CNS, CNB, Th, PS, FM, DM, FS, HC, Cl, and Ml. For each agent the information is as complete as possible. By seeing data pertinent to only one

**See illustration. - Ed.*

agent at a time the task of learning individual characteristics is simplified.

Familiarization with this device will provide the basic knowledge of chemical warfare necessary to prevent out troops from becoming casualties. It will provide an adequate foundation upon which to build the instruction necessary in training unit gas noncommissioned officers.

The device consists of two discs which may be of cardboard or other suitable material. The lower disc resembles the usual pie diagram with its area divided into 15 segments. In each segment are printed, in the appropriate color, the data relative to one agent. The upper, or masking disc, which has a 24 degree segment cutout, revolves on the lower disc in such a way that data for only one agent may be seen at one time.

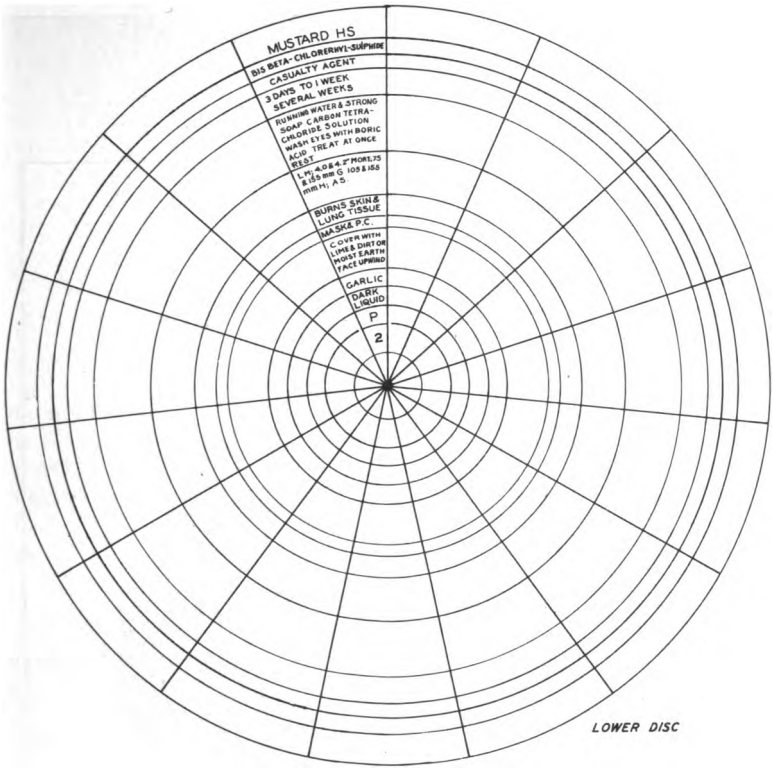
The upper disc lists in order from the center toward the periphery the following items:

1. Number of colored bands on the container.
2. "P" or "NP" to indicate degree of persistency.
3. Physical state (solid, liquid, or gas).
4. Odor.
5. Field method of destroying.
6. Protection needed to avoid injury by the agent.
7. Physiological action or effect of the agent.
8. Method of projection of the agent.
9. First aid and treatment of casualties.
10. Persistency in both winter and summer.
11. Tactical classification.
12. Chemical name.
13. Common name and CWS symbol.

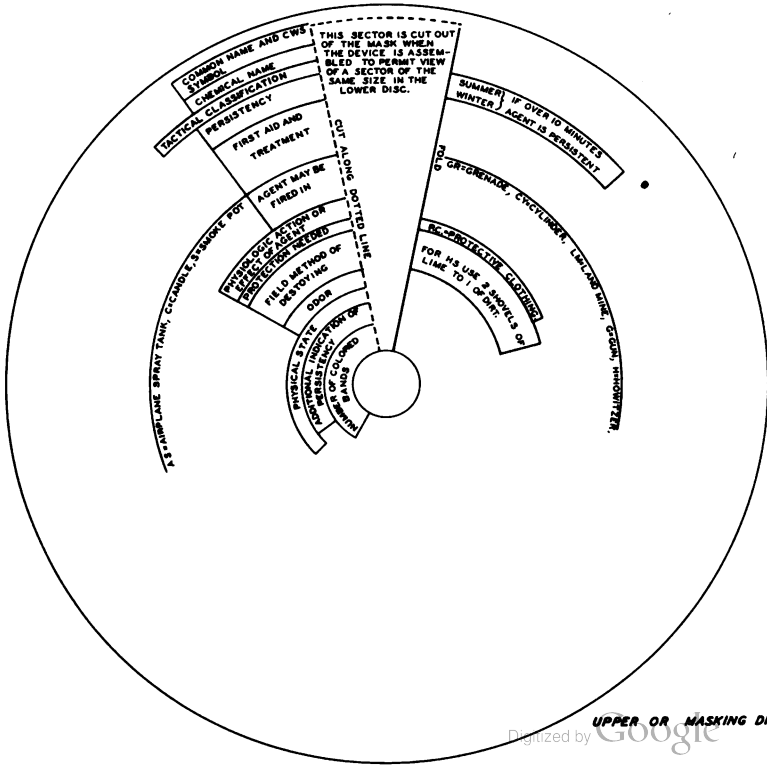
* * * * *

Stock well the quiver
with arrows bright,
The woman feared
need never fight.

- *Millay*



LOWER DISC



UPPER OR MASKING DISC

British high-altitude oxygen mask

CHEMICAL WARFARE TRAINING

The current training directive as to chemical instruction in the Sixth Corps Area is so complete and informative that it is herewith reproduced for the information of all readers of the Bulletin.

HEADQUARTERS SIXTH CORPS AREA
U.S. Post Office Building
Chicago, Illinois

TRAINING MEMORANDUM)
NO. 13) December 4, 1940

CHEMICAL WARFARE TRAINING

Training Memorandum No. 8, this headquarters, December 28, 1938, is rescinded and this training memorandum substituted therefor.

This training memorandum applies only to troops under the jurisdiction of the corps area commander and does not apply to units assigned or attached to any of the four armies.

SECTION I - TRAINING

1. GENERAL. - a. The objective, scope, methods of instruction and standards of proficiency for basic chemical warfare training are prescribed in Basic Field Manual 21-40, "Defense Against Chemical Attack".

b. Recruit training will be conducted as prescribed in paragraph 59, B.F.M. 21-40, and relevant sections of War Department Mobilization Training Programs for the appropriate arm and service.

c. General information and details on this subject are covered in the appropriate references listed in Section VII of this memorandum.

2. TRAINING REQUIREMENTS. - a. Regular Army. The annual training of units of the Regular Army under the jurisdiction of the commanding general, Sixth Corps Area, will include the following:

(1) Individual and unit training to meet the requirements set forth in B.F.M. 21-40.

(2) The training of unit gas officers in the division chemical warfare school (see par. 4 b).

(3) The operation of troop schools for the qualification of unit gas noncommissioned officers and their replacements.

(4) Special operations: Particular stress will be placed on the use of chemicals in special operations under the provisions of W. D. B. F. M., Vol. VII, "Military Law", Part Three.

(5) Training of units in the mechanics of defense against chemical attack. In order to attain the required standards of proficiency in defense against chemical attack, training of tactical units will include the following: (See paragraphs 60 and 66, B.F.M. 21-40).

(a) Gas mask drill, paragraphs 28 and 79, B.F.M. 21-40.

(b) Fitting, care and minor repair of gas masks, including the gas chamber exercise, shown in paragraphs 32, 33, 34, B.F.M. 21-40, and Sec. XI, B.F.M. 21-40.

(c) Accustoming men to march, maneuver and carry out their normal duties with gas masks adjusted.

(d) Characteristics and identification of standard chemical agents.

(e) Physiological effects of chemical warfare agents and first aid treatment of gas casualties.

(f) Protection of food and water and degassing of areas and equipment.

(g) Methods of projecting chemical agents both from the organic weapons of the unit and from the air.

(h) Technique in the use of chemical training ammunition.

(i) Effect of weather and terrain on chemical

attack.

(j) Construction and maintenance of gasproof shelters.

(k) Alarm devices, procedure to meet a gas attack and procedure during and after such an attack.

(6) Execution of tactical exercises and combat firing by small units,with all personnel wearing gas masks. During this phase of chemical warfare training, instruction will be given as prescribed in paragraph 60 c, B.F.M. 21-40, and will include the following:

(a) Habituating all personnel to marching, patrolling and operating communications and weapons in an atmosphere of nontoxic gas and smoke. To accomplish this mission, the following minimum requirements will govern in the operation of weapons and in the use of materiel:

1. Infantry and Cavalry. Twenty percent of the annual ammunition allowances for combat firing (par. 41 b, AR 775-10) will be fired, with gas masks adjusted, by all troops participating in combat firing exercises. In addition, infantry troops will be habituated to using the bayonet with gas masks adjusted,and will include at least two practice runs per man through the bayonet qualification course each training year.

2. Field Artillery and Coast Artillery. Twenty percent of the annual allowance of subcalibre ammunition will be fired under conditions involving the wearing of the gas mask by all men employed in the battery, except these detachments which would normally operate in gasproof shelters. (F.M. 21-40, 21-45, 100-5, TM 3-205.)

3. Air Corps. All ground troops will be trained to carry on normal ground activities with masks adjusted, including the preparation of airplanes for takeoff. Stress will be given to decontamination training, not only of ground installations,but also of airplanes. (See W.D. letter, May 9, 1940, Subject: "Air Corps Training, 1940-1941", A. G. 353 (3-4-39) Misc.), and paragraphs 11, 25, 26 and 27, B.F.M. 21-40.

4. Staff Troops. Detachments of Signal Corps, Ordnance Department, Quartermaster Corps, Finance Department, Medical Corps and Veterinary Corps, on duty at stations of combat troops,will be trained in the use of gas masks and in gas discipline. Gas masks on hand at stations will be made available for the training of these detachments. Medical Corps units and detachments will, in addition, be given thorough practical training in the administration of first aid to simulated gas cases.

(b) Combat units will be well grounded in the tactical use of smoke, and be thoroughly informed concerning its powers and limitations. Stress will be placed on the ef-

fect of smoke on aimed fire and on fire control, both in theoretical instruction and by practical demonstration, so far as allowances of chemical munitions will permit. To this end, tactical situations involving the use of smoke and nontoxic agents and intensive measures to assure adequate protection against all types of chemical agents and methods of projection will be included in appropriate problems and terrain exercises. Tactical maneuvers will include operations involving the use of smoke and simulated toxic gas. (See TM 3-305, "Use of Smokes and Lachrymators in Training".)

b. National Guard. (1) The chemical warfare training of the National Guard, prior to induction into Federal Service, will conform to the instructions issued by the National Guard Bureau and will, insofar as practicable, parallel that of the Regular Army, as herein prescribed. (See paragraphs 1, 2 a, 3 and 4 a).

(2) Reserve Militia. Training of Reserve Militia units (State Troops, as authorized, Public Resolutions 874-76, 76th Congress, approved October 21, 1940), if and when authorized by the States concerned, will be as per Chapter 3, Volume VII, B.F.M. "Military Law", Part Three.

c. Organized Reserves. Inactive status training schedules will include a minimum of two hours instruction in chemical warfare, in preparation for the active duty period.

d. R.O.T.C. The chemical warfare training for the R.O.T.C. units at colleges will conform to the War Department directive for these units. Camp schedules will include three hours instruction in chemical warfare, as outlined in paragraph 65, B.F.M. 21-40.

e. Enlisted Replacement Centers. (1) Training at Enlisted Replacement Center (Medical Corps), at Camp Grant, Illinois, will be conducted as prescribed in Section II, War Department MTP 8-1, September 9, 1940, and B.F.M. 21-40.

(2) A chemical warfare school will be conducted at Camp Grant for the purpose of training officers and noncommissioned officers as instructors at the Enlisted Replacement Center, Medical Corps.

SECTION II - GAS OFFICERS AND NONCOMMISSIONED OFFICERS

3. UNIT GAS OFFICERS AND NONCOMMISSIONED OFFICERS. a. As provided in paragraphs 41, 44 and 45, B.F.M. 21-40, each unit under the jurisdiction of the commanding general, Sixth Corps Area, will have detailed at all times the prescribed number of

qualified gas officers and noncommissioned officers who will function in accordance with the duties therein assigned to them.

b. In order that as many officers and noncommissioned officers as practicable may become familiar with this phase of training, and to provide within each unit a pool of competent instructors in chemical warfare, commanders concerned will rotate officers and noncommissioned officers in assignment to these duties.

c. Post gas officers. In addition to the unit gas officers prescribed above, a line officer of rank commensurate with the duties involved, will be detailed, in addition to his other duties,as post gas officer at each post under the jurisdiction of the commanding general, Sixth Corps Area, and will perform the duties prescribed in paragraph 46, B.F.M. 21-40. Each post gas officer will also function as post property officer for Chemical Warfare Service property at his post.

d. Report of changes. Changes in post and unit gas officers under the jurisdiction of the commanding general,Sixth Corps Area, will be promptly reported to this headquarters.

4. QUALIFICATION OF UNIT GAS OFFICERS. - a. Officers will be qualified for appointment as unit gas officers by one of following means:

(1) Satisfactory completion of an appropriate training course at the Chemical Warfare School, Edgewood Arsenal, Maryland.

(2) Graduation from the 5th Division Chemical Warfare School, Fort Custer, Michigan. (See sub-par. b, below.)

(3) Satisfactory completion of the Army Extension Course, Common Subcourse 10-3, "Defense Against Chemical Warfare";the Chemical Warfare Service Extension Course 40-5; Part II, "The Employment of Chemical Agents in Troop Training", and Special Extension Course, entitled, "The Unit Gas Officer", supplemented by ten hours practical instruction for Regular Army personnel and by six hours practical instruction for National Guard or Reserve personnel, in the subjects outlined in paragraph 65, B.F.M. 21-40. (Note: Applications for enrollment in Subcourse 10-4 will be submitted through the usual channels. Applications for enrollment in Extension Course 40-5, Part II, and Special Extension Course "The Unit Gas Officer" will be submitted through channels to the corps area chemical officer, who will conduct this course.)

b. 5th Division Chemical Warfare School. Subject to approval of commanding general, Second Army, unit gas officers will, unless otherwise qualified under the provisions of subparagraphs 4 (1), (2) and (3) above,be trained at the Chemical Warfare School, Fort Custer, Michigan, at a period to be announced later. When this time is announced,unit and post commanders will designate personnel from units under the juris-

diction of the commanding general,Sixth Corps Area, to receive necessary training, as prescribed by paragraphs 43 and 44, B.F.M. 21-40.

5. QUALIFICATION OF UNIT GAS NONCOMMISSIONED OFFICERS. - a. At each post under the jurisdiction of the commanding general, Sixth Corps Area,a troop school in chemical warfare will be conducted annually for the training of noncommissioned officers as unit gas noncommissioned officers.

b. The schedule of training for this school will include appropriate portions (approximately 20 hours) of the applicable subjects outlined in paragraph 65, B.F.M. 21-40.

c. Instructors for this school will be carefully selected from among officers who possess the qualifications stated in paragraph 4 a above. Full use will be made of all officers who are graduates of the Chemical Warfare School, Edgewood Arsenal, Maryland.

d. Noncommissioned officers will be required to attend the school in such numbers as necessary to complete the unit complement of unit gas noncommissioned officers, together with one substitute for each. In addition thereto, all unqualified company, battery and troop commanders will be encouraged to attend this school as observers. (Paragraph 44, B.F.M. 21-40.)

SECTION III - ORGANIZATION

6. ORGANIZATION. - a. All unit commanders (Regular Army, National Guard and Organized Reserves), under the jurisdiction of the commanding general, Sixth Corps Area, will appoint the appropriate number of gas officers and gas noncommissioned officers, as prescribed in paragraphs 41, 43, 44 and 45, B.F.M. 21-40.

b. Reserve officers who have been qualified and appointed as unit gas officers will conduct the chemical warfare instruction of the Organized Reserve units, where practicable.

c. Post and camp commanders under the jurisdiction of the commanding general, Sixth Corps Area, are responsible that all chemical warfare training under their jurisdiction is conducted by qualified gas officers. They will detail Regular Army officers for the training of the R.O.T.C., and,where necessary, to conduct the training of the Organized Reserves.

SECTION IV - SUPPLY

7. GAS MASKS. - a. The training allowances of gas masks are governed by Tables of Basic Allowances, 1939, or later revisions.

b. All service type training gas masks, used in normal peacetime training, will be equipped with the MII-R canister (O.D. body, with two horizontal blue stripes),which gives protection against DM (irritant smoke).

c. Present plans contemplate the issuing of the MI training mask as soon as available after January 1, 1941. When issued, paragraphs 77, 78, 79, 80, 81, FM 21-40, will apply as to drill and inspection; paragraphs 34 and 82, FM 21-40, as to storage; and TR 1120-35 (to be published as TM 3-205), as to repair procedure.

d. The size of the gas mask, fitted and tested in tear gas, worn by each soldier, will be entered on his service record.

e. Until training masks are issued to each individual, they will be pooled and issued to units, in turn.

f. Inspection, storage and repair of gas masks is set forth in Circular 39, W.D., 1935, and in paragraph 34, B.F.M. 21-40. See also TR 1120-35 "The Gas Mask" (to be published as TM 3-205).

8. CHEMICAL WARFARE SERVICE TRAINING MATERIEL. - The authorized instructional gas identification sets,and other Chemical Warfare Service training materiel and ammunition, will be requisitioned and used in the training of all components of the Army of the United States. See AR 775-10 and Tables of Allowances, Camps, Posts and Stations (1938), or later revision.

9. REQUISITIONS. - Requisitions for Chemical Warfare Service supplies and ammunition will be addressed to the Chief, Chemical Warfare Service, War Department Annex #1, 401 - 23rd Street, N.W., Washington, D.C. They will be prepared on W.D. Q.M.C. Form No. 400, and submitted, in quadruplicate, through the commanding general, Sixth Corps Area.

The nomenclature must conform to that shown in the latest annual issue of "War Department Standard Nomenclature and Price List of Chemical Warfare Materiel".

Courses used in 1939-40

CWS Nos.	Titles	Lessons	Hours
10-1	Organization of the Army	4-R	7
10-2	Organization of the Chemical Warfare Service	3-R	9
10-3	Administration	4	8
10-4	Military Law-Law of Military Offenses	7-R	15
10-5	Military Discipline,Court'y.& Cust.of the Serv.	3	6
10-6	Interior Guard Duty	3-R	8
10-7	Map & Aerial Photograph Reading	10-2R	25
10-8	Military Sanitation and First Aid	4-R	10
20-1	Chemical Warfare Agents I	12-R	27
20-2			
20-3	Chemical Warfare Agents II	6-R	15
20-4	Supply and Mess Management	7-2R	18
20-5	Chemical Warfare Agents III	10-R	30
20-6	Property, Emergency Procurement and Funds	5-R	12
20-7	Defense Against Chemical Warfare	8-R	19
20-8	Chemical Warfare Weapons	7-R	21
20-9			
20-10	Military Law-Courts Martial	7-R	18
20-11	Care and Operation of Motor Vehicles	12-R	28
20-12	Chemical Warfare Agents IV-Manufacture	7-R	25
30-1	Storing & Shipping of C.W. Munitions	4-R	13
30-2	Sig. Com. for all Arms and Services	7-R	11
30-3	Chemical Warfare Troops	7-R	19
30-4	Mobilization	5-R	14
30-5	Organization of the Infantry Division	3	6
30-6	Combat Orders and Solution of Problems	3-R	12
30-7	Training Management (Part I)	6-2R	21
30-8	Tactical Employment of Chem. Agents (In Part)	11-2R	43
30-9	Tech. Divisions, Organization & Operation	5-R	16
30-10	Prod. Divisions, its Organization & Operation	4-R	11
30-11	Development Procedure	4-R	15
30-12	Chemical Warfare Service Units of Field Army	4-R	10
40-1	Combat Orders & Solution of Problems	3	24
40-2	Duties of Chem. Off. of Div. & Higher Units	4-R	11
40-3	Tactics & Tech. of Sep. Arms (Parts II & III)	21-3R	83
40-4	Staff & Log. for the Division (In Part)	8	34
40-5	Chem. War. Sup. System; Dep. Org. & Adm.	4-R	10
40-6	Industrial Mobilization	17-2R	51
40-7	Commercial Law-Contracts	9-R	22
40-8	Chemical Warfare Procurement	6-R	14
50-1	Tactics & Tech. of Separate Arms	12-R	106
50-2	Tactical Principles and Decisions	8-R	82
50-3	Troop Lead.; Com. Staff & Log.	5-R	56
50-4	Tactical Principles and Decisions	8-R	78
50-5	Mil. Org., Com. Orders & Est. of Situation	4-R	38
50-6	Troop Lead. & Com., Staff & Log.	5-R	78
50-7	Com. Staff & Log.;Terr. Org.;Mob. Troop Move.	4-R	56
60-1	Tactical Principles and Decisions	5-R	46
60-2	Special Subjects	6-R	66

LEGEND AND NOTES:

1. R - Examination or review lesson or lessons.
2. X - Required for---------.
3. 20-3 (1940-41) equivalent to 20-4, Pt. II (1939-40).
4. 40-1 (1940-41) equivalent to 40-3, Pt. I (1939-40).
5. 40-3 (1940-41) partly covered in 30-8 (1939-40).
6. 40-5 (1940-41) equivalent to 30-7, Pt. I (1939-40).
7. 50-5, Pts. II & III (1940-41) equivalent to 40-3, Pts. II & III (1939-40). Part IV is new.
8. When space under "Lessons and Examinations" is blank, the course will not be given in 1940-41.

Compiled 11 December, 1940, by

COURSES FOR SCHOOL YEAR 1940-41

CWS Nos.	Current Courses Titles	Lessons	Hours	Service with Troops	Special Service
10-1	Organization of the Army	4-R	7	X	X
10-2	Organization of the Chemical Warfare Service	3-R	9	X	X
10-3	Defense Against Chemical Warfare	9-R	20	X	X
10-4	Military Law-Law of Military Offenses	7-R	16	X	X
10-5	Military Discipline,Court'y.& Cust.of the Serv.	3	6	X	X
10-6	Interior Guard Duty	3-R	8	X	X
10-7	Map & Aerial Photography	10-2R	25	X	X
10-8	Military Sanitation and First Aid	4-R	10	X	X
10-9	Chemical Warfare Agents I	12-R	27	X	X
20-1	Use of Smokes and Lacrimators in Train.	3-R	12	X	X
20-2	Scouting and Patrolling	5-R	17	X	
20-3	Mess Management	4-R	10	X	X
20-4	Chemical Warfare Agents II	6-R	15	X	X
20-5	Organization,Function & Equip. of Chemical Troops	6-R	21	X	X
20-6	Care and Operation of Motor Vehicles-General	12-R	27	X	
20-7	Chemical Warfare Agents III	10-R	30	X	X
20-8	Chemical Warfare Weapons	7-R	21	X	X
20-9	Military Law-Courts Martial	7-R	18	X	X
20-10	Conduct of Elementary Training	3-R	12	X	
30-1	Tactical Protection and Chemical Reconnaissance	---	--	X	-
30-2	Marches and Shelter	---	--	X	-
30-3	Sig. Com. for all Arms and Services	7-R	11	X	-
30-4	Chemical Warfare Troops	7-R	19	X	-
30-5	Administration	10-R	35	X	-
30-6	Com. Orders & Solution of Problems, C.W.S.	3-R	12	X	-
30-7	Meteorology for Chemical Operations	---	--	X	-
30-8	Advanced Map & Aerial Photograph Reading	7-R	24	X	-
30-9	Combat Principles, Chemical Platoon	---	--	X	-
30-10	Tech. Divisions, Organization & Operation	5-R	16		X
	As prescribed by Chief, C.W.S.	---	--		X
40-1	Tactics & Tech. of Separate Arms-I, Inf.	10-R	33	X	-
40-2	Combat Orders and Solution of Map Problems	7-R	24	X	-
40-3	Combat Principles of the Chemical Company	---	--	X	-
40-4	Mobilization	5-R	14	X	-
40-5	Training Management	6-2R	21	X	-
40-6	Chemical Warfare Service Units of the Field Army	4-R	10	X	-
40-7	Hasty Field Fortifications	---	--	X	-
40-8	Chem. War. Sup. System; Dep. Org. & Adm.	4-R	10	X	-
40-9	Storing & Shipping of C.W. Munitions	4-R	13	X	-
40-10	Prod. Division, its Organization & Operation	4-R	11	-	X
40-11	Chemical Warfare Agents IV	7-R	25	-	X
40-12	Development Procedure	4-R	15	-	X
40-13	Commercial Law-Contracts	9-R	22	-	X
40-14	Chemical Warfare Procurement	6-R	14	-	X
	As prescribed by Chief, C.W.S.			-	X
50-1	Estimation and Use of Terrain	---	--	X	-
50-2	Organization of the Inf. Div. (Triangular)	3-R	9	X	-
50-3	Com., Staff & Log. for the Division	13-2R	45	X	-
50-4	Duties of Chem. Off. of Div. & Higher Units	4-R	11	X	-
50-5	Tac. & Tech. of Sep. Arms, Pts. II, III, IV	19-3R	66	X	-
50-6	Combat Principles of Chemical Battalion	---	--	X	-
50-7	Advanced Military Chemistry I	---	--	-	X
50-8	War Dept. Procurement Planning	---	--	-	X
	As prescribed by Chief, C.W.S.			-	X
60-1	Combat Principles of the C.W.S.	---	--	X	
60-2	Advance Military Chemistry II	---	--	-	X
60-3	Mob. of Ind. & Control of Econ. Resources	---	--	-	X
	As prescribed by Chief, C.W.S.	---	--	-	X

SECTION V - INSPECTION

10. INSPECTIONS. - Frequent inspections of the methods used and the results obtained in chemical warfare training will be made by post and unit commanders who are under the jurisdiction of the commanding general Sixth Corps Area. Quarterly inspections of chemical warfare materiel will be made by such post and unit commanders or their commanders or their representatives (gas officers). The corps area chemical officer will make an annual technical inspection of chemical warfare materiel, and of the proficiency of unit gas officers and noncommissioned officers. When practicable, training and tactical inspections will include the use of smoke and nontoxic gas.

SECTION VI - REPORTS

11. MONTHLY ACTIVITY REPORTS. - Each camp, post and station commander will submit at the end of each month an Activity Report on chemical warfare training of units under the jurisdiction of the commanding general, Sixth Corps Area. This report will include the following:

a. Number trained.
b. Synopsis of training given.
c. Amount of time devoted to chemical warfare training.
d. List of munitions or other materiel used.
e. Name and grade of officer who conducted the training.
f. Other pertinent comments not covered above.

This report will reach this headquarters not later than the 5th of the month following. The corps area chemical officer will incorporate the chemical warfare activities in the monthly report to the Chief of the Chemical Warfare Service, required by paragraph 6, AR 50-5.

12. AMMUNITION EXPENDITURE CERTIFICATES. - Consolidated Chemical Warfare Service ammunition certificates will be submitted semiannually as of June 30th and December 31st, on forms furnished by Headquarters Sixth Corps Area. These certificates will be prepared as per instructions contained in paragraph 2 b, AR 35-6620; will show the expenditures made by each

component of the Army of the United States, and will be mailed to arrive at this headquarters on or before the 15th of the month following the date of the certificate.

13. INVENTORIES. - An inventory of all Chemical Warfare Service property and ammunition on hand as of December 31st each year will be submitted annually to reach this headquarters not later than January 15th, following the date of the inventory. Forms will be furnished by this headquarters.

14. SERVICE CHARGES. - Reference is made to the current War Department letter of June 7, 1939, A.G. 400.23 (6-7-39) Misc. M,"C.M.T.C. and Organized Reserves,for use of supplies, equipment and materiel at training camps", to commanding generals of all corps areas, etc. Not later than fifteen (15) days after the close of R.O.T.C. training camps, camp commanders will forward, in quadruplicate, separate Service Charge Reports covering the use of gas masks by each component trained,to the Chief, Chemical Warfare Service, through the corps area commander.

SECTION VII - REFERENCES

15. REFERENCES. - Appropriate portions of subjects contained in the references listed below should be studied by each unit gas officer in order that he may have a thorough understanding of the whole subject of chemical warfare as pertains to his arm or service. The application of certain portions of these publications to all types of training should not be overlooked.

a. Army Regulations.
   - AR 50-5 -- "Chemical Warfare Service, General Provisions"
   - AR 750-10 -- "Range Regulations for Firing Ammunition in Time of Peace"
   - AR 775-10 (As amended) -- "Ammunition Allowances"

b. Training Regulations.
   - TR 10-5 -- "Military Training", (paragraphs 9 b (7) and 26 b)
   - TR 1370-a -- "Ammunition, General"

c. Technical Manuals.
   - TM 3-305 -- "Use of Smokes and Lachrymators in Training"
   - TM 3-205 -- (To be published to supersede TR 1120-35)

d. Field Manuals.
   - BFM, Vol. I, Chapter 2 -- "Personal Hygiene and

First Aid" (paragraph 17)

BFM, Vol. III, Part One, Chapter 3, -- "Automatic Rifle Marksmanship" (paragraph 35)

BFM, Vol. III, Part Three -- "Machine Gun Company" (paragraph 35)

BFM, Vol. III, Part Four -- "Howitzer Company"(paragraphs 8 b and 20 d (2))

BFM, Vol. VII, Part Six, Chapter 1 -- "Antiaircraft Marksmanship" (paragraph 4 c (4))

BFM, Vol. VII, Part Two -- "Rules of Land Warfare" (paragraph 29)

BFM, Vol. VII, "Military Law", Part Three

FM 21-40 -- "Defense Against Chemical Attack"

FM 23-30 -- "Hand Grenades"

FM 30-5 -- "Combat Intelligence" (paragraphs 13 b (2), (c) 5)

FM 30-35 -- "Military Intelligence" (paragraph 10)

FM 3-10 -- "Examination for Gunners"

FM 100-5 -- "Field Service Regulations" (paragraphs 88, 89, 263, 268, 443, 514, 617)

FM 101-5 -- "Staff Officers' Field Manual" - "The Staff and Combat Orders" (paragraph 25)

Cavalry Field Manual, Vol. II, (paragraphs 42, 46 and 114-122)

Cavalry Field Manual, Vol. III,(paragraphs 139, 217 and 247)

C.W.S. Field Manual, Vol. I -- "Tactics and Technique"

Coast Artillery Field Manual, Vol. I, Part One, (paragraphs 180 and 181)

Coast Artillery Field Manual, Vol. II,"Antiaircraft Artillery", Part One, "Tactics" (paragraph 163)

Engineer Field Manual, Vol. II, Part Two, (paragraph 129)

Field Artillery Field Manual, Vol. II (paragraphs 48, 159 and 200 b)

Infantry Field Manual, Vol. II (paragraphs 328, 333 f and 395)

Staff Officers' Field Manual, Part One (pages 7, 8, 20, 87, 89, 110, 129, 139, 144)

Staff Officers' Field Manual,Part Two (pages 31-36, 67 and 74)

Staff Officers' Field Manual, Part Three (pages 16 and 57-59)

f. Miscellaneous.

General Order 67, War Department, 1920, "Extermination of Rodent-Vermin" (also see War Department Circular 1, 1924, as amended by Circular 33, War Department, 1926).

War Department Letter, May 9, 1940, Subject: "Air

Corps Training, 1940-1941", A.G. 353 (3-4-39) M-M-C)

War Department Mobilization Training Program, W.D., 1940, (Appropriate Arm or Service)

War Department Training Directive, 1940-1941, letter A.G. 353 (12-17-38) Misc. M-C, dated March 2, 1940

Chemical Warfare School Textbooks, 1 to 6, inclusive

Chemical Warfare School Pamphlet No.2,1938. (Training Guide - Chemical Warfare)

C.W.S. Pamphlet No. 4, 1936 (Instructions for Using Gas Identification Sets)

C.W.S. Pamphlet No. 5, 1939, (Meteorology)

Standard Nomenclature and Price List

Chemical Warfare Materiel (1940)

C.W.S. Supply Catalog, 1937

Reference Data, Chemical Warfare School (Restricted) (1938)

Circular 15,War Department, 1940 -- "War Department Training Films"

TM No. 6, Hq. Sixth Corps Area, October 1, 1938, (Corps Area Training Directive) (As amended)

Tables of Basic Allowances

Circular 39, War Department, 1935, "Local Responsibility for Inspection, Storage and Repair of Gas Masks"

Circular 28, War Department, 1936, Section II, "Gas Masks (Acted on by Inspectors and Surveying Officers, Disposition of)"

Circular 49, War Department, 1938, "Size of Gas Mask--Entry on Service Record"

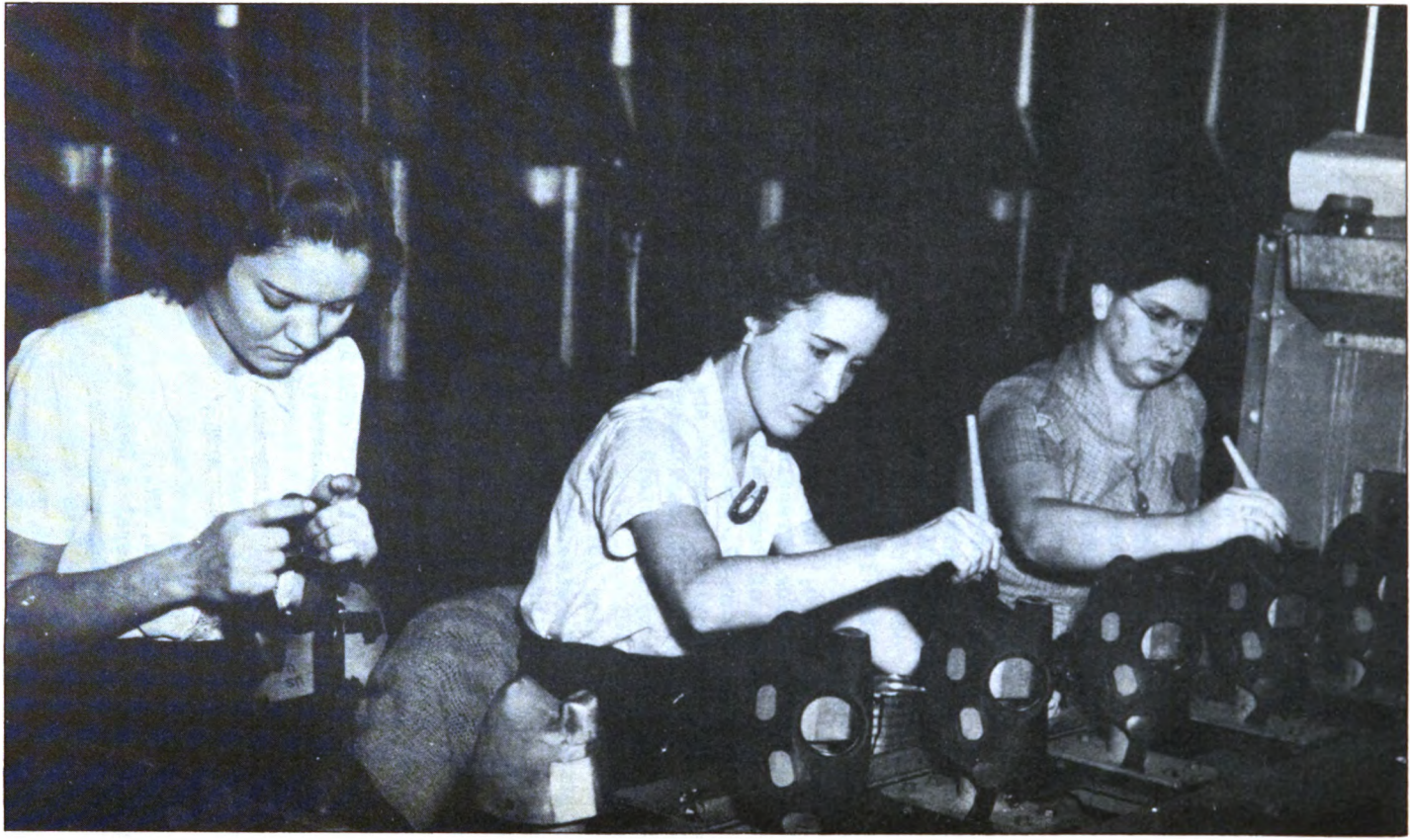
Circulars 73 and 75, War Department, 1938, "Handling Smoke-producing Materiel"

By Command of Brigadier General BONESTEEL:

WILLIAM H. WILBUR,
Colonel, General Staff Corps,
Chief of Staff.

OFFICIAL:

EDWARD ROTH, JR.,
Colonel, Adjutant General's Department,
Adjutant General.



LIFE PHOTO

SOME MEDICAL ASPECTS OF CHEMICAL WARFARE AGENTS

Leon Goldman, M. D. and Glenn E. Cullen, Ph. D.

Since the technique of modern warfare has changed so considerably the civilian and especially the civilian physician must have more than an academic interest and knowledge of chemical-warfare compounds.

The official report of the ninth International Congress of Military Medicine and Pharmacy includes the sentence "Considering the great progress of the chemical industry in all countries since the war, the new discoveries made in this field, and the technical advances in other methods of warfare, it is very likely that in future wars the use of gas will be made on a larger scale." Incendiary bombs and mustard gas were used extensively and efficiently in the Italo-Ethiopian War. So far incendiary bombs and flame throwers, but not gas, are being used in the present European wars.

There have been too few voices raised to rid the public of propaganda-induced fear of chemical warfare. Notable of these voices have been J. B. S. Haldane with his *Callinicus: A Defence of Chemical Warfare.* Others have been the chemist James Kendall with his *Breathe Freely* and, in this country, Prentiss with his technical work on *Chemicals in War.* Frequently the noninformed physician shares in this unwarranted fear of chemical warfare. Since the last war there have been relatively few changes in the actual principles of the treatment of chemical-warfare casualties, but there has been considerable progress in the study of the organization of the civilian aspects of this form of warfare. In recent years only scattered reports have appeared in American medical literature.

In order to emphasize the clinical aspects of the lesions produced by the chemical-warfare agents, we have included in review only the more important principles. We have learned

*Extracted from *The Journal of the American Medical Association.*

that otherwise the subject will appear too confusing and the practical aspects will be lost. The detailed study of specific portions can be investigated by the individual interested. This review will consider the military aspects only as they are concerned directly.

Very early it was found that all the agents used at present could be classified, physiologically, into five groups: (1) lacrimators, (2) lung irritants, (3) vesicants, (4) sternutators, (5) nerve and blood poisons. This classification is essentially that of Julius Meyer.

It is seen readily that quite a number of difficult situations arise with the problem of caring for the casualties of civilians and especially of large numbers of civilians. Previously trained personnel, both medical and nonmedical, is absolutely necessary. This has been realized in all European countries and for some years this form of training and preparedness has been going on.

Physicians will be concerned with those casualties in which pulmonary damage and skin burns have been incurred. Sometimes in the midst of confusion and panic little can be done, and yet, on the other hand, treatment must be instituted as early as possible to prevent serious reactions and death.

For the dangerous lung irritants, absolute rest is needed and, of course, rest in a gas free atmosphere. So the patient must be brought by stretchers or ambulances to previously arranged treatment centers. Because of the insidious nature of these gases, it is much safer to consider any gassed patient as in a serious condition. Artificial respiration must not be given since the patient gassed by the pulmonary irritants must be kept at absolute rest.

The most serious symptom to combat is, of course, pulmonary edema. Especially with phosgene, this may coexist with deep cyanosis and increased venous pressure (the so-called blue type of asphyxia) or with the even more serious form, the shock form (the so-called pallid or gray type). The treatment is, of course, different with each of these types.

For the first type, oxygen of course should be given. If the various types of oxygen inhalation apparatuses are not available, oxygen may be given in a much less efficient manner by means of subcutaneous injections. Henschen reports that 500 cc. may be given. Venesection also should be done, especially if the neck veins continue to be distended and the right side of the heart continues to be dilated. At the present time some are advising the prophylactic use of chemotherapy, such as the quinine derivatives and sulfapyridine, to prevent the secondary bronchopneumonia. However, bronchopneumonia is not very common on recovery from the acute phase of phosgene poisoning and the bacteriology of the bronchopneumonia has not been studied thoroughly. Therefore the value of these

drugs is not known at present.

For the pallid type of asphyxia as much of routine shock therapy should be given as is possible. In this condition the shock plus the emphysema, of varying degree and distribution (even mediastinal) may obscure the presence of moisture in the chest. In general,the treatment of this form is very discouraging and the patient may die within several hours in spite of intravenous injections of various forms of blood and other fluids, and cardiac and respiratory stimulants, even if all these materials are available in the emergency first aid stations.

Briefly, the essential pathologic condition caused by the lung irritants is acute pulmonary edema associated with emphysema, and pulmonary vessel thromboses. The other significant visceral pathologic changes include purpura especially throughout the brain, and dilatation of the right side of the heart. When a patient gassed by a lung irritant also needs surgical attention,he may be operated on when his general condition "warrants". Local anesthesia, nerve block of sacral or spinal type,are the forms preferred. Chloroform may be given.

The other dangerous forms of gas poisoning are by means of blistering agents, the "chemical lepers". This phase has been reviewed in great detail for the dermatologist. Because of the persistence and efficiency of these agents, these will be used frequently in preference to the lung irritants. These gases too are insidious. For some hours with mustard gas there is no complaint;then the eyes may become reddened and the skin burns and itches, especially in the moist sweating areas.

Erythema appears chiefly in mild cases, in the form of a punctate eruption if the exposure has been slight. This may clear in from twenty-four to forty-eight hours. In severe cases the color may become darker, bullae are formed after eight to twelve hours and, if the patient has breathed in the gas, bronchopneumonia may occur. Occasionally pigmentation results from mustard gas burns even after mild degrees of erythema. This may last for several weeks and then the skin desquamates and the color fades.

To prevent skin burns, the vesicant must be removed from the skin in from three to ten minutes. Under most situations and especially with uninformed patients this will be impossible. It is important for the physician to note that these patients are dangerous for him to handle.

Unless the physician is protected properly against breathing the chemical agent vaporizing from any of these areas, he, the physician will become a casualty. The gas mask will protect only against breathing the poison gas but will not protect the skin surface or the clothing. Special oilskin gloves and oilskin clothing are needed. With these cumbersome outfits it is difficult and impossible to work for any long per-

iods.

Liquid vesicant agents may be removed from the skin with soap and water, kerosene, gasoline or carbon tetrachloride. It must be remembered that these materials are only solvents and not neutralizing agents and therefore fresh cloths should be used each time. If bleaching powder solution is used to oxidize the gas, this solution of bleaching powder must be removed from the skin in order to avoid burning with this also.

For burns with lewisite gas, a neutralizing agent such as 5 percent solution of sodium hydroxide may be used and then rinsed thoroughly from the skin. After the bulla has formed, debridement should be done. Various pastes are then used, but it is doubtful whether they have any "specific" action. Tannic acid solution was used to treat mustard gas burns in the Italo-Ethiopian War and the results, uncontrolled, seemed encouraging. These cutaneous burns are relatively slow in healing and the patient's morale must be kept up during this period.

Unlike the pulmonary complications following the lung irritants, bronchopneumonia is much more common after irritation of the tracheobronchial tree with mustard gas. For lewisite, the general measures to minimize the subsequent arsenical intoxication must be given. The usual bland treatments should be used on the eye injuries. It is recommended that no cocaine be used in the eye and that the eye be not bandaged. Briefly, the pathologic changes of mustard gas poisoning include,in the skin, perivascular infiltrates, vessel thromboses and vesicle and bulla formation. In the lung the picture is chiefly that of severe ulceration of the trachea, larynx and bronchi; bronchopneumonia and pulmonary abscesses may occur later.

Since mustard gas is persistent, lasting for days, weeks and even months under certain conditions, areas contaminated by this gas are dangerous for some time. These areas must be freed from mustard gas or decontaminated, as it is called. This is done usually with bleaching powder solutions and vigorous cleansing; contaminated clothing may be decontaminated by long exposure to windy air, by boiling, by chlorination or by the action of bleaching powder. As was mentioned before, special clothing must be worn, because this gas will penetrate cloth and even shoe leather.

Because of all this elaborate routine, it is seen readily that special treatment centers are required to treat mustard gas patients. Moreover, food and water supplies also can be contaminated. Severe poisoning can result from the ingestion of such materials. Water can be freed by the methods mentioned. Food usually must be discarded and destroyed. As a rule, intact cellophane wrappers or glass jars will protect food. Ordinary paper wrapping and paper bags do not protect. It should be emphasized again that early and prompt measures must

be taken for patients affected by the lung irritants and blistering agents; in many instances even this purely symptomatic treatment will not be available.

From the data presented it is evident that there must be set up special treatment centers for the chemical-warfare casualties. These patients cannot be handled adequately in an ordinary first aid station. In the treatment center, special rooms must be set aside for patients contaminated by mustard gas. Special precautions must be taken about the clothing of such patients.

The general material required in the ideal protected treatment center would be (1) stretchers and beds, (2) blankets, (3) hot water bottles, (4) hot drinks, (5) fresh clothing, (6) oxygen breathing apparatus, (7) gastric tubes, (8) gas masks, (9) mustard gas resistant clothing, gloves, sheets, (10) venesection needles.

The special materials required would be (1) bleaching powder, (2) sodium bicarbonate, (3) alcohol,(4) carbon tetrachloride, (5) kerosene, (6) soap and water, (7) 5 percent sodium hydroxide, (8) ferric hydrate paste, (9) compound tannic acid solution, to be used for patients received with bullae already on the skin, (10) silver nitrate solution (10 percent), (11) cocaine solutions, (12) morphine, (13) gentian violet (1 per cent), (14) heart stimulants, (15) respiratory stimulants (caffeine, xanthine derivatives), (16) fluids for intravenous use: (a) blood, (b) plasma, (c) dextrose, (d) acacia, (e) methylene blue, (f) sodium thiosulfate.

As mentioned before, all cases should be considered as serious and so treated. For minimum therapy, a patient subjected to a lung irritant must be held at absolute rest and kept warm for some hours. For the patient exposed to mustard gas, the clothing must be removed, the body surfaces washed with soap and water or kerosene or bleaching powder or paste must be used. In times of stress, this really may be all that can be done.

To keep a treatment center effective,patients should be removed as quickly as possible. They can be moved only by ambulance when that procedure is safe for the patient and the patient himself is not potentially dangerous to those who may care for him in the next treatment area (hospital).

There is a vast amount of misinformation on the residual effects of chemical warfare agents. The blame for practically every complaint,respiratory or otherwise, in veterans has been placed on "being gassed in the war". The truth of the matter is that there are relatively few residuals from chemical warfare and certainly not those horrible ones following shrapnel, gunshot wounds and the like. The question of chemical warfare casualties has been studied thoroughly by Gilchrist

and Matz.(1) In most instances "gas discipline" was very poor and many casualties were suffered through carelessness. Moreover, with little if any immediate therapy in most cases the relatively low percentage of sequelae is indeed surprising. With an efficient arrangement with trained personnel,this percentage could be reduced even more.

Since this review is practical and clinical, many subjects have been omitted. Nothing is known at present about the administration of sulfanilamide or its related compounds in gas poisoning in order to prevent subsequent wound infection or for the actual therapeusis of infections associated with the gas poisoning. The subject of complete destruction of cities by poison gas is not even considered, since this is entirely impossible now and is merely a myth produced by imaginative writers. There is always the real danger of the production of new and powerful gases which will not fall into our present categories.

This review is not intended to be an encyclopedic reference work on chemical warfare. It merely emphasizes some of the more important points of the medical aspects of such warfare especially as it relates to the civilian physician.

We must face the fact that such warfare is efficient and may be used. In fact, it seems much less dangerous as regards fatalities and residuals than the other commoner and more horrible forms of warfare. This brief report will provide a vocabulary for a type of medicine which is new to most of us, a type of medicine which will interest every branch of experimental and clinical medicine. With knowledge in advance we can assist in driving away the fear of the unknown. We can then reduce the number of casualties from these chemical compounds.

(1) Gilchrist, H.L., and Matz, Philip B.: The Residual Effect of War Gasses, Washington, U. S. Govt. Printing Office, 1933.

LIFE PHOTO

Approaching: ↑ Identification of agents: ↓ Sniffing

CURRENT COMMENT

Army Extension Courses.

"From a national viewpoint and from the viewpoint of the individual, the advantages of pursuing the Army Extension Courses are obvious. The Nation depends largely for its defense upon the citizen army. The quality of this defense will be in proportion to the efficiency of the officers of that army. Efficiency can only be attained and maintained by constant study and training. The position and importance of the individual citizen soldier depends upon the mastery of his duties and functions; his reassignment and promotion depends in great part upon his own efforts and study."(1)

In an effort to maintain the high standard of instruction offered in extension courses and to prepare officers of the Chemical Warfare Service to perform, in a more efficient manner, duties required of them upon assignment to active duty, numerous changes in the Course of Study for 1940-41 have been made as indicated on chart published in this issue. The following courses have been added:

Subcourse 20-1, Use of Smokes and Lachrymators in Training.
Subcourse 20-2, Scouting and Patrolling.
Subcourse 20-5, Organization,Functions and Equipment of Chemical Troops.
Subcourse 20-10, Conduct of Elementary Training.
Subcourse 30-1, Tactical Protection and Chemical Reconnaissance.
Subcourse 30-2, Marches and Shelter.
Subcourse 30-5, Administration.
Subcourse 30-7, Meteorology for Chemical Operations.
Subcourse 30-8, Advanced Map and Aerial Photograph Reading.
Subcourse 30-9, Combat Principles, The Chemical Platoon.
Subcourse 40-3, Combat Principles, The Chemical Company.
Subcourse 40-7, Hasty Field Fortifications.
Subcourse 50-1, Estimation and Use of Terrain.
Subcourse 50-5, Part IV,Tactics and Technique of Antiaircraft Artillery, Combat Aviation, Engineers and

(1) Announcement of Army Extension Courses, 1940-41, p.6.

Chemical Troops, Antiaircraft and Antimechanized Security Measures, Signal Communications, and the use of the Combined Arms.

Subcourse 50-6, Combat Principles of the Chemical Battalion.
Subcourse 50-7, Advance Military Chemistry - I.
Subcourse 50-8, War Department Procurement Planning.
Subcourse 60-1, Combat Principles of the Chemical Warfare Service.
Subcourse 60-2, Advanced Military Chemistry - II.
Subcourse 60-3, Mobilization of Industry and the Control of Economic Resources.

Recent statistics of the Adjutant General's Department indicate that 66,675 students were enrolled in correspondence courses during the year 1939-40. The students enrolled completed 168,887 subcourses for a total of 2,684,708 credit hours. Officers of the Chemical Warfare Service Reserve enrolled for correspondence courses totalled 1,113. This group completed 2,854 subcourses for a total of 43,957 credit hours.

In view of the present emergency it is urged that Reserve officers avail themselves of all possible training in order to more efficiently perform the varied duties assigned them while on,or if called into, active duty. A Reserve officer on inactive status who desires to enroll for Army Extension Courses should request duplicate copies of W.D., A.G.O. Form No. 145 from the commanding general of his corps area. If on active duty, the procedure is prescribed in a radio to the commanding generals of all corps areas and departments under date of October 25, 1940, as follows:

"The extension course instruction of Reserve officers on extended active duty will be conducted by extension school agencies of the corps area in which duty is being performed. Notice of subcourse completion will be furnished the headquarters of the corps area of permanent address for students serving in other corps areas, using therefore W.D.,A.G.O. Form No. 152, as provided for in paragraph 24c (1) (b) AR 350-3000."

Honoring General Sibert.

Camp Sibert, a training center near Boulder City, Nevada, is named for Major General William Luth Sibert, widely known for his work on the Panama Canal,and as organizer of the Chemical Warfare Service. A graduate of the United States Military Academy,he served as a member of the Isthmian Canal Commission from 1907 to 1914. He built the Gatun Locks and Dam of the Canal and West Breakwater, Colon Harbor, and excavated the channel from Gatun to the Atlantic Ocean. He was Chairman of the Board of Engineers appointed by President Coolidge in 1928 to examine and report upon the proposed site for Boulder Dam.

General Sibert was assigned as commander of the 1st Division, A.E.F., in France during the World War. Late in 1918,

he became director of the Chemical Warfare Service. After he retired in 1920, he became chairman and chief engineer for the Alabama State Docks Commission in 1923. He died October 16, 1935.

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ON LEADERSHIP

The discipline which makes the soldiers of a free country reliable in battle, is not to be gained by harsh and tyrannical treatment. On the contrary, such treatment is far more likely to destroy than to make an army. It is possible to impart instruction and to give commands in such a manner and such a tone of voice as to inspire in the soldier no feeling but an intense desire to obey, while the opposite manner and tone of voice can not fail to excite strong resentment and a desire to disobey. The one mode or the other in dealing with subordinates springs from a corresponding spirit in the breast of the commander.

- Schofield

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FOREIGN NOTES

Flame Throwers*.

Studies dealing with flame thrower construction date from the beginning of the present century. Germany was the first country to experiment with this type of weapon. By the outbreak of war in 1914, the German Army possessed flame throwers and had gathered considerable experience in their technique and tactical employment.

The first flame thrower assault took place 25 February 1915, at Malancourt, on the Western Front. The successful application of this new weapon by German troops led the Allies to construct similar types of flame throwers.

The construction of all flame throwers is based on one and the same principle. One container holds the oil which is a mixture of tar residues, hydrocarbons, creosote and carbosulphide. A second container,connected with the first by a valve, is filled with compressed gas, preferably nitrogen, which serves as the propelling agent.

As the valve is opened, the oil is forced through a pipe. Upon emerging from the nozzle, the oil is ignited by means of a fuse or pilot light.

The range of flame throwers depends upon:

(1) The amount of pressure exerted by the propelling gas. This pressure must not exceed a certain limit,in order to prevent the oil stream from scattering.

(2) The thickness of the stream of flaming oil. Varying with the duration of the flame thrower assault, the oil consumption rises with the increase in diameter of the oil stream.

Thus the range and duration of effect of the flame thrower depend upon the weight of the equipment and oil that has to be carried along.

Two main types of flame throwers were used during the World War, namely, fixed and portable equipment.

While fixed types of flame throwers are not in use today, their construction data probably may be applied to flame

**From Allgemeine Schwiezerische. Militarzeitung (Bern).*

throwers built in tanks. These modern flame throwers have a range of over 300 feet and can deliver from 50 to 100 bursts, with a duration of fire of from one to three minutes. Italy has for a number of years armed her tanks with flame throwers; and the German Army employed them with great surprise effect in the Battle of Flanders.

The construction of portable flame throwers, no doubt has been greatly improved, especially by the use of light materials. Their range now measures up to 115 feet; and their duration of fire between 30 to 40 seconds, in as many bursts.

The stream of fire acts primarily through the flaming oil itself as well as the heat whose radius measures approximately three times the diameter of the stream of flaming oil. The flame thrower personnel is protected against the heat by asbestos cloaks. The oil stream acts further by the poisonous combustion gases, especially where the stream is directed into closed spaces, such as dugouts and bunkers. As the stream strikes a surface, the incomplete combustion creates carbon-monoxide.

At the point of impact, the effect of the oil stream is immediate and complete. The moral effect is even greater than the material effect; this is definitely proven by the number of prisoners taken in flame thrower operations. On 1 June 1916, the German 66th Infantry launched an attack in the woods of Caillette,near Verdun. The assault was preceded and strongly supported by a flame thrower company armed with five fixed and twelve portable flame throwers. Besides gaining considerable ground, the regiment captured 1,900 prisoners, including two regimental commanders and 60 other officers.

In fighting tanks,the flame throwers are aimed at the slits and other apertures, the oil setting fire to the interior of the tank. Moreover, when a tank is enveloped in flames, the air inducted by the motor is deprived of its oxygen. This reduces the speed of the tank, or stops the motor entirely.

Fixed flame throwers were employed for offensive action in position warfare,where the opponents faced each other at close range. The fixed types served to put out of action the enemy in the advanced trenches and deliver fire concentrations with surprise effect, thus preparing the invasion of the hostile front lines. This type of equipment is of no avail in modern warfare;and no mention has been made of the employment of fixed flame throwers in recent operations. Though fixed flame throwers may be used effectively in the defensive to cover small sectors, their effect remains of limited duration. In certain circumstances, fixed equipment might play a role in short-range defense of bunkers and fortifications.

Portable flame throwers are included in the armament of assault troops. Protected by the fire for destruction of all weapons and carefully taking advantage of all natural cover,

the assault troops armed with flame throwers close in on the hostile strong points and bunkers. Resistance encountered in the intermediate zone is overcome with hand grenades and automatic rifles. If the flame thrower operator finds that he cannot approach his target within range of his equipment, he delivers a burst and pushes on to effective range under cover of the smoke screen created by the flaming oil. Depending upon the situation, it may be well to blast the obstacle before committing the flame throwers to action; then again, the demolition may be carried out with the support of the flame throwers. Their function then is to wipe out or neutralize close resistance, or, by their smoke screen, to cover the advancing demolition party against observation.

Flame throwers play an important role in street fighting, where they are used to smoke out cellars and buildings at ranges which prevent a good aim with hand grenades at windows or doors. Besides,flame throwers will cause local fires, thus contributing largely toward spreading confusion among the enemy.

In the offensive, the flame thrower is not so much a weapon of favorable opportunities, but an arm which should be assigned a definite mission based on careful reconnaissance. Therefore, the flame thrower as such is not suitable to assure assault troops continuity of the attack within a given zone. In order to gain that assurance,the assault troops must be accompanied by a number of flame throwers commensurate to the number of individual tanks. Figures as to the requisite number of flame throwers cannot be given,unless the hostile situation is clear. Besides supporting certain individual actions, the primary employment of flame throwers seems to consist in lending the assault troops that moral superiority which is essential to the penetration and the continuity of the attack. Their use is very effective at the moment when the support of the rear echelons ceases. In the recent operations, flame throwers have played a vital role in assaults directed at bunkers and have been used against them jointly with other weapons of offensive fire power.

In warding off a counterattack,the flame thrower is employed for defensive action at close range. On the other hand, portable flame throwers will rarely be committed to action at the outset of a defensive action.

Little information has been published concerning the tactical employment of flame throwing tanks. They may be used for antitank defense and against bunkers, provided the approach is accessible to tanks.

While there is no individual protection against the stream of flaming oil, it should be feasible to provide collective protection for bunkers. With all due respect to the local material effect, it must be brought home to the troops that the

success of the flame thrower depends mainly upon its moral effect. Any man who does not lie within the radius of the oil stream must direct his action immediately against the flame thrower. That is the best method of defense, for the operator of the flame thrower constitutes a fairly large target, and the duration of effect of the flame thrower is relatively short. Once the moment of extreme moral strain is overcome, the success of the flame thrower reduces itself to the actual material effect, and the attack of the hostile troops loses much of its vital momentum.

The Corps of Officials*. (German).

Officials play an important part in the activities of the German Army by performing many of the duties assigned to commissioned officers in other armies. They are not full-fledged soldiers according to German legal conceptions, but they occupy, rather, a double position. As officials of the German Reich, they are subject to transfer from one division of the civil government to another; hence, they may be serving one year in the Ministry of Agriculture and in the next year in the Army or Navy.

While serving with the armed forces, they are subject to general laws governing officials of the German Reich and also to most of the laws and regulations for officers and soldiers. They wear a uniform closely akin to that of a soldier while on duty with the Army, but their uniform is distinguished from that of the soldier by the dark green color of the epaulets and cuff distinguishing marks.

Civil officials serving with the Army fall into four general categories.

a. Officials of higher classification;
b. Officials of upper middle classification;
c. Officials of lower middle classification;
d. Officials of lower classification.

It is not possible for a German official to be promoted from one of these group classifications to another. When a German desires to enter upon a civil official career in the German government, he is classified in one of these four groups according to the general level of his education and the degree of excellence with which he has passed the required examinations. In general, all officials of the higher service have passed examinations equivalent to those required for graduation from an American university.

Army officials perform a variety of different tasks. The two principal classifications into which their duties fall are

**Translated from the 1940 edition of Das Bach Von Heer, a yearbook published by the German Army for information of civilians ---*

the technical engineering and the administrative.

The following are the principal divisions of the administrative service:

Intendance (QMC)
Finance
Military Architecture
Military Pharmacy
Archives
Libraries
Psychology
Sport Teaching
Chemistry
Military Agricultural Service
Military Museums Service
Military Forestry
Army Radio Reception Service
Remount Service
Mobilization Service
Army Motion Picture Service
Army Clothing Service
Judge Advocate General's Department
Army Chaplains' Corps
Army Trade Schools

Branches in the engineering and technical classifications are as follows:

General Technical Service
Artillery
Sound and Flash Ranging Service
Fortress Engineer Service
Motor Transport Service
Signal Service
Gas Protection Service
Pioneer Service
Topographical Service
Ordnance Service

German officials,while on duty with the Army, are not given military titles, but each position has a title of its own. Thus, the Chief Intendant of the German Army has the title of *Generalstabsintendant*, while the Chief Intendant of the Corps Area has the title of *Generalintendant*. All officials of the higher and upper-middle classifications have social position equal to that of an officer within the Army,while those of the lower-middle and lower classifications are treated as noncommissioned officers.

BOOK REVIEWS

THE ARMED HORDE, 1793-1939. *By Hoffman Nickerson. New York: G.P. Putnam's Sons, 1940. $3.50.*

Nickerson's numerous contributions to military thought have established him as a soldier's author and assures him a respectful hearing among serious students of military art.

In his present work Nickerson considers the mobilization of national man power as it has developed from the era of the French Revolution to the beginning of the present European war.

The proper ratio of man power to machine power is a continuing problem of higher strategy. It appears clear today that in 1914-1918 an excessive number of men were under arms in proportion to the military machinery that might have been utilized. A better balance between these two factors was achieved by Germany as a result of lessons learned in the last war, which affords one explanation of the striking success of German arms in the present war.

In tracing the rise of the theory of "all-out" mobilization of man power as it paralleled the rise of the democratic principle of government, and the later modification of that theory as forced by hard military experience, the author presents a thesis valuable to the solution of our present mobilization problems.

- G.J.B.F.

FROM PANAMA TO VERDUN. *By Col. Philippe Bunau-Varilla. Philadelphia: Dorrance & Co., 1940. $2.50.*

Shortly before the end of his long and constructive life, Bunau-Varilla sent a number of his American friends, including this reviewer, copies of his recently completed autobiography. It was obvious at once that here was an interesting record of a career little known to the present generation of Americans yet one that exerted a definite influence on our recent history. Fortunately, with this translation of *From Panama to Verdun,* Bunau-Varilla's story is now readily accessible to the nation whose best characteristics he, a Frenchman, so fully typified.

It is not too much to assert that but for the unaided yet persistent efforts of this French soldier-engineer, neither the Panama Canal nor the Republic of Panama would exist today.

A courageous soldier of the first World War, the then-aged Bunau-Varilla lost a leg at Verdun. Pershing relates: "From his cheerful mood he seemed to be rather proud of his wound". Although he lived in vigorous old age into the present war, this doughty warrior was spared the distress of witnessing the surrender of Paris.

- G.J.B.F.

AMERICANS WANTED. *By Maj. Gen. Stephen O. Fuqua, U.S.A., Ret. New York: Smith and Durrell, 1940. 183 pages. $2.00.*

This book is essentially a handbook of the military organization of the United States. The author, a distinguished officer and well known commentator, has discussed with conciseness and clarity, for the benefit of the lay reader, the subdivisions of our defense forces.

Besides a discussion of the various arms and services, there are well-written chapters on such pertinent matters as the meaning of conscription to the individual, and civilian home defense.

- R.F.

WHERE THEY HAVE TROD. *By Lt. Col. R. Ernest Dupuy. New York: Frederick A. Stokes Co., 1940. 624 pages.*

Weaving his presentation around the careers of West Point's three outstanding educators, Colonel Dupuy contributes a fascinating chapter to West Point lore----"lore" in its archaic as well as in its modern sense. For *Where They Have Trod* is the story of the development and influence of West Point's system of education besides being a record of its alumni, its customs, its early difficulties, its survivals, and its legends.

Many readers will be familiar with the military accomplishments of West Point graduates in the wars of the United States, beginning with the War of 1812. Fewer readers will be familiar with the accomplishments of its graduates in the more peaceful pursuits. And it is quite probable that but a very small percentage of the graduates themselves are acquainted with the history of the background that produced these graduates.

- M.R.K.

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Books reviewed in these pages may be obtained through the Book Department, Chemical Warfare School.