

CHEMICAL WARFARE

A quarterly magazine devoted to the activities
of the Chemical Warfare Service, of interest
to all arms---



Edited by Staff, The Chemical Warfare School,
Edgewood Arsenal, Maryland

THE CHEMICAL WARFARE SCHOOL

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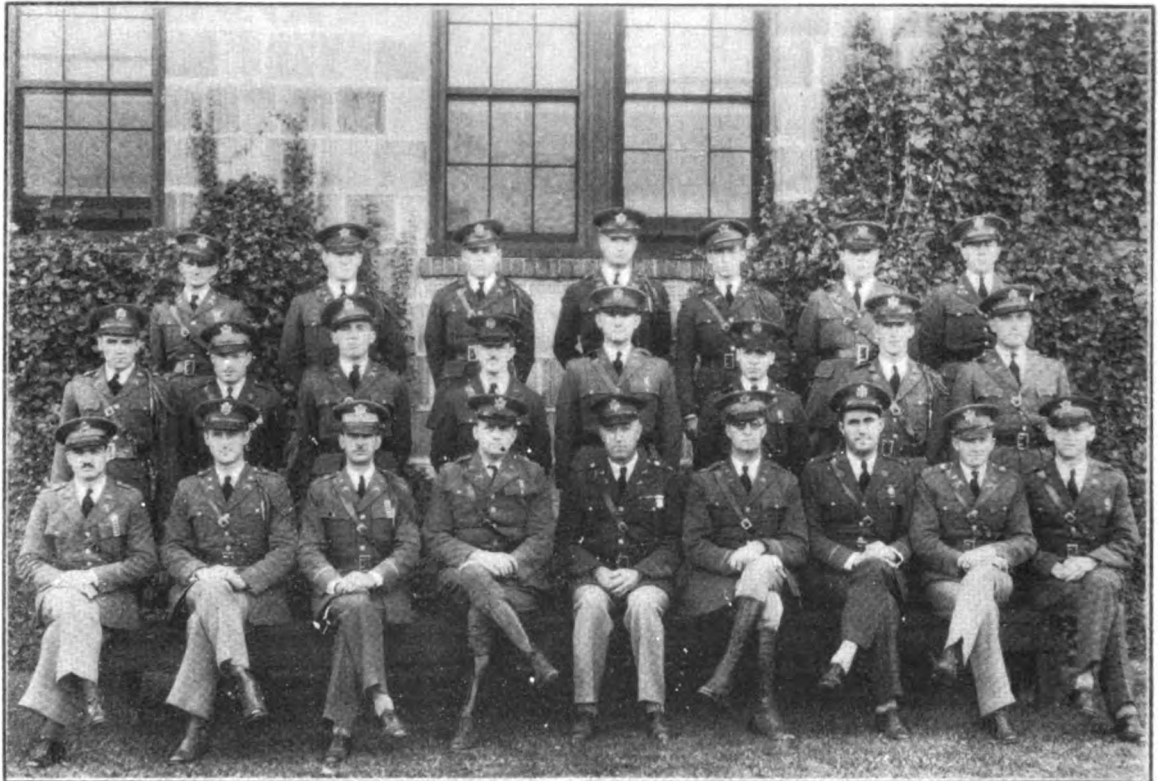
First Lieutenant Milton T. Hankins - Signal Corps

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Sixth Unit Gas Officers' Class

BACK ROW: 2nd Lieuts. Bertolet, Lehrfeld, Hackett, Wertz, Dick, Ray, Crossley.
MIDDLE ROW: 2nd Lieuts. Lermond, Selby, Sink; 1st Lieuts. Adair, Smith, Wilson;
2nd Lieuts. Cole, Kunzig.
FRONT ROW: 1st Lieuts. Grace, Pheris, Smyser; Capts. Johnston, Griffin, and
Livingston; 1st Lieuts. Gillespie, Burns, Rick.

CHEMICAL WARFARE

VOL. 19

JANUARY, 1933

NO. 1

SIXTH UNIT GAS OFFICERS' CLASS

The Sixth Unit Gas Officers' Class completed its course of instruction on November 23, 1932. Brigadier General Ernest D. Scott, U.S.A., delivered the graduation address and presented diplomas to the following officers and enlisted men:

Captains

Griffin, Ashley J., Ord. Dept., Conn. N.G.
Johnston, Edward G., Inf., Ill. N.G.
Livingston, Walter, Cav., Iowa N.G.

1st Lieutenants

Smyser, Harold E., Inf.
Gillespie, Reginald R., A.C.
Pheris, William E., Jr., Inf.
Burns, John R., Inf.
Grace, William P., Jr., Inf.
Rick, Edwin M., C.A.C., N.Y. N.G.
Smith, Harold M., CW-Res.
Adair, James T., Jr., CW Res.
Wilson, Alfred J.P., CW-Res.

2nd Lieutenants

Sink, Robert F., Inf.
Cole, George M., F.A.
Selby, Irving R., A.C.
Kunzig, Henry B., Inf.
Lermond, George W., Inf.
Wertz, George M., F.A.
Hackett, Robert, F.A.
Dick, William W., Jr., F.A.
Lehrfeld, Irving, Inf.
Ray, George G., Inf., Miss. N.G.
Bertolet, John H., C.A.C., Pa. N.G.
Crossley, Arthur W., CW-Res.

Sergeants

Bridges, W.T., 1st Cml. Regt. Houser, W.F., 1st Cml. Regt.
Deptula, F.A., 1st Cml. Regt. Keebler, J.A.G., 1st Cml. Regt.

Corporals

Leslie, Joseph F.V., C.W.S.
Palmer, John M., C.W.S.
Richardson, Sherman B., 1st Cml. Regt.

ADDRESS BY BRIGADIER GENERAL ERNEST D. SCOTT,
TO THE GRADUATING CLASS, UNIT GAS OFFICERS' COURSE,
THE CHEMICAL WARFARE SCHOOL, EDGEWOOD ARSENAL.

November 23, 1932

Ages ago, men fought with the weapons nature had endowed them with - fists, nails, teeth, feet. Probably they did each other no particular harm - fatalities rarely attend the fights of similarly equipped animals today.

In time, rocks and clubs came into use with attendant increasing fatalities. No doubt the boxers and biters and kickers of that day exclaimed their horror at the new methods of warfare and denounced them vigorously.

Then someone devised the sling, and someone the bow and arrow; stones could be thrown with greater accuracy and force than by hand, an end-on club blow could be delivered from a distance. Nature had placed the little man at a disadvantage as against the big man, but now an equalizer had been found. One may imagine the roars of the Goliaths of the day, their dominance threatened by the new weapons.

Down through the ages man has sought to improve his weapons and the means for their use in order to make war, in order to protect his fireside, in order to prevail over others, in order to insure the keeping of the peace by unruly elements, in order to secure lands for his surplus population, in order to support such fictions as the Divine Right of Kings, the superiority of one church over another, that all men are equal.

Again and again was the "last word" in armaments uttered and man went along in enjoyment of that fact and grew stale and set in his ways. Then someone invariably designed something new that put the old at a disadvantage. Invariably the air was rent with the cries of those who were drifting comfortably along with what had been long accepted, ridicule of the pretensions of the new, defense of the virtues of the old, denunciation of the dreadful results to follow the adoption of anything new, praise of the good old reliable means of taking life and maiming men.

It was always so; it is so today. Every innovation in arms has met with the bitterest opposition. The firelock, the flintlock, the percussion cap, the paper cartridge, the metal cartridge - all were greatly delayed by the blind opposition of the military commanders - I will not say the military leaders - of the day. Wars had to be fought and lost before some would accept the breech-loader, the magazine rifle, the machine gun. In the early Nineties, when our Ordnance Department was developing the Krag-Jorgenson, among the proofs adduced against its value was the performance of an old sergeant who could hold ten or twelve cartridges of the old calibre forty-five in

his left hand and pour them from a single-shot Springfield into a target faster than a man with the new magazine rifle could deliver an equal number of shots. In the Nineties, the French brought out their famous 75. Another nation that had just rearmed its artillery with a gun embodying none of the improvements of the 75, at once sought to disprove the claims made for the new weapon. Many of their military writers were honest in their attitude. Seventeen years after the appearance of the French gun, nine years after our artillery had been armed with similar weapons, after the South African and Manchurian Wars had furnished an abundance of examples of the advantage of indirect fire, and after the Balkan wars had caused the coining of the phrase "A battery seen is a battery lost", a great nation entered the World War with open sights and direct fire.

The pages of history are crowded with instances of stupid and costly opposition to anything new in arms and methods of using them.

War has gone through many changes. Long ago, it was a struggle between tribes in which every able bodied man participated - the idea of the Nation in Arms, erroneously thought of as a modern conception. Gradually the making of war became limited to selected men who made it their profession. In time it became, in Europe at least, a thing quite apart from the life of the countries wherein it was fought, small mercenary armies operating and observing the rights of the inhabitants as scrupulously as do troops today on maneuvers. The Armies of the French Republic taught Europe that the day of small professional armies was past; the restrictions laid by Napoleon on Prussia's forces led that country to the idea of creating a large reserve by short term training; collectivism became the watchword in Continental Europe, conscription its expression. The old idea of the Nation in Arms began to be preached, and by the end of the XIXth Century, had been wholly accepted by the two most powerful and probable antagonists, France and Germany. Great Britain and the United States had shown only an academic interest in the idea, their internal wars had been marked by desperate fighting which would only have been worse and more extended had the idea been extant; geographically they were safe from invaders, and their foreign wars had been fought on foreign soil.

The World War brought home the idea to all, and even in these United States it is accepted. Even the Pacifists use as an argument for universal peace and the abolition of war, the fact that war between great nations in the future will involve all ranks and classes, both sexes, that the nation will win that can throw into the struggle the greatest mass of human, financial, material, weight. The possible results in loss of life, of man-power, of treasure, are appalling, and the aftermath of crushing taxation for generations to come is being daily brought home to all, and can be readily visualized for any future effort of the Nation in Arms.

During the latter part of the XIXth Century, some military and other writers gave some consideration to the possibilities of chemicals in war. That was the period of greatest development in arms that the world had ever seen; enthusiasts were many; the race between arms and armor reached its peak; the lesser powers were dreaming of developments that might enable a challenge to the long accepted British dominance of the Seas. The new shrapnel promised to be a wonderful man-killer, the rate of fire with the magazine rifle and the machine gun promised such slaying as had never been seen before, and here were people talking of using gas, something almost intangible, something mysterious and therefore terrible, something new in warfare and therefore unfair, something the military class knew nothing about, something that did not fit into any idea of the tactical handling of troops on the field - why! a chemist might thwart an epauletted General at his own game! Perish the thought! Down with the idea that anaesthesia might be more effective on the battlefield than body-destroying high explosive. So the greatest war in history began with the armies marching to the sound of drums, banners fluttering, much of the old panoply of war, somewhat akin to the noise producers and horrible faces with which the Chinese not so long ago sought to terrify their foes.

The slaughter created by the boasted new weapons soon compelled a return to the armor of long ago, eliminated much of the panoply, wiped out much of the old pomp and circumstance, ended forever the glory of the charge of cavalry, the charge of infantry pepped up by fife and drum or bagpipe. War degenerated into close and bloody struggles in the mud, with every conceivable weapon that could harm the adversary - no glitter and glamour and dash, just cold, brutal, relentless destruction of men. Stalemate ensued on the field; and then one day the Germans made their famous gas attack on the British front. What a roar went up from all the civilized world! Press and pulpit, legislative halls and the streets alike rang with denunciation of the Hun and his barbarian act. Had he massed sufficient guns to accomplish the same end, and had the same number of casualties occurred, there would have been noted merely another German victory. No one would have stopped to consider that the dead would have been horribly mangled, the wounded likewise, that many of the latter would go maimed and helpless through life. No one did consider that the men who died from gas that day went rather painlessly, that few of the wounded were not as well as ever in short time, that no maiming resulted - except possibly the loss of a few eyes. No one could see anything but the perfidy of the Hun, playing the game of war with new rules formulated by himself. It was the same old cry of the stone thrower against the slinger, of the archer against the musketeer, of the musketeer against the riflemen, of the heavy cavalryman against the carbine-armed dragoon; muzzle loading versus breech; quick fire versus rapid fire; direct laying versus indirect; sabre versus pistol, and all the rest.

But the new weapon had to be met with protection, and it had

to be employed, fair or not, against the enemy lest the morale of the Allied soldiery suffer. And so Chemical Warfare was born in the midst of a war, and before that war ended it had proven such an infant prodigy as no war had ever produced. Probably nothing ever developed in the arts of peace or war, grew to such importance or had such an influence in the affairs of the world, in the space of three short years.

Usually at the end of a war, weapons that had proven their worth were continued in service, not so Chemicals. Their very efficiency was quoted against them. It was most disconcerting that a perfect development and deployment for assault might be brought to naught by a whiff of gas! What chance had a general if an unknown factor was likely to be injected in his problem at any time and without warning? And then there was the poor civilian population, which as everyone knows peacefully goes about its normal pursuits on the battlefield when only conventional high explosive is being used, are they to be asphyxiated? And curiously enough, while those of us who served at the front were quite ready to admit the high importance of the new weapon, many of those who did not have personal experience had to be educated up to it after the war ended. One general officer high in the councils of the AEF and high on the active list today, pooh-poohed the Chemical Warfare Service long after the war, and delighted to refer to it as the "Comical Warfare Service".

Through the efforts of relatively few people, Chemical Warfare has been preserved in one of our arms. It has done much since the war to justify its existence for peace purposes alone. It has been hampered by hostility of other arms, by legislative neglect engendered by pacifism, and by the old, old feeling that voiced itself against the sling, the flint, and the cartridge. But the nucleus exists and I doubt not that its expansion program will enable it to keep step with the mobilization of the armies should such mobilization ever occur. You see, I take it for granted that no nation in the future will fail to avail itself of this new weapon, if it has the means to produce or procure it. No one with experience at the front in the World War, or who has read the records of battle casualties, can honestly doubt that gas is more humane than high explosive; it remains for all such to contribute to the education of the people in the truth of that. Once it is understood and accepted, chemical warfare will be accepted as a matter of course, and it requires no stretch of the imagination to see it become a more menacing, because more impendable, threat to any bellicose neighbor than even a fleet or standing army, whose capacity for battle can be accurately gauged.

"Nations in Arms" will contend in the next war; each will try to impose its will on its adversary in the shortest possible time; is it reasonable to suppose that it will be willing to prolong the agony by adhering to the arms and customs of a bygone generation when others of proven worth are available?

You gentlemen are fortunate in having been introduced to the means, methods, and some of the secrets of the Chemical Warfare Service. I hope the impressions you have received are deep and will be lasting. In your own bailiwicks you may have little opportunity to develop or to practice what you have learned, but you can do yeoman service for your country by establishing in men's minds the fundamental truths about the humaneness and the efficiency of chemical warfare.

I congratulate you on the opportunity that has been afforded you, and compliment you on the advantage you have taken of that opportunity as evidenced by your being graduated at this school.

MECHANIZED CAVALRY AND CHEMICALS

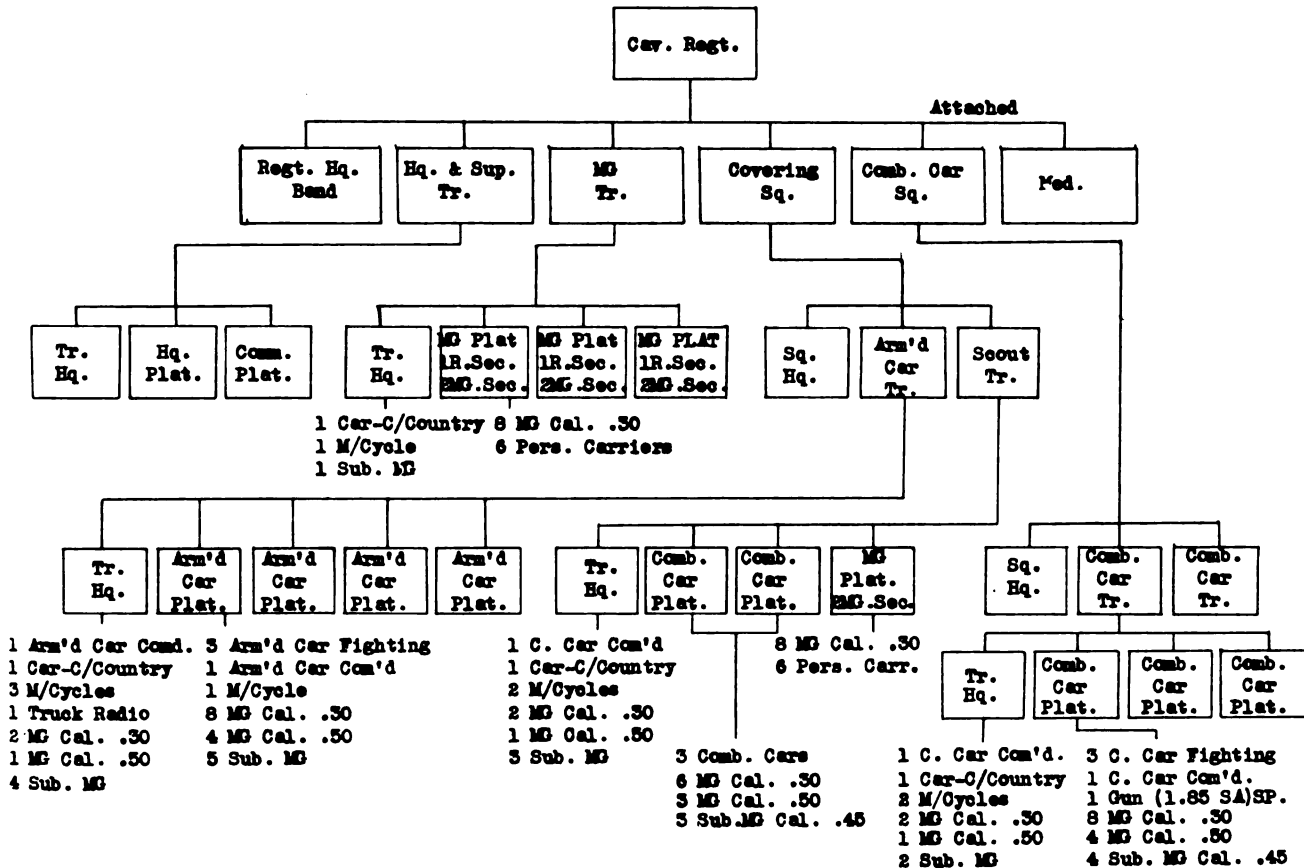
By: Captain Rhey T. Holt, Cavalry

In considering the use of chemicals (or any auxiliary weapon), we must first consider the characteristics, the organization, and the tactics of the arm involved. This is necessary in order to determine the type of and the uses for the auxiliary weapon and to see whether the disadvantages resulting from the addition of another weapon are more than compensated for by its value.

The characteristics of a mechanized cavalry are in general similar to those of horse cavalry: a. Mobility, both on roads and across country, is one of its greatest assets. The vehicles of the regiment are of two distinct types - those with great road mobility, which include the armored cars, and those with great cross-country mobility in combat, which include the combat cars and personnel carriers. Although individual vehicles can move much faster, units of the size of the regiment or brigade can maintain marches of about 130 miles per day at an hourly rate of 16 miles. This allows ample time for the necessary inspections, servicing, and maintenance of vehicles. Night rates are somewhat less, being about 12 miles per hour with lights and about 10 miles without lights. Rates across country are variable, being adversely affected by soft ground, grades, wooded areas, streams, etc. Steep rocky slopes, heavy woods, and deep streams form impassable barriers. For short distances over favorable terrain combat units may move at rates of 20 to 30 miles per hour. (Example - combat cars and personnel carriers in maneuver or in the attack, i.e., those vehicles upon which the mechanized regiment depends for its combat strength).

b. The fire power, built around the fifty (.50) caliber machine gun, is particularly strong in automatic weapons. Thirty (.30) caliber machine guns constitute the main weapon for personnel destruction. All guns are capable of being fired from the vehicles. The fire power is very flexible due both to the mounting and the means of transport. This flexibility permits rapid changes in the concentration of fire for supporting the attack or in meeting a

CAVALRY REGIMENT (MECHANIZED)
(Tactical Organization for the purpose of instruction only)

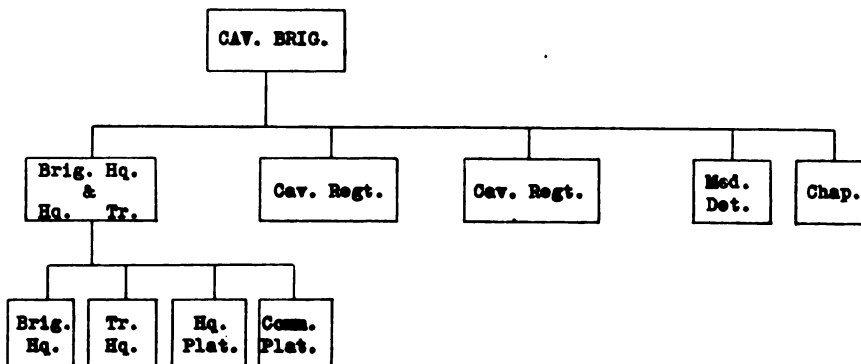


Regiment, when acting alone, might be reinforced by:



Figure I

CAVALRY BRIGADE (MECHANIZED)
(Tactical Organization for the purpose of instruction only)



Brigade may be reinforced by:

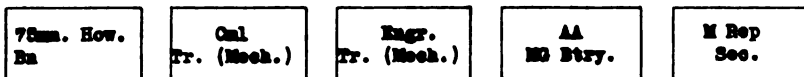


Figure II

changed situation; it permits early movement with a view to taking advantage of faulty dispositions by the enemy.

c. Shock, as with horse cavalry, implies actual collision in the mounted attack. This reaches its greatest value when the combat car elements are attacking with speed from a direction or at a time in an attack which the enemy is at least prepared to meet. Shock action, to be most successful, must include the elements of mass, speed, and surprise.

The defensive capabilities of a mechanized regiment or brigade are extremely limited. Ground gained by an attack of armored vehicles can be held but a relatively short time by the comparatively weak dismounted elements of the force. For a protracted defense the support of horse-cavalry or of infantry is necessary. The ground holding ability of armed combat vehicles is negligible. The latter - when stationary and unconcealed, present a vulnerable target to the fire of hostile anti-tank guns and light artillery.

From the foregoing, it is apparent that the missions assigned to mechanized cavalry should be such as will permit it to utilize this high degree of mobility for movement or maneuver, concluded by quick, hard-striking actions. When attached to the cavalry division or corps, the commander thereof holds a powerful weapon for extending the normal roles of his arm. When employed with the Army, the Army commander possesses a highly mobile reserve capable of carrying out certain of the missions normally assigned to horse cavalry.

Figures I and II illustrate the tactical organization of the regiment and brigade. Tables of organization have been approved by the Secretary of War.

In the regiment we find that the combat car squadron is the major tactical element. This forms the main striking unit, normally composing the maneuvering force or forces and the reserve. The combat cars are of the Christie type, armored so as to give reasonable protection against weapons such as the .50 caliber machine gun and 37 mm gun. Theoretically, they are not vulnerable to small arms fire. They have considerable offensive armament in both the .50 caliber and .30 caliber machine guns and in addition carry .45 caliber sub-machine guns. Primarily as a supporting weapon for employment against hostile tanks and anti-tank guns, one 1.85 caliber S.A. gun (47 mm) on a self-propelled mount has been included as an integral part of the platoon.

Means of terrestrial reconnaissance are provided through the covering squadron. This unit includes an armored car troop and a scout troop. The armored car troop performs the distant reconnaissance missions prior to combat. After contact, and during combat, it conducts aggressive reconnaissance of the hostile force and provides flank protection. With 2 to 5 hours start over the main body, one ar-

mored car troop can reconnoiter a zone about 15 miles wide. This time permits the removal of obstacles, repair of bridges, or the planning of detours without delaying the main body. Various makes and types of chassis have been experimented with for such reconnaissance purposes. The Cunningham and Franklin have shown potentialities. The armored car has great road mobility and fair cross-country mobility. It is sufficiently armed and armored to participate in such light fast actions as usually occur in the carrying out of reconnaissance missions.

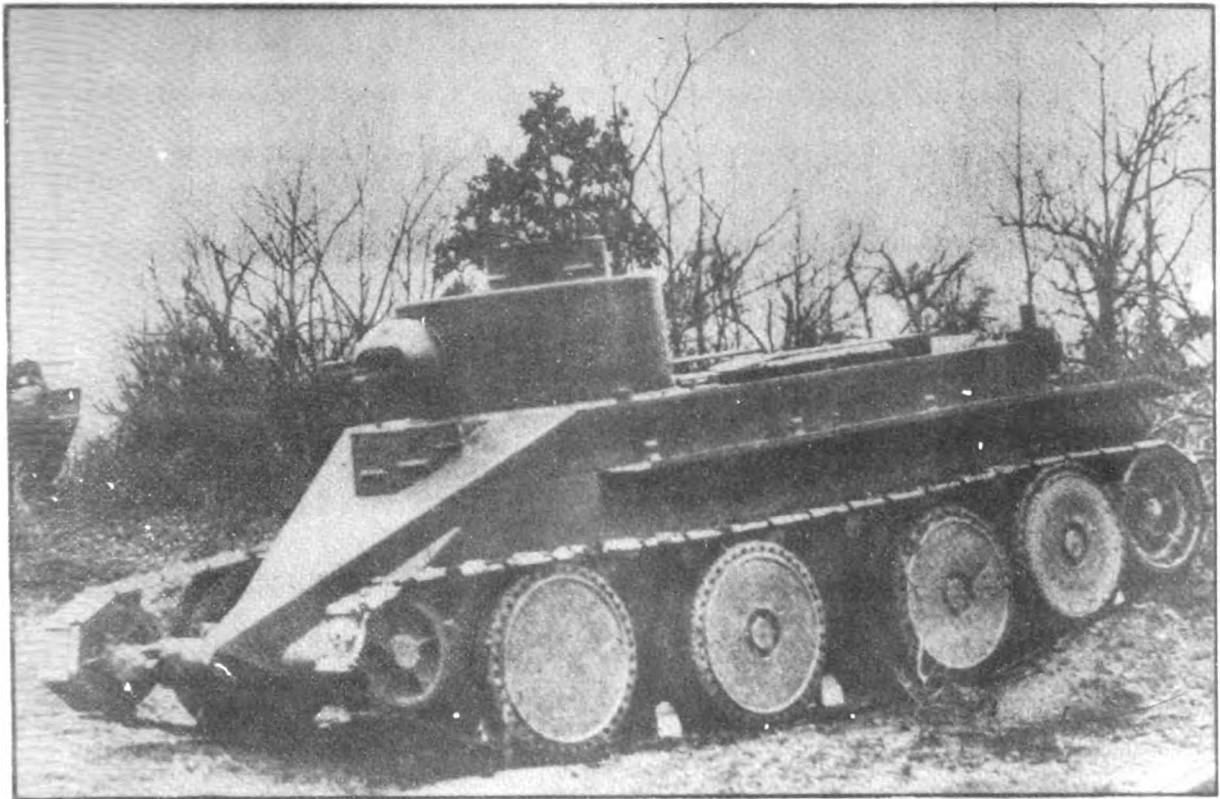
The scout troop provides additional means for close reconnaissance and security preceding and during combat. It normally functions as the advance guard, but may be augmented by attachments. Its combat cars permit offensive action against small hostile groups in proximity to the axis of movement, while the machine gun platoon provides the necessary holding force for securing advanced terrain features and for use on an exposed flank during combat. The dismounted elements are normally transported in light cross-country personnel carriers which are track-laying, or semitrack-laying such as the Citroën-Kegress car.

The machine gun troop is the main holding and protective element. It normally reinforces or takes over from the scout troop, forming the pivot of maneuver. Thus, additional security is provided for certain phases of the development, and strong machine gun fire for use in pinning the enemy to the ground during the maneuver and initial stages of the attack by the main effort. The primary mission of the machine gun troop is to hold ground gained by other means. Its personnel is normally transported by vehicles similar to those employed with the machine gun platoon in the scout troop.

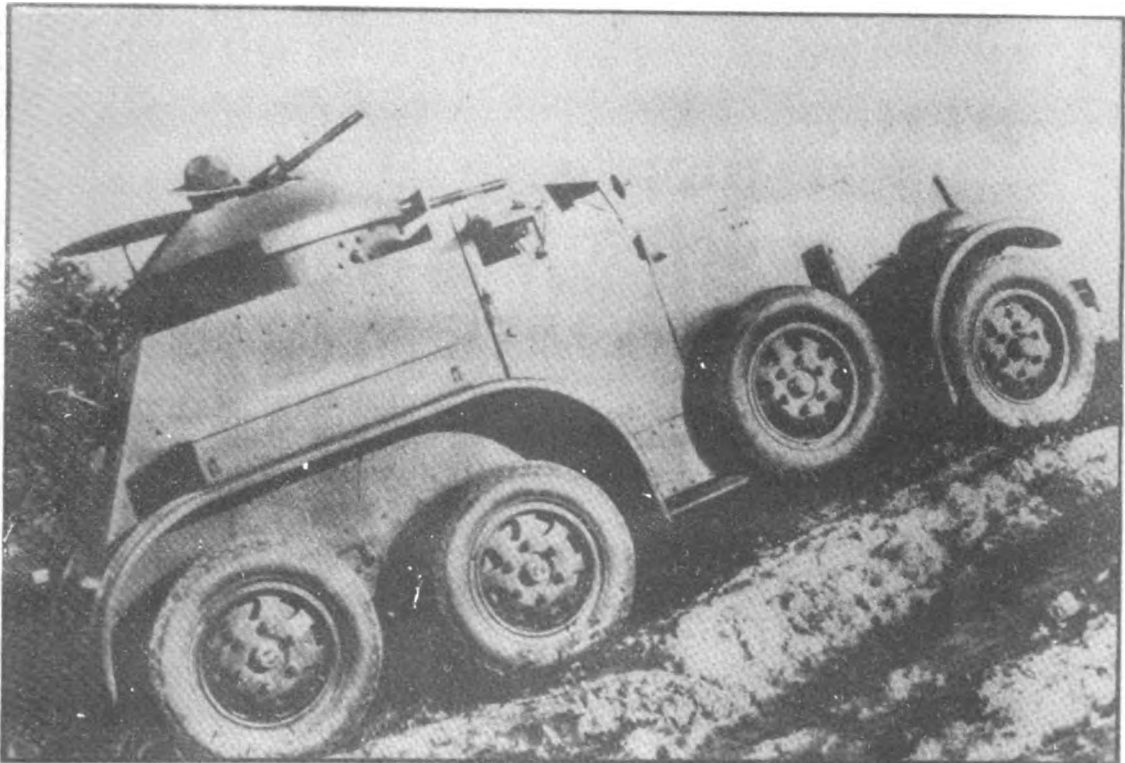
As mechanized units of the size of the regiment and brigade will often operate against hostile forces supported by artillery, some provision for counter-battery and destructive fire must be included. Experiments are to be conducted with the 75 mm Howitzer and 81 mm mortar with a view to determining the best weapon for support and accompanying missions. The question of using a track-laying mount for either of these weapons is still subject to decision.

The necessity for and the functioning of certain attachments, such as Engineer and Maintenance organizations, are apparent and require no further comment.

Control is an especially difficult problem. In order to utilize the capabilities of such a force to the utmost, its control can only be accomplished through rapid and accurate information and communications, early decisions followed by comprehensive but simple plans, and intensive training in teamwork. This implies that the facilities for terrestrial reconnaissance must be augmented by aerial reconnaissance. The communications system includes radio telephone-telegraph, visual color codes and signals, and motorcycles messengers. Much stress is placed upon teamwork on the part of the staff and all



CHRISTIE COMBAT CAR



CUNNINGHAM ARMORED CAR

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<u>TACTICAL ELEMENTS</u>	<u>ORGANIZATION</u>	<u>REMARKS</u>
Reconnaissance	Armored Car Troop (less 1 Plat) Engineer Reconnaissance Det.	.
Advance . Guard	Distance 2 - 5 hrs.	Comd'rs Group may march here
	1 Plat. Arm'd Car Tr. Scout Tr. Engr. rec. Det. AA Plat (less 2 sqds)	AA may be detached to cover defiles, re-joining after passing of main body.
	Distance 10 - 30 min.	Comdr's Group usually marches here
Main Body	Forward Echelon Hq.	Marches by bounds in interval ahead
	MG Tr C.W. Plat. AA Sqd. Comb. Car Sq. 75 mm How. Btry AA Sqd.	
	Distance 0 - 5 min.	Distance maintains until Serv. Gp. is detached to form Ad. Serv. Park
Service Elements	Engr. Plat (less deta) Main Sec. Med. Sec.	
	Distance 0 - Base	Distance 0 until base is established
Supply & Administrative Elements	Rear Ech. Hq. Hq. Co. (less deta.) Attached Med.	Organization Supply Vehicles attached

Combat elements only enter combat area. Trains establish base well in rear of combat area. Service elements establish advance service park close in rear of combat area.

FIGURE III - POSSIBLE MARCH FORMATION

REGIMENT OF CAVALRY (MECHANIZED), REINFORCED.

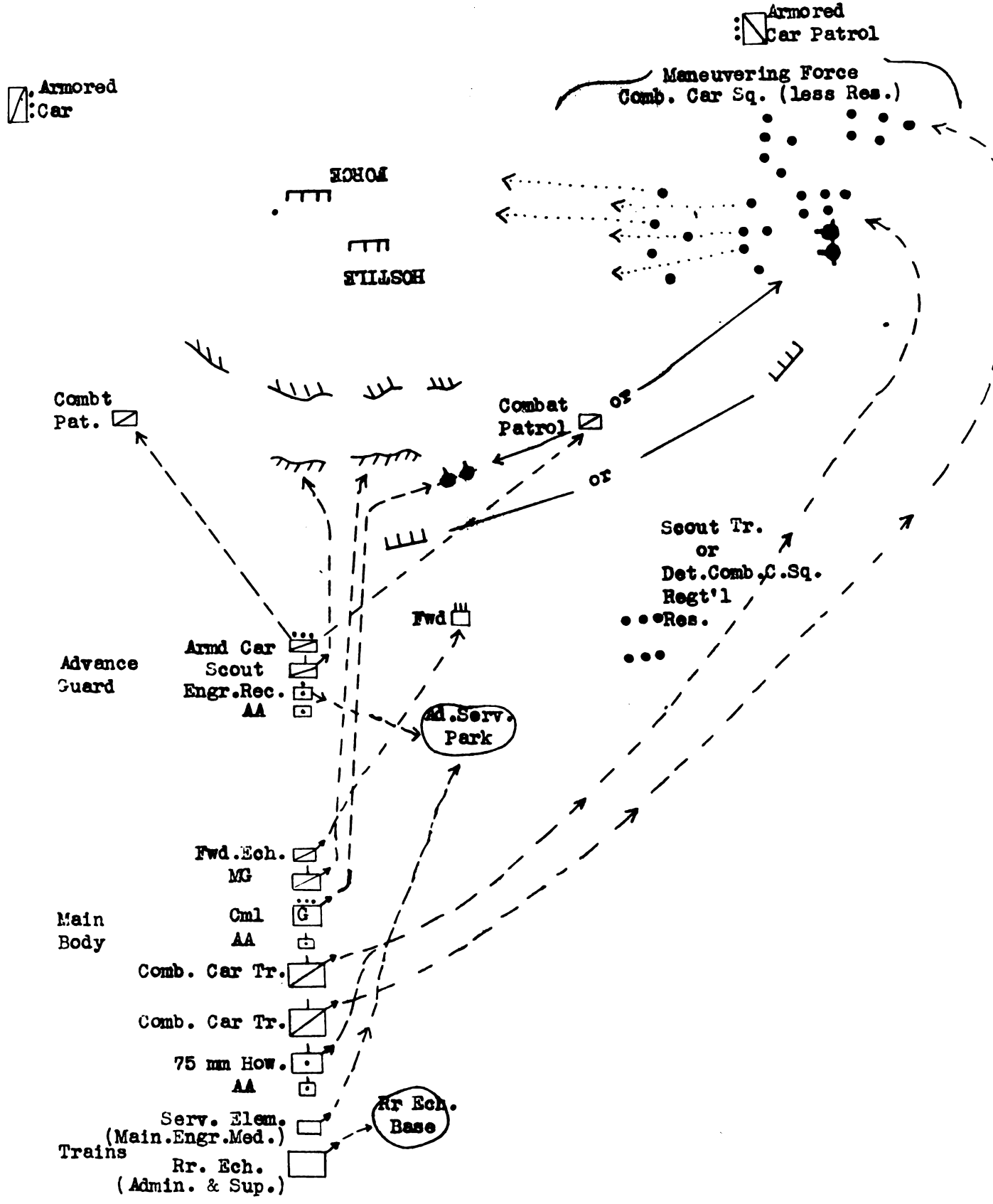


FIGURE IV - REINFORCED CAVALRY REGIMENT (MECHANIZED).
 Deployment for Attack (Combined Action - Envelopment of Hostile Left Flank)
 (Not drawn to scale)

subordinate commanders. This is essential since often the fast-changing situations occurring after the promulgation of the initial attack orders will not justify a subordinate in awaiting additional instructions before taking action.

The tactical employment of mechanized cavalry conforms in general to that of horse cavalry. When combat is not imminent, the unit normally marches with distances of about 75 yards between vehicles, in one or more columns, depending upon the size of the force and the road net. This provides elasticity for the march and a less vulnerable formation in case of an aerial attack. Upon contact or when combat is imminent, columns are usually closed, pending the development. At times it may be more expeditious for the elements to move directly toward their attack positions without first closing up. Normally, the force will pass through a development phase prior to deploying for the attack, even though there is no distinct line of demarcation. The forms of attack, like those of horse cavalry, are normally wide envelopments with the decisive blow being made against the hostile flank or rear. It will be necessary at times to vary the forms of attack, depending primarily upon the dispositions and strength of the hostile anti-tank defense and upon the terrain. (See Figures III and IV).

Normally, an attack against an enemy in position has as its prime mission the securing of one or more key localities of tactical importance. An enemy in movement is, of course, the objective itself. Before the final objective can be reached, it will usually be necessary to destroy or neutralize certain hostile elements capable of holding up or delaying the main attack. In an attack by mechanized cavalry, these will consist primarily of the hostile anti-tank guns, accompanying or close support guns, and light artillery which is so disposed as to bring effective fire against the combat vehicles. The destruction or neutralization of these hostile elements may be accomplished by means of the auxiliary and supporting weapons, by their assignment as initial objectives for the attacking elements, or by a combination of such means.

Formations for the attack will vary according to the hostile objective - its composition, location, contour, and according to the flank security and penetration required of the attacking element. When units are attacking an anti-tank gun area from a flank, the formation may consist of a column of small lines. Example: Column of Platoons at 500 yards to 1000 yards distance. Against an area of considerable depth and width, the more usual formation of successive waves will be employed. Example: Column of troops at increased distances. Formations must be such as will permit the maximum fire power and utilize the element of shock. However, they must be sufficiently flexible to permit the necessary maneuverability of all units down to and including the individual combat cars. Figures V to VII illustrate these points.

Regarding the conduct of the attack proper, we find that there are several schools of thought.

One is based upon the idea that combat vehicles of this nature can make very limited objective attacks only before reorganization, after which the attack will be continued either by the reorganized units or by the reserve. In such actions, the successive objectives may be only some few hundreds of yards apart, resulting in a requirement for considerable artillery support. These ideas have apparently been influenced by personal experience with the light tank.

A second school, which appears more radical, seeks to employ all the elements and their fire power as a moving barrage; in other words, to have all of the combat vehicles, accompanied by all support-weapons, drive through the hostile area while firing (more or less at random) a frontal barrage. Such a procedure, although conforming to the principle of mass, certainly violates the principle of economy of force. Due to the relative blindness of the combat vehicles, the varied terrain existing in any zone of attack, and the unavoidable casualties among vehicles, a very short advance of this nature would result in such confusion and lack of control that the extraction of the force would be extremely doubtful.

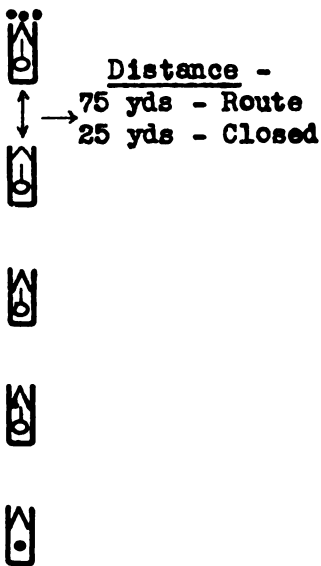
The more generally accepted method includes the maximum use of mobility in the attack while contemplating the rallying and reorganization of assault units when the casualties and lack of organization reach such a magnitude as to make them ineffective. Each unit aggressively pushes its attack as far forward as practicable, rallying and reorganizing when forced to do so. For example, the squadron is making an attack with Troop A forming the assault and Troop B the reserve. Troop A moves as far as practicable towards its objective until forced to rally, accomplishing this under the nearest cover (probably to a flank) upon orders or signal by its commander. Troop B then continues forward and either passes through or around Troop A, which forms the reserve upon completing its reorganization.

Having briefly considered the factors which in general influence the use of auxiliary weapons, we can better appreciate the requirements for chemicals.

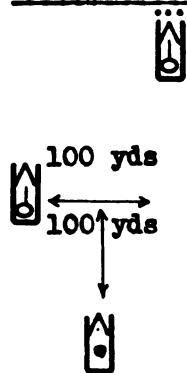
Certain additional means for securing surprise in the attack are desirable. Means for blinding hostile observation and for reducing the effectiveness of the enemy's aimed fire are necessary. Probably the more critical phases of an action requiring such assistance are: (1) During the movement into position for the attack; (2) During the initial stage of the attack (while units are advancing from the line of departure, or other coordinating locality, until within proximity of their initial objectives); and (3) during the rallying and reorganization of the assault elements. As the attack progresses many units will be subjected to effective fire from hostile emplaced guns which cannot be definitely located. The available art-

POSSIBLE PLATOON FORMATIONS

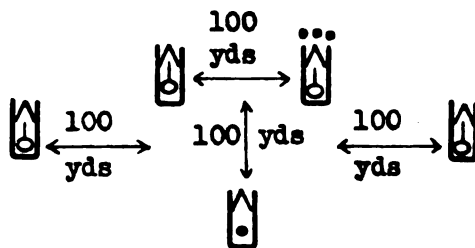
Column



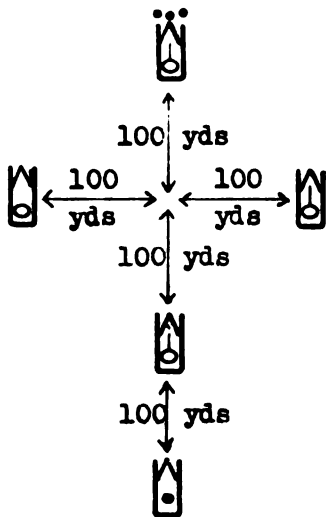
Echeloned to the Left



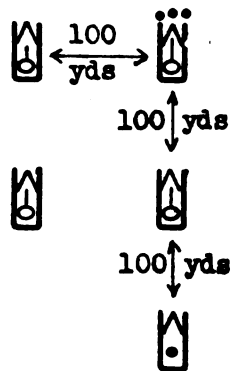
Line



Diamond



Square



Legend






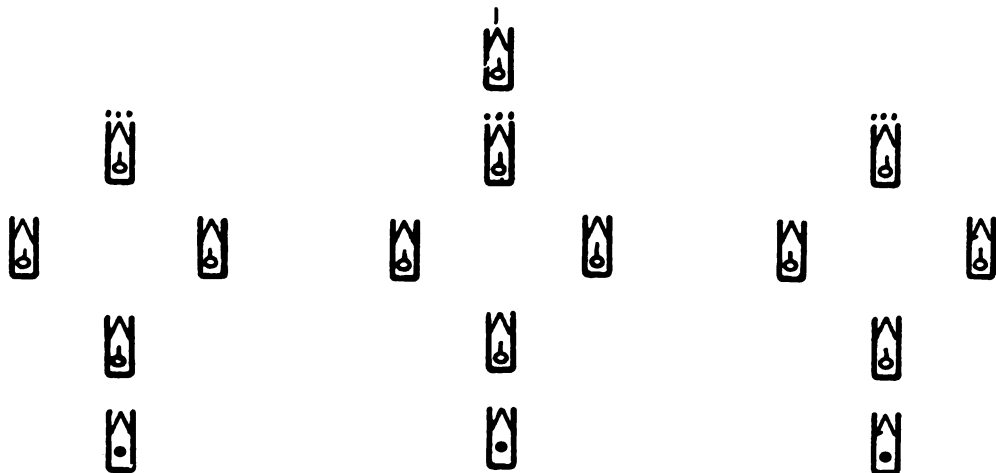
-  Sq. Com'd Car
-  Tr. Com'd Car
-  Plat. Com'd Car
-  Combat Car
-  Plat. Sup'g Gun
(1.85 S.A.)

Figure V

POSSIBLE TROOP FORMATIONS

Line of Platoon Diamonds:



Column of Platoons:

1st and 2nd Platoons - In Assault,
3rd Platoon - In Support:

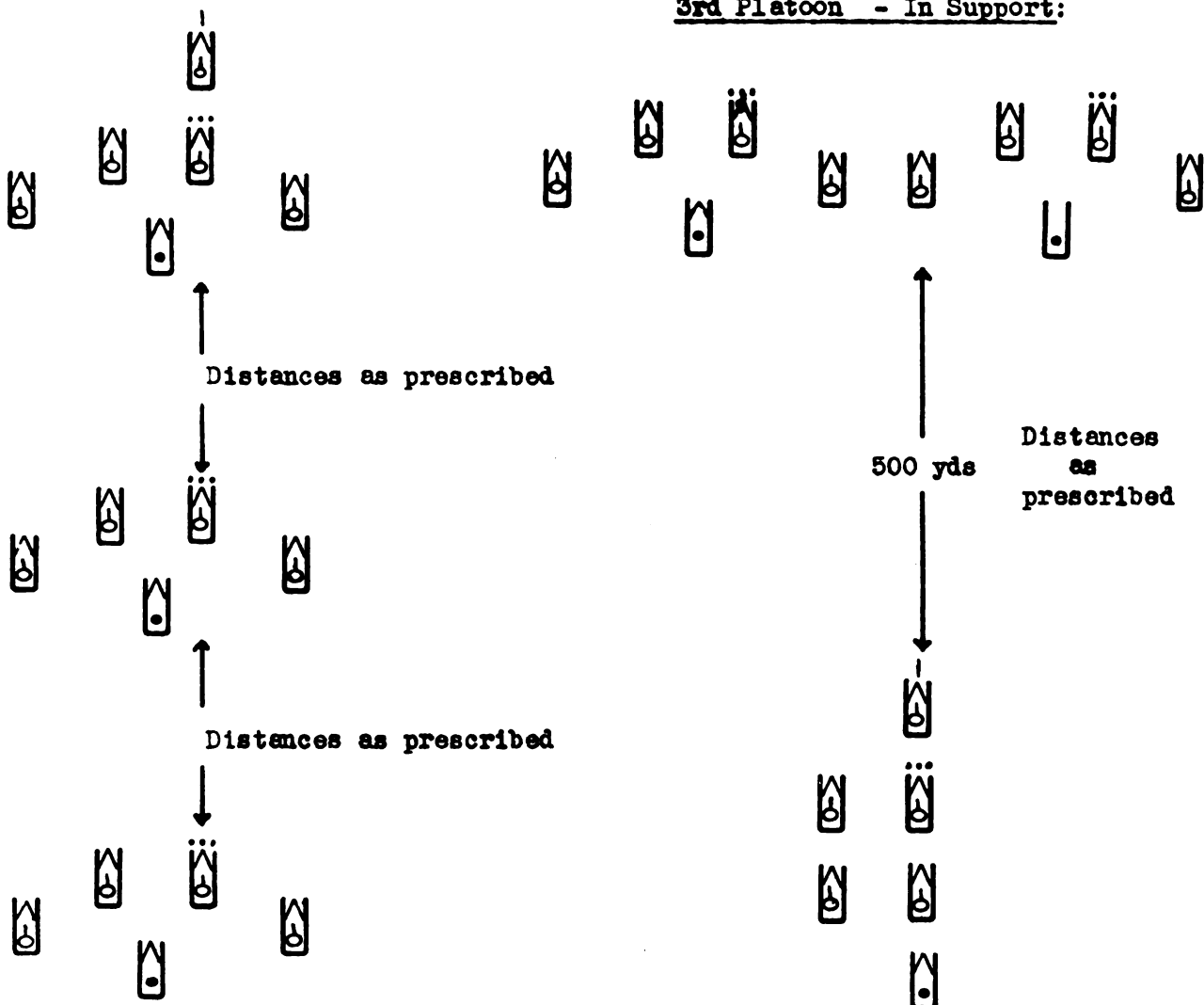
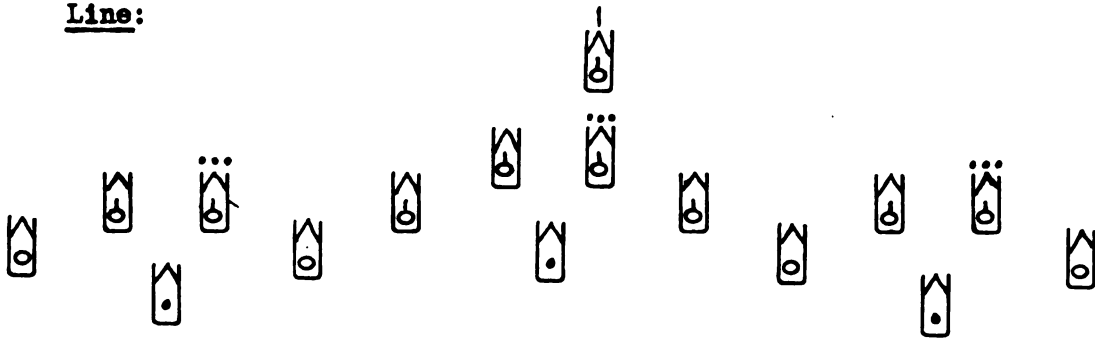


Figure VI

POSSIBLE TROOP FORMATIONS (Cont'd)

Line:



Wedge (Flank Platoons to the Rear):

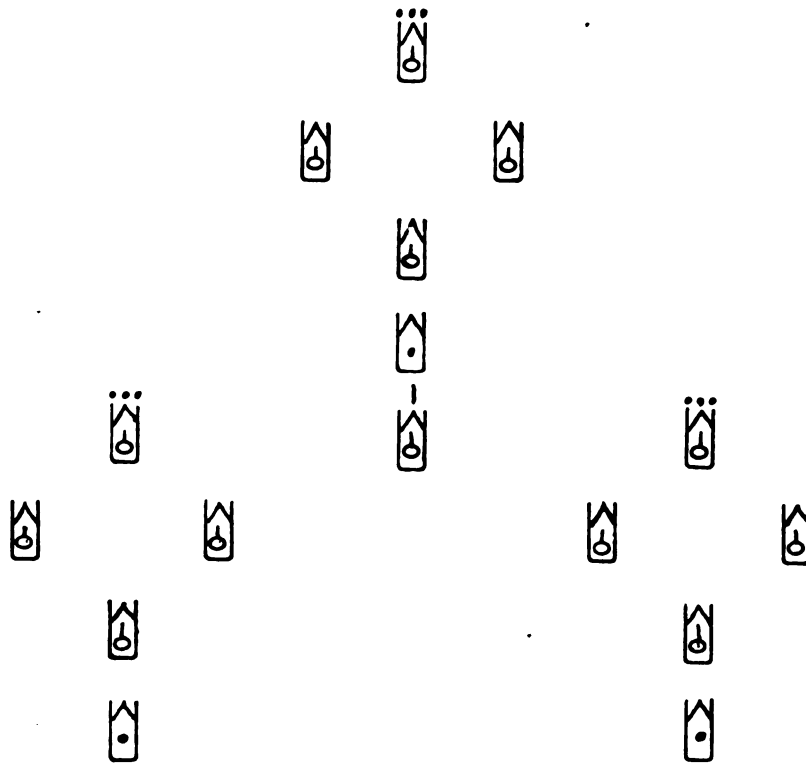
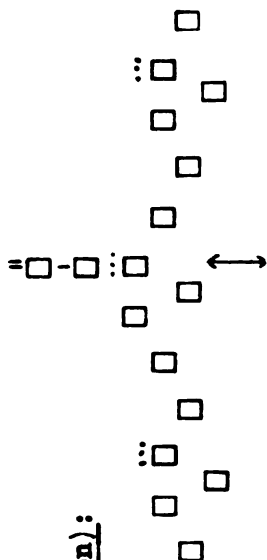


Figure VI (Cont'd)

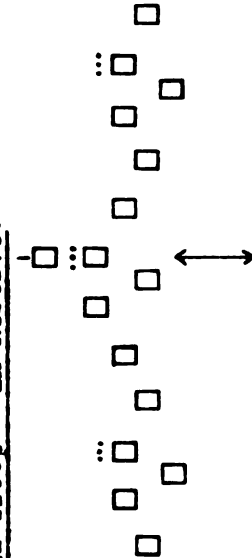
POSSIBLE SQUADRON FORMATIONS

Column of Troops at 500 yds -
(Distances determined by situation):



500 yds. Distances as prescribed

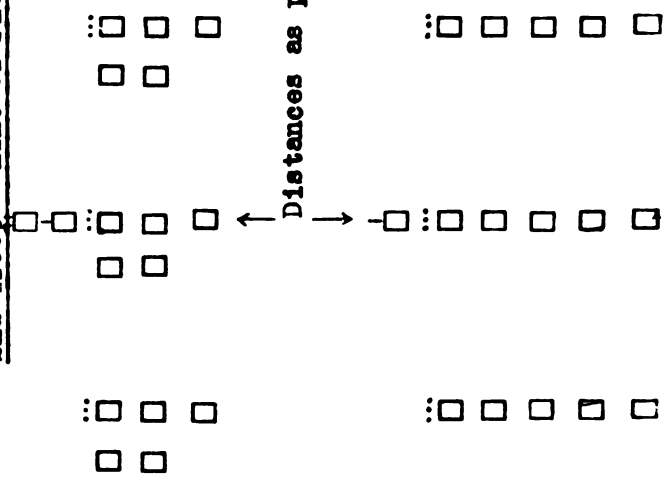
Column of Troops at 1000 yards -
1st Troop - In Assault,
2nd Troop - In Reserve:



Distances as prescribed

Approach Formation -
(Column of Troops) -

1st Troop - Line of Platoon Squares,
2nd Troop - Line of Platoon Columns:



Distances as prescribed

Figure VII

illery and lighter guns cannot render the desired support against such areas. Smoke is the best solution. To illustrate this point, the following extract from an article written by Major General Robert H. Allen, then Chief of Infantry, published in the Infantry Journal, January, 1928, is quoted:

"A similar experiment to determine the value of smoke against anti-tank guns was carried out at The Tank School. Four targets approximately the size of tanks were placed on several butts of the small arms range at Camp Meade. Four one-pounder anti-tank guns were located on the firing line. With no smoke in the vicinity, forty shots were fired. Seventeen of these shots hit the target. Smoke was then placed on the anti-tank guns. This smoke simulated the smoke fired by chemical mortars, emplaced in rear of the tanks. Again forty shots were fired. All shots missed the target. This experiment demonstrates that the tanks could not have advanced against the anti-tank guns without the aid of blanketing smoke, and that by its aid they definitely could have advanced."

Many situations will make the use of persistent agents, such as those of the mustard gas type, of considerable importance. As mechanized units cannot negotiate all kinds of terrain, it will often be desirable to neutralize or interdict certain areas to prevent their occupancy by the enemy. The use of chemicals is the most economical method, and, with limited artillery support, it may form the only means for carrying out such missions. The airplane is an efficient weapon for dispersing certain persistent agents and if attached to, or operating with, mechanized cavalry, it is both suitable and efficient for many of the neutralization and interdiction missions not requiring fine timing and perfect terrain locations.

The nonpersistent agents, such as those of the phosgene type, must be released in large quantities and within the minimum of time (2 minutes) for maximum effectiveness. The difficulties of supply and the time factor will preclude the use of such agents.

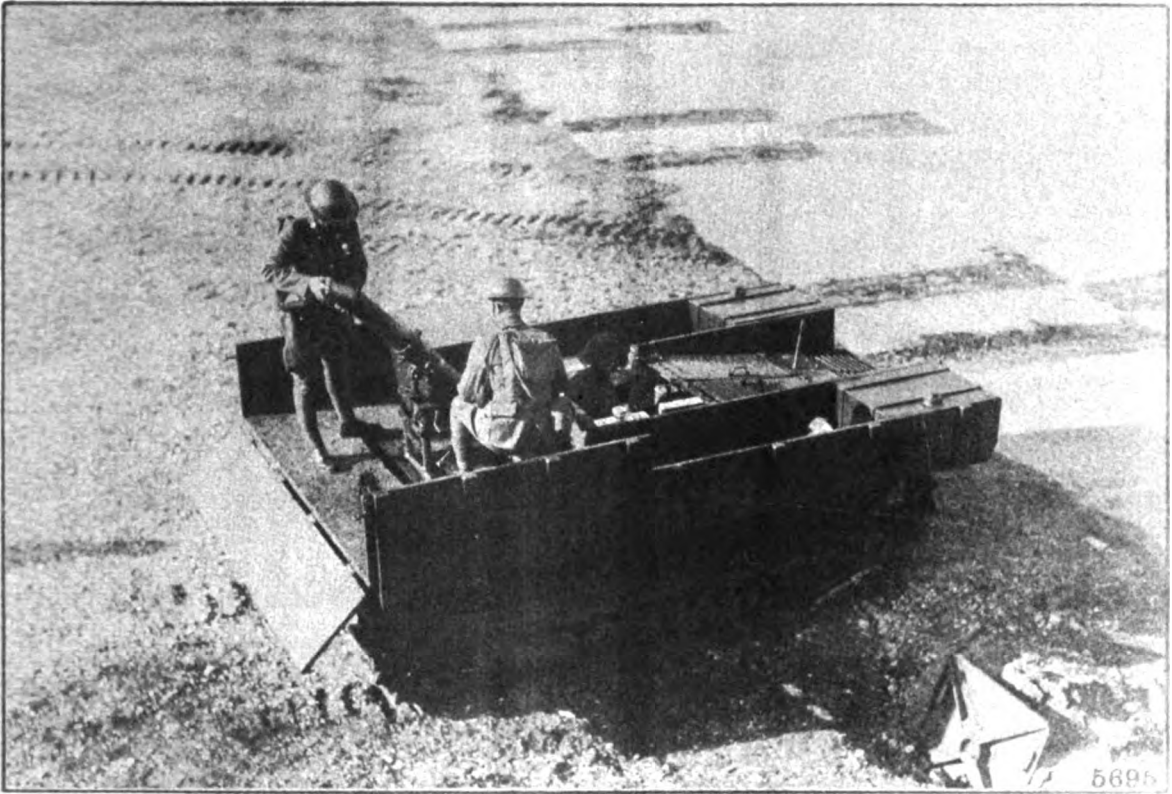
Smoke is of the greatest importance in the normal type of action. However, considerable technique is required in its use to prevent an adverse effect on friendly elements. This is particularly true in a fast moving situation. In combat, the combat cars afford poor visibility. The further hampering of the visibility by a cloud of uncontrolled smoke while the cars are advancing might jeopardize the entire operation. This requires that the weapon used for laying and maintaining smoke be mobile and flexible in its operation. It must be capable of accompanying the assault waves over varied terrain and, by direct observational methods of placing smoke in the minimum of time, of maintaining it for the necessary period and of shifting or lifting it so as to prevent an adverse effect on our own elements.

The 75 mm gun or pack howitzer is not an economical smoke weapon. Again, the number of pieces available would not justify its being used for such purposes at a sacrifice to other important missions. The flat trajectory is a deterrent to short range fire necessary in such close support missions.

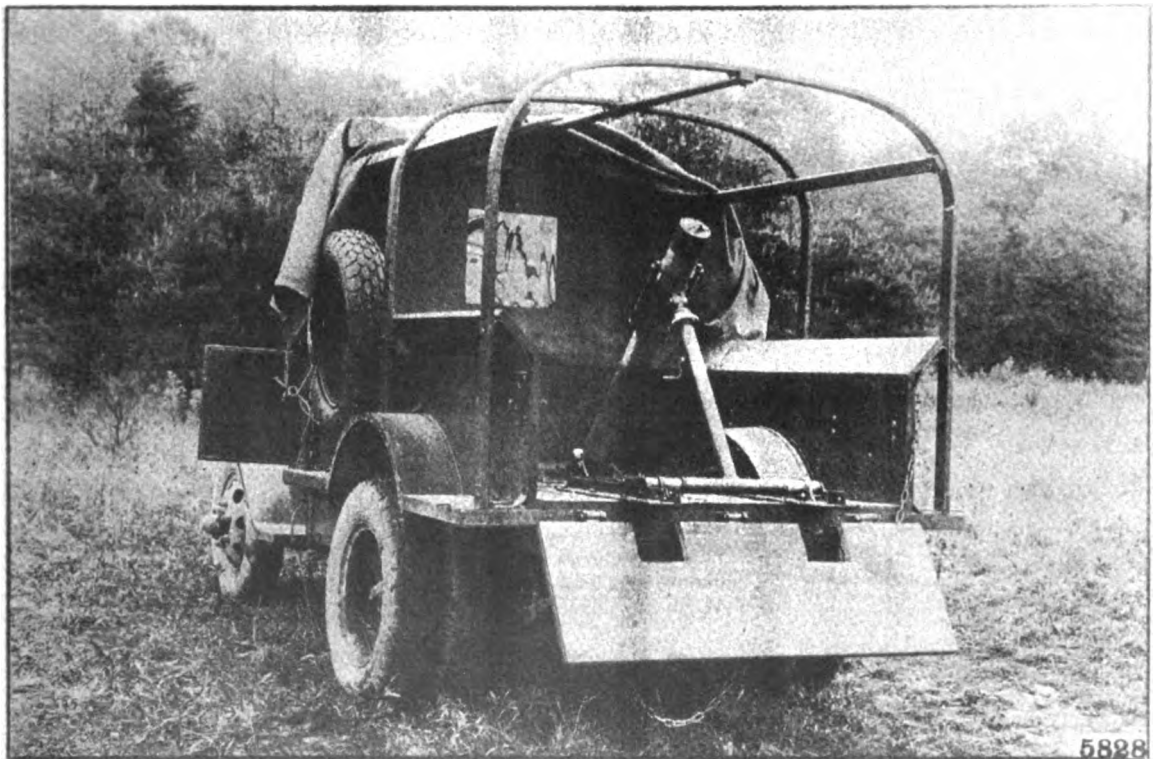
The airplane, even though available, is not suitable for supporting by smoke the fast actions occurring in the combat area. The main disadvantages include: the inability to control the smoke after it has been released, and the impracticability of obtaining the smoke when and where desired upon short notice. Under conditions permitting perfect timing and terrain locations, smoke may be laid by plane to cover movement prior to and during the initial stages of an attack. However, such conditions are the exception rather than the rule and do not warrant the placing of much reliance upon this means.

A chemical mortar appears to be the best solution. The 4.2" chemical mortar, which has been standardized as to type, is the most efficient smoke weapon within its range of 2400 yards. The present mounting is not satisfactory for carrying out close supporting missions with mechanized cavalry, as too much delay is entailed by "digging in" the baseplate. Certain experimental mountings and means of transport have been tried with varying degrees of success. One of these was the light tank chassis and another the Franklin armored car chassis. Still another idea was a surface baseplate which could be quickly set up in firing position. Using the first two mountings, cross-country mobility and rapidity and flexibility of fire (due to wider traverse) have been increased. However, these vehicular mounts are either too slow or uncertain of arrival when forced to cross very rough terrain. Again their visibility is too great. Using the surface baseplate the 4.2" chemical mortar can open fire quickly, but the means of transport has not been improved.

A special mounting for the 4.2" chemical mortar was developed at The Cavalry School last year, designed with the purpose of obtaining a more mobile piece for use with horse cavalry. This included a surface baseplate with both the mortar and plate attached to the rear end of an Oakland chassis resulting in greater stabilization and giving a 480 mil traverse. A sliding frame permitted the mortar to be raised to a horizontal position on the chassis for transport. The crew and sufficient ammunition for a normal action were carried on the vehicle. This provided a very compact and flexible fire unit which could open fire within one minute after arrival at its position. Since the maximum height of the vehicle is less than 15 hands, it requires the minimum of cover, and can operate well forward in the execution of smoke missions. The principle appears sound and worthy of further development. For use with mechanized cavalry a track-laying vehicle appears desirable, preferably one of similar type and performance to that employed with the combat cars or personnel carriers. It is with the former that mortars must be capable of operating. A small vehicle such as the Citroën-Kegress or Ford might meet the re-



TIEI CARGO CARRIER



FRANKLIN CROSS-COUNTRY CAR

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quirements. However, the standardization of vehicles throughout a command is of great importance and should also apply to the auxiliary elements.

In considering the chemical organization for such employment, there are several important factors involved: (1) The parent organization must be of the minimum size permitting the execution of the larger smoke missions; (2) overhead in both men and vehicles must be no greater than required for efficient operations; (3) the composition of the subordinate tactical elements should be based upon the requirements of the combat car squadron (the main tactical unit); (4) the communications system must conform to that of the supported elements; and (5) facilities for fire control and ammunition supply must be included for all tactical organization down to and including the basic fire element.

With adverse wind conditions six mortars would be required for conducting the larger smoke operations over fronts of 1200 yards to 2400 yards (assuming the 480 mil traverse). Under certain conditions this amount of smoke will be required during the initial stage of the attack, for concealing movement or as a feint. With the combat car squadron, the use of smoke on an 800 yard front must be contemplated. From the foregoing, it appears that a two mortar platoon should be capable of giving the necessary support to the squadron, will not require excessive overhead, and can be efficiently controlled by one officer. In the platoon, each of the two mortar vehicles can transport both the necessary ammunition for short actions and its gun crew. The platoon commander and the communications and fire control material can be transported in a cross-country car, while a fourth vehicle may be required for transporting additional ammunition. The platoon thus provides a compact and flexible fire unit for close support.

The chemical troop organization should include three platoons. Additional overhead for the purpose of administration and supply must be included; however, it need not be excessive. Such an organization provides the necessary number of mortars for normal operations with the brigade during the initial phases of combat. A chemical platoon is available for close support of each combat car squadron, allowing one for general missions. For employment with the regiment, a chemical troop, less one platoon, should be adequate, providing one platoon for close support of the combat car squadron and one for general missions. These two platoons will have sufficient mortars for carrying out the normal chemical missions incident to regimental action.

In conclusion, it is believed that the chemical requirements for mechanized cavalry are now sufficiently well-known to warrant the organization of mechanized chemical mortar elements at an early date. The necessary experimental and development work should be conducted by chemical warfare detachments at the station of the mechanized cav-

alry regiments and under the control of the cavalry. The joint training suggested would show the mechanized cavalry requirements for a suitable mounting for the 4.2" chemical mortar, and would serve to clarify the tactical ideas with regard to the employment of chemicals (in particular, smoke) with this arm.

THE MACHINE GUNNER AND CHEMICAL WARFARE

By: Captain Sidney H. Young. Infantry

Neither the use of chemicals nor of machine guns is peculiar to the World War. Leonardo de Vinci designed a workable machine gun in the 19th century, while the use of chemicals in warfare dates back to the early Greeks. In 1861 Dr. Gatling demonstrated his "pepper pot" on the battlefield, and a decade later the English contemplated the use of chemicals in the Crimea. It wasn't until the World War, however, that chemicals and machine guns came into their own.

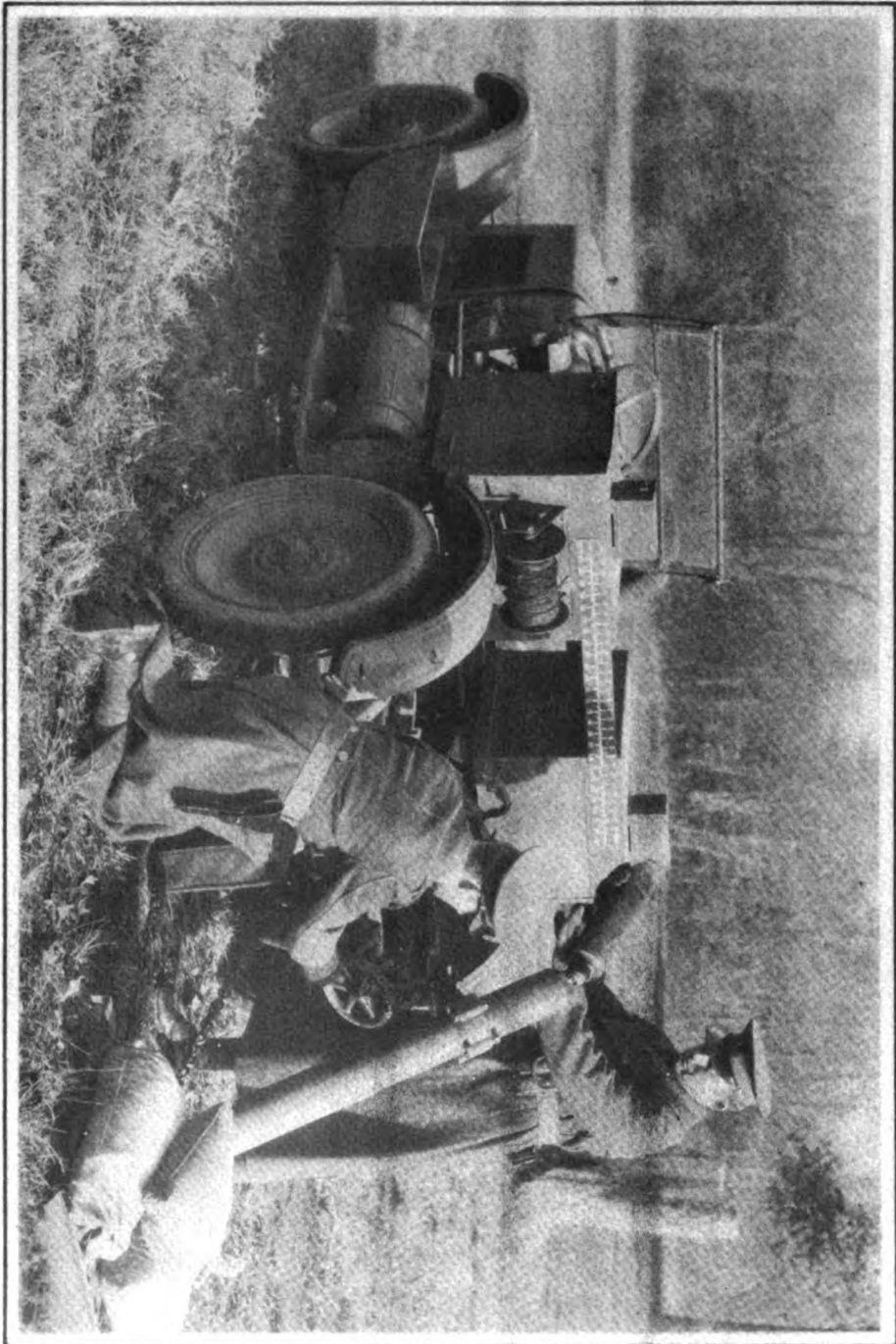
It is my purpose to try and show that with the efficient use of chemicals now possible, including the lethal, irritating and smoke types, the mission of the machine gun, already important, becomes doubly so. From data prepared at The Chemical Warfare School, over a period of several years, and covering the firing of rifles at 300 yards prone, by twenty-three classes, the following results have been obtained:

Considering a man without a mask, and with no smoke present as 100% efficient.

Firing with masks on	70%	efficient (approx.)	
Firing with smoke on target	35%	"	"
Firing with smoke on firer	8%	"	"

As no data has been prepared on the effect of masks or smoke on the efficiency of a machine gunner we must proceed on theory only. Based, however, on War Department requirements for qualification with rifle and machine gun on known distance ranges we find that for an average shot, or marksman, the firer must be about 68% efficient in the case of the rifleman and about 60% in the case of the machine gunner. We may therefore consider that the War Department standard of proficiency for the two arms is about equal. Keeping the data of rifle firing under various handicaps and the War Department standards of proficiency in mind, let us now consider why the mission of the machine guns when chemicals are used becomes of greater importance.

The missions of machine guns as laid down by Training Regulations are that of offense and defense. In the offense we find that in the initial stages of attack the machine guns support the rifle troops by gaining and keeping fire superiority. In later stages of the attack machine guns are invaluable in reorganization, in regaining a lost fire superiority, in repulsing counter attacks and in consol-



An Improvised Mount

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idating positions. In defense, machine guns by coordinating fires can deliver and maintain interlocking bands of bullet swept ground, as well as fire on targets of opportunity. With the mandatory organization in depth machine guns slow up or stop penetrations and in the event of penetration assist in the counter attack.

With the use of gases and obscuring smokes almost a fore-gone conclusion in future warfare the added importance of machine guns under such conditions falls under three headings which follow:

We have seen that a gas mask lowers the efficiency of the rifleman about 30%. A machine gunner firing in a sitting position with the rear sight aperture as large as it is and at the distance it is from the eye, can sight without any difficulty. Furthermore, after the first laying of the gun, adjustment will be made by watching the fall of the burst, and the present mask should not be any hindrance in this case.

Training Regulations 420-130, Par. 6, b. says "It is ordinarily assumed that the fire effect of a single machine gun is equivalent to that of 25 to 50 rifles". If we admit that with mask on the machine gun is more efficient than the masked rifleman, we see that one machine gun can deliver during a gas attack the equivalent of fire power of from three to six squads, and that this fire will be more accurate. If provision has been made to supply the emplacement with an ample supply of ammunition the gun can be served by a team of two men, and in emergency by one man. Thus it is seen that during a mustard gas attack, two men who can be shifted often, can deliver the fire power above given and thereby allow from 23 to 48 men to withdraw from the affected area.

Because of its fixed mount the machine gun is capable of delivering indirect fire. Training Regulations 240-15 says "Machine guns employed in the attack or defense must therefore use supplementary indirect-laying methods even though these guns are primarily sited for direct laying. As the smoke and dust of battle may obscure the target, it is important to provide for the indirect laying of the guns so that the fire will not be interrupted by poor visibility". By indirect fire we may thus overcome the handicap of smoke to a marked degree. We may safely say that indirect fire is at least 50% as efficient as direct fire. Harking back to the tests at The Chemical Warfare School, we see that with smoke on the targets a machine gun is 15% more efficient than a rifle, and with smoke on the firer the machine gun is six times as efficient as a rifle. There are other reasons for the increased importance of the machine gun, but the three above appear to be the paramount issues.

The machine gunner, like the rifleman, artilleryman or cavalryman, is not at the present time "chemically conscious". To those officers and men who served in France smoke is a new weapon, and to the new officer or enlisted man, chemicals of any kind are more or less of a strange and terrifying mystery. We must therefore make the

machine gunner realize the possibilities of chemicals, and at the same time ingrain in him his added importance with the advent of smoke and gases.

Primary education of the machine gunner like that of any other military man must include training in the adjustment of the mask, and his introduction to gas in the gas chamber. In addition it is absolutely essential that he train himself to handle and fire the machine gun while masked. Elementary, advanced and rough ground drill as well as field firing should be done while masked.

Specialized education for the machine gunner must be in the nature of repeated exercises in indirect fire. If possible, smoke of some nature should be used to screen target, or firer. In the absence of HC candles wet grass or straw burned upwind should be used. He must be trained to figure fire data rapidly and accurately in the case of an officer, and to set this data on the gun in the case of the enlisted men. Both officers and men should train themselves so as to be able to perform these functions while masked. Finally field problems should be fired with smoke on target and on firer using successive lines of targets to simulate friendly or enemy advancing infantry.

For the efficient use of machine guns, firing indirectly while in smoke, certain equipment other than gas and tripod will be necessary.

For accurate fire the tripod should be on a firm T base. This requirement is met by the so-called Mathews Mount or Mark I Wheeled M.G. Mount.

The present instruments, i.e., Aiming Circle, Range Finder, Lensatic Compass, Protractor, Alidade, Angle of Sight Instrument and Clinometer will be necessary for indirect fire and are adequate and satisfactory.

A set of aiming stakes for each gun should be provided. These stakes should be painted black, red and orange as it is believed that stakes of these colors can be seen more readily through smoke. In addition to the stakes for aiming purposes a supply of plain stakes and cross pieces should be carried for the construction of limiting devices. (A wicket that limits traverse and elevation).

Having educated the machine gunner to make him chemically conscious, and having supplied him with the necessary materiel we can now touch on the methods applicable to various situations. Let us first consider the defense:

Under our present Tables of Organization the regiment has 64 machine guns. Of these 64 guns we may expect to find 32 guns sited on or near the forward limits of the battalion areas. In a great mea-

sure methods used on first line guns are applicable to break through and reserve guns, so only the first line guns will be concerned. On the defense we can expect a regiment to cover a front of from 1600 to 3200 yards. These figures give one machine gun to each 50 to 100 yards of front. One machine gun can cover efficiently an arc to its front of 50 mils. Depending on the distance between the opposing lines, and on the length of the line held, first line guns can cover from 25 to 100% of the front when delivering coordinated frontal fire. In very close defense one gun can cover a much wider arc by employing swinging traverse. Upon occupation of a position the Machine Gun Company Commander must first coordinate the fire of his own sector and with those of adjoining sectors for fire on the final protective line. Next, he must see that platoon leaders figure indirect fire data so as to cover the frontal sectors of the guns. Aiming stakes must be set out in close proximity to the guns covering the frontal fire of the gun as well as F.P.L. Clinometer readings corresponding to ranges on advancing enemy can be expected to reach from minute to minute, must be figured and tabulated, or, using the mil check on the elevating hand wheel, a table of depression will be worked out. The platoon leader by means of his aiming stakes must coordinate the fire of his guns, using platoon scissors or four point method. He must arrange for a signal for the firing on the F.P.L. and finally, if the F.P.L. fails to hold, he must arrange for traversing stops to coordinate the swinging traverse of the guns. If these measures are carried out quickly and accurately whenever a defensive position is occupied then the handicap of the smoke on the firer can be cut down from a 94% handicap for the rifleman to about the average loss of efficiency by indirect fire or 50%.

In the offensive action we may expect that smoke will be utilized to screen the enemy front. We can also expect that the enemy may try to blind our O.P.'s and possibly machine gun positions. In any event a machine gun commander having sited his guns for direct fire in the initial stage of the attack must see that accurate ranges to the targets are obtained, and that the guns are laid carefully on the targets with the proper sight setting. His guns having been laid, clinometer readings should be taken on each gun, and aiming stakes should be set out. He must arrange for lifting fire either by signal or at a set time. Having taken these precautions, except for the observation of his fire, the machine gunner can maintain direction and elevation as though firing in the clear. If indirect fire is used in the initial stages then no other procedure, other than normal, need be taken. Reorganization, regaining a lost fire superiority and consolidation are specialized forms of offense or defense and can be handled accordingly.

A machine gunner who becomes a casualty from toxic gases, smokes, or liquids is of no more use than one who suffers a shell or bullet wound. From the fact that a machine gunner may have to remain at his post in contaminated areas it can be seen that additional protection must be furnished him besides that afforded by the mask and

impregnated clothing. The following additional equipment should be issued to each squad:

- (1) Impervious gloves for each man other than mule leaders.
- (2) A square of impervious cloth about two feet square for the gunner and number two to sit on. Each man should carry one of these in a gas-proof envelope, and the cloths should be of a nature easy to demustardize.
- (3) At least two impervious suits.
- (4) In one ammunition box a bottle of copper sulphate for WP burns; a bottle of kerosene and sufficient bleaching powder for demustardization of the gun.
- (5) The expendable ammunition box and expendable belt should again be issued to prevent possible burns from boxes and empty belts when reloading. With this additional equipment a machine gun squad should be able to reduce gas casualties to a minimum.

Admitting that the foregone is based on theory as well as fact, I do not believe it can be denied that, with the advent of gas and smoke, the machine gun has grown in importance. I further believe that it has been shown that with proper education the machine gunner can partially overcome the handicap of gas and smoke. If these two promises are granted then the "proof of the pudding is in the eating" and the theories should be tested at The Chemical Warfare School, not only as a point of academic interest, but also as a point essential to successful warfare.

301st CHEMICAL REGIMENT

The staff officers of the 301st Chemical Regiment, Organized Reserves, held a conference at Athens, Georgia, on the evening of November 19, to formulate plans for the winter activities and summer training of the regiment for the coming year.

During the conference they decided to award two cups annually for competition in pistol marksmanship. The first cup is to be given to the officer in the Chemical Warfare Service Reserve in the Fourth Corps Area, regardless of his assignment, who attains the highest score in pistol marksmanship during the year, and the second will be awarded to the battalion of the 301st Chemical Regiment registering the highest average score at summer camps. All competition will be in accordance with rules which are to be drawn up by the Chemical Officer at Headquarters Fourth Corps Area. Before adjourning it was decided to hold the next meeting in Atlanta, Georgia, on the evening of February 4, 1933.

ARMISTICE DAY - 1932

By: Major W. G. Gribbel, CW-Res

November 11th was a great day for the "Old Timers" at Edgewood. Some of us hadn't seen a Stokes since we last signed the payroll.

Men came from New York City, Ravena, N.Y., Wilmington, Del., Newark, N.J., and Lancaster, Slatington, Scranton, Bethlehem, State College, and other Pennsylvania towns. The last lap - from Philadelphia - was made in "column of squads", all comfortably seated in a big P.R.T. bus, decked out with banners reading "1st Gas Regiment Reunion" and bearing the old 1st Gas Battle Blaze. Everybody, including the two small sons of Cooner and Morgan Williams, seemed to enjoy it.

Mr. and Mrs. Whipple (Ravena, N.Y.), whose son, LeRoy Whipple, gave all he had for the old 1st Gas, were present in person. They never miss a Reunion, and no gathering would be complete without them. Leo Meyerowitz brought his father, R.A. Johnstone brought Mrs. Johnstone, "Pop" McGuffy brought his bride of a week, and several comments heard during the day indicated that more wives would be present next year. The fourteenth since the War! Yes, it was fourteen years ago we took off the old "O.D."

The following were checked in at 10:00 AM - right on the minute:

Eddie Jepson, Frank Fleming, Ira Williams, J.D. Cooner with his boy, M. W. Dodson, and R. E. Ellis, all of old Company "A"; Fred McWilliams, L.J. Romkey, R.A. Johnstone with Mrs. Johnstone, and G.D. Hamilton, of Company "B"; Herbert P. Orth of Company "C"; C.J. Lentz, Morgan Williams with his boy, and H. Brunnell of Company "D"; Marshall E. Smith, E. W. Bowman, Frank E. Johnson, E. A. Lewis, Leo Meyerowitz with his father, "Pop" McGuffy with Mrs. McGuffy, and E.C. Baker, of Company "F"; our old friend H.C. ("Red") Rowlands of the Medical Detachment, Captain Edward Steidle, and Majors R. C. ("Roc") Berlin and W.G. Gribbel. Some of these soldiers had to get up at 3:30 AM to make Edgewood on time, which proves conclusively that a bugler isn't necessary any more.

Of course, we found Sgt. William Harding and Fred Bernheim there. Fred has been running the Exchange for some years and doing it well, as usual. Remember when G.H.Q. took the "paper work" away from the companies and let Fred attend to it? That was one grand stunt - G.H.Q. was smart.

Captain Paul T. Martin, CW-Res, well known as 1st Sgt. Mousby, "Top Kick" of Company "A", welcomed the visitors and showed them through the Arsenal.



At the First Gas Regiment Memorial

November 11, 1932, at Edgewood Arsenal, Maryland

**Standing: R.E. Ellis (old Company "A"), Major Leigh F. J. Zerbee, CWS
G.L. Hamilton (old Company "B"), Herbert P. Orth (old Company "C").**

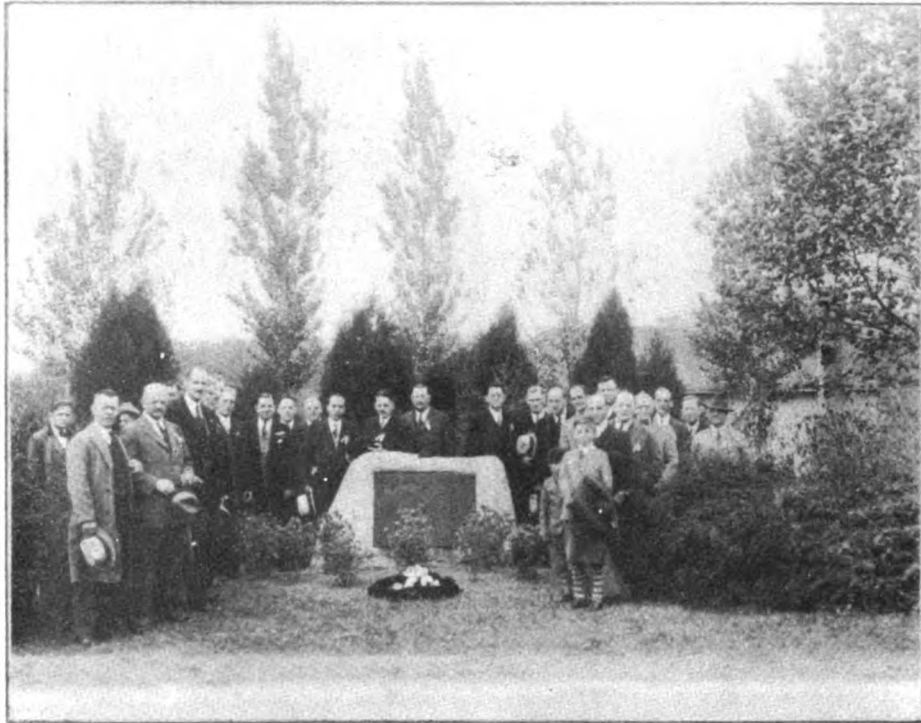
Seated: W.G. Gribbel (old Company "A")

Interest naturally centered in the Technical Museum, where much, now obsolete, was very familiar, and recalled days and nights in France that will never be forgotten.

Troops were paraded at 11:50 AM before the 1st Gas Regiment Memorial, and after a pleasing and sincere welcome by Colonel Brigham himself, Major Leigh F. J. Zerbee, C.O., 1st Chemical Regiment, called on Captain Steidle, who made a short, earnest address, recalling vividly the days in France, referring reverently to the boys whose names, are on that bronze plate, and expressing the appreciative thanks of the "Old Timers" for the courtesy and hospitality accorded them.

Mrs. Whipple placed a wreath on the Memorial, and we stood silent while a salute of twenty-one guns was fired in memory of the boys who didn't come back. It was a simple ceremony, the kind that leaves you with a clear recollection of just what happened and why you were there.

Mrs. Whipple was presented with a cluster of golden chrysanthemums tied with blue ribbon, as an expression of the regard and affection of the old Regiment.



Old Timers at First Gas Regiment Memorial
Edgewood Arsenal, Maryland



1932 Armistice Day Ceremony
First Chemical Regiment
Edgewood Arsenal, Maryland

Everyone dined with Company "B", and what a dinner it was: Captain Benner and Sergeant Ludwig certainly showed us how to change a company mess into a banquet. If we had had such grub in 1918 the war wouldn't have lasted twenty-four hours - the Heinies couldn't have resisted it. Honest-to-God pie, plenty of good meat (no minced hoof), mashed potatoes with no soldier buttons inside it, ice cream and cake with caramel icing all over it. No "goldfish" or "corned willie" in sight.

Some of the visitors seemed stuck when time came to get up, so we had a meeting right then and there, and unanimously voted to come back next year if Colonel Brigham and Major Zerbee would stand for it. Major Berlin read a letter from Sergeant Welsh, Master Engineer in charge of regimental transportation, who is staying in Buckeye, Arizona. Welsh is not so well, but his heart makes up for it. He certainly is one game guy. After this we pried loose the heavy eaters and expressed our hearty thanks to Sergeant Ludwig and his K.P. detachment. Nobody was anxious to go home, so we loafed about in knots of three and four, talking things over. You never get through talking at these meetings. A remark from one man will recall an associated incident in the memory of another, and this has to be told all over again, and so it goes. You never get all the questions asked nor all the answers given.

Captain Phillips, regimental adjutant, had to leave early, and we hope to see him again next year. Major Zerbee stayed with us until we shoved off at 3:00 PM, making certain that everything was done for our comfort and enjoyment. Our thanks are herewith tendered to Colonel Brigham and Major Zerbee, and we hope our behavior was such as to insure another invitation. Major Berlin and Captain Bernheim got tangled up in a personal reunion at the last minute, but we waited at the gate and a committee of "Old Timers" finally persuaded "Roc" to get aboard. The gatekeeper lifted his little old black and white pump-handle, and we rumbled away, everybody happy, glad we came, and each man proud to have served in the old First Gas - the finest regiment Uncle Sam ever stamped his initials on.

PSYCHOLOGICAL ASPECTS OF CHEMICAL WARFARE

By: Captain Francis M. Flanagan, Infantry

What causes so much aversion for chemical warfare among civilians and - not infrequently - among otherwise militant individuals?

Is it a feeling akin to sportsmanship which arouses resentment against any change of method in playing the age old game of war?

Is it a profound regard for the well-being of our neighbors sometime called brotherly love - which has for its purpose the abolishment of all warfare?

Is it fear - that painful emotion caused by a sense of impending danger or evil?

A consideration of the last three questions may suggest an answer to the first.

Since practices in the World War submerged any preconceived ideas as to sportsmanship in combat, it may be assumed that opposition to the use of chemical agents on this premise falls flat.

In view of recent developments in the Far East, it may also be assumed that any altruistic sentiment looking toward an enduring world peace is premature.

Then, perhaps, fear may be the basis of the alleged qualms against the use of chemicals in warfare.

There is no intention of suggesting here that this fear may be due to inherent moral weakness. It is believed that viril manhood is still quick to resent any imputation of cowardice. It is perhaps only fair to assume that fear which does not degenerate into abject pusillanimity is often excusable, for it may be accepted as axiomatic that the bravest of men have known fear. Marshal Ney is quoted as having said: "The one who says he never knew fear is a compound liar."

But, assuming that this abhorrence of chemical warfare is predicated upon fear, how has this condition been brought about? In looking further for an answer, it may be well to consider some of the circumstances.

The hue and cry against the use of chemicals in warfare had their inception in April 1915, when the Germans liberated that deadly chlorine cloud upon the Allied soldiers at Ypres. Vivid descriptions of the agonies of the hapless victims were given to the world by an imaginative press.

This publicity was calculated to appeal to the primal instinct - self-preservation - based upon the assumption that when life itself is threatened, fear may become the dominant trait.

That the victims of the gas cloud may have suffered less than their shell-torn, bullet-riddled comrades was carefully suppressed. That death from suffocation was less horrible than death from gangrene was apparently never considered. Emphasis was placed only upon the horrific details of the cloud attack.

Arguments against chemical warfare appear to be founded upon appeal to the human emotions - upon assumptions that man is an highly emotional animal whose judgment may be warped even in the calmest moments and whose every thought and act may be distorted and

unnatural when under the influence of fear.

Army officers are of necessity familiar with these human traits. Based upon this knowledge of human behavior, all military training is with a view to inculcating soldierly habits which will cause the individual to suppress his natural fear of death and to disregard personal safety when called upon to do so. When this degree of training has been achieved, there remains, according to many authorities, the essence of discipline.

Early descriptions of the effect of poisonous gas were colored so as to inspire a fear of the unknown. Soldiers and public alike, were led to believe that one sniff of the terrible war gas meant inevitable death. This sort of propaganda stretched war-taut nerves almost to the breaking point. Doubtless, it lent its influence toward producing types of madness found only on the battlefield.

But while the World War soldier became inured to chemical warfare agents, he never fully overcame his apprehension of them. Even after the war, soldiers who had been gassed still believed they could only look forward to deadly complications, among them being tuberculosis.

Post-war analysis, however, did much to solve the mystery of the effect of chemicals in warfare. When the true facts were discovered, chemical agents were seen as the least deadly of all weapons. The "gas" myth was exploded.

Statistics showed that of gas casualties numbering 70,752 in the American Expeditionary Force, only 1,421 died. This was one death for every fifty gas casualties. Total battle casualties numbered 258,338, of whom 34,349 - one in every eight - were killed or died upon the battlefield. A startling contrast!

Statistics also dispelled the belief that men who had been "gassed" were predisposed to tuberculosis. The Surgeon General, in a report, stated that the percentage of tuberculosis cases among men who had been gassed was 2.45 per 1,000. The report further stated that since the annual rate of occurrence for tuberculosis among enlisted men in the A.E.F. in 1918 was 3.50 and in 1919, 4.30 per 1,000, it would seem apparent that tuberculosis occurred less frequently among the soldiers who had been gassed than among those who had not been.

Finally, statistics indicated that gas fatalities were not only less numerous, but also that recovery of gas casualties was more complete and, except in a few cases, without the many serious handicaps resulting from other kinds of casualties such as loss of limbs.

While these facts appear successfully to rebut all statements as to the inhumanity of chemical warfare, opposition is apparently no less pronounced. The "anti-gasiacs" have now turned from

the facts of the past and have begun to stress the possibilities of the future. Imagination has again been stretched; no picture or sentiment is too dreadful. Their attitude has been compared to that of the cub reporter who was sent to "cover" a local catastrophe. Shortly, he returned and sent page after page of amazing detail over the city editor's desk. Finally, the astonished editor interrupted the young writer to inquire: "How was it possible for you to acquire so many facts in such brief time?" "Facts?" replied the cub, "I'm not bothering about the facts - they embarrass me."

Newspapers and magazines have vividly pictured the effects of poisonous gas in air attacks upon large cities in future wars. The following description will serve as a prototype: Men dying in clusters like so many ants, stricken mothers clinging to infants, overcome children with their toys in hand - all in a setting of wreckage and desolation.

No attempt has apparently been made to ascertain the facts. That chemical engineers state it would be impossible to produce a deadly concentration of any known war gas over a large area of a city is of little import to the chemical warfare antagonist. That authorities further state that it would require 640 large bombing planes loaded to capacity to build up a lethal concentration of war gas in one square mile of city, is just another embarrassing detail. Where any such number of planes could come from - assuming it were possible for them to maneuver as to dump their loads on a mile-square target - is a question for anybody to conjure with.

Yet, this sort of pabulum is fed to the public, apparently with the two-fold purpose of instilling fear in the individual mind and of creating revulsion against chemical warfare.

Chemical warfare has been, now is, and will undoubtedly continue to be, an important subject for the consideration of international disarmament conferences. Well-informed persons, however, believe that the use of chemicals in warfare has come to stay. It is pointed out that no weapon that has demonstrated its superior effectiveness has ever been abandoned. It is also pointed out that there is every reason why the United States, with its wealth of chemical resources and a chemical industry second only to Germany, should be loath to ignore the value of a weapon affording so great an advantage.

So another question presents itself: How may the baleful influence of false propaganda be overcome? Perhaps, it has been suggested, the answer may be found in counter-publicity and an insistence upon the truth about chemical warfare.

A publicity plan of the following general nature may well be considered: Within the limitations of public policy as pertains to national security, the veil of secrecy should be lifted from chem-

ical warfare. Information should be given freely with a view to informing the public. Knowledge of possible chemical warfare agents should become so general that, by familiarity alone, fear is dispelled.

What publicity has done for one war agency it should do equally well for another. For example, the average citizen knows that high explosive will rend a human limb from limb, that an army service rifle bullet has sufficient force to penetrate and probably kill twenty-nine men placed one behind the other, and that numerous other weapons have various and sundry deadly effects. Yet these weapons arouse no more than passing interest; mentioning them normally promotes no reaction in opposition to their use.

Hence, it follows that the physiological effects of chemical warfare agents should be made a matter of general public knowledge. Based upon World War statistics, the humanitarian aspect of chemical agents compared with that of other weapons should be stressed, but actual facts as to the types of chemical agents and their effect upon the human body should not be withheld.

Let it be generally known that in the next war chemical agents will probably be classified under three general headings: lung irritants, vesicants and sensory irritants. Explanation should be made that the deadly agents will be found among those of the lung irritant and vesicant type.

That a more complete understanding of the requirements of a chemical warfare agent may be had, it should be explained that war gases are heavier than air and have different degrees of persistency. The United States Army classifies as persistent any gas which remains in sufficient concentration at the point of release at the end of ten minutes as to require protection of any kind.

As part of the program of education, it has been suggested that the matter of protection of the public should also be considered. Education of the public in chemical warfare protection has already been undertaken by several European countries.

Authorities are apparently agreed that an excellent gas mask will protect against all war gases except those known as vesicants which also require that some kind of protective clothing be worn. But aside from individual protection the problem of affording means of collective protection, especially in the larger cities, should receive increasing consideration.

While the problem of collective protection for the public presents difficulties, experts believe a practical solution may be found. It has been pointed out that war gases, in order to be effective, must be heavier than air. In consequence, these gases not only stay close to the ground, but also flow into low places. The first step in public collective protection appears to be in the direction

of educating the public to get as high above ground level as possible.

Any building, authorities have stated, may be made reasonably gas-proof by the closing of all doors, windows and ventilators - that is, by making the building air-tight. High buildings, for obvious reasons, are better adapted for protection, for after taking the above precautions occupants may move to the upper part of the building and feel reasonably safe.

In this connection, persons who know the limitations of chemical agents state that the effect of war gases or vapors upon any large city could not possibly approach that pictured by those who oppose chemical warfare, especially after the public has been educated in protective measures.

The city of New York, for example, has many high buildings which afford excellent protective possibilities. It has been pointed out that the Empire State Building, with a ventilating system which draws fresh air from a point more than a thousand feet above street level, could be converted into a gas-proof haven for thousands of people.

As a further means of protecting the public, it has even been suggested that certain city departments - perhaps the health and the fire departments - be trained in the use of defense chemicals - those agents which absorb, neutralize or destroy chemical warfare agents. Organizations so trained would operate almost entirely against agents of the persistent type, and should be able to eliminate all traces of a gas attack upon any community with a short period of time.

Training of soldiers in protection against chemical warfare agents should be carried to greater extremes than is possible in the case of civilians. Their training, military authorities agree, should keep abreast of developments in chemical warfare, and should include not only a general knowledge of the kinds of chemical agents they may expect to encounter but also every phase of individual and collective protection against such agents.

Such adages as "In knowledge there is strength" and "Forewarned is forearmed" may aptly be applied to the chemical warfare situation. With adequate knowledge of what may be expected in any future war and reasonable protective plans, that source of fear which may cause panic not only upon the battlefield but also in the large centers of population is deprived of much of its effectiveness and the nation may look forward with equanimity to the possibilities of future warfare.

BOOK REVIEWS

(Republished from 'Review of Current Military Literature',
The Command and General Staff School Press,
Fort Leavenworth, Kansas)

Meyer, Dr. Julius. - DER GASKAMPF UND DIE CHEMISCHEN KAMPFSTOFFE.
(The gas battle and chemical munitions.) Leipzig, 1926.

Contents: Einleitung; Geschichte des Gaskampfes; Die Grundlagen des Gaskampfes; Anwendung chemischer Gaskampfstoffe im Felde; Friedliche Verwendung chemischer Gaskampfstoffe; Rauch und Nebel im Kriege; Schutz gegen chemische Kampfstoffe; Wirkung und Erfolg des Gaskampfes; Gaskampf und Heerwesen; Anwendung chemischer Kampfstoffe vom sittlichen Standpunkte aus; Zukunft des Gaskampfes; Namenregister; Sachregister.

ABSTRACTED BY MAJOR E.F. KOENIG
Introduction (By the Author)

Although written in the quiet of my study, this book is by no means the product of abstract theory. I had been active as a battalion commander at the front, on duty in the Gas Division of General Headquarters, and in the Gas Schools at home. When the publishers therefore approached me, it was a simple matter to utilize my extensive experiences. If for obvious reasons this book has become rather personal in its viewpoint, this may be well understood. I neither could, nor wanted to avoid such a situation.

My own experiences, including the painful memories of wounds caused by rifle bullets and shell splinters, the temporary loss of voice as a result of gas, the frequent defensive measures against enemy gas attacks, as well as occasional participation in a few German attacks, and my natural tendency as a chemical engineer, have created in me a predilection for gas as a weapon and influenced my judgment in comparing this weapon with others. Probably my observations will also hold good for the future as well as the past.

For Germany this book, as well as chemical warfare, are unfortunately of only historical interest. The peace treaty of Versailles prevents further experimentation, or work of any kind in this subject. All facilities which had been used for this purpose have been destroyed, as well as all those which could possibly be used for the production of chemicals in war. All intimations appearing in the anti-German press of foreign countries to the effect that work on chemical warfare is being continued in this or that German institution, are outright mendacities. They bear the stamp of fiction in view of the fact that such experiments can not be conducted on a small scale, nor with any degree of secrecy.

It has been said that the publication of such a book, in which war secrets would be discussed and given away, would react un-

favorably to the advantage of Germany. Such fears are, however, entirely ungrounded, because the foreigners are fully informed of all of our war secrets and our experiences in gas warfare, both offensively as well as defensively. All experiences and data we had gathered had to be turned over to the enemy. As a result, foreign countries know more about German gas warfare than our own people.

There is not a passage in this book, which is not based on published matter, both German as well as, and primarily, foreign. References to source are found at the end of each chapter.

The purpose of this book is not so much to present a technical foundation and description of chemical warfare; it is primarily to publish the remarkable achievements of German chemists for the German people. Chemical Warfare is a page out of the book of glory of German science, of the German Army, and the German people, at a time of world crisis.

INTRODUCTION TO THE SECOND EDITION

The reception of this book throughout the world, for what it was intended, that is, a scientific, unprejudiced picture of chemical warfare as inevitable, has been most pleasing.

It adds to the first edition certain recent foreign developments, which are important, although not as yet tested in the crucible of war.

The need for such a book, combining matter available only in scattered publications, has been evident by the rapid sale of the first edition.

CONTENTS:

1. Introduction.
2. History of Chemical Warfare.
3. Principles of Chemical Warfare
 - a. Chemical agents
 - b. Meteorology
 - c. Terrain.
4. Application of Chemical Agents in the Field
 - a. Principles
 - b. Cylinders (Tactics translated)
 - c. Projectors (Tactics translated)
 - d. Chemical Mortars (Tactics translated)
 - e. Artillery gas shell (Translated)
 - f. Hand grenades (gas)
 - g. Rifle grenades (gas).
5. Peace time uses of Chemical Warfare.
6. Smoke and Fog in War. (Translated)
7. Protection against Chemical Agents.

8. Effect and success of Chemical Warfare.
9. Chemical Warfare and the Armed Forces. (Translated)
10. The Use of Chemicals and their Relation to the Moral and Legal Viewpoints.
11. Future of Chemical Warfare. (Translated)

(NOTE: Major Koenig has made partial translation of various chapters, viz: The Tactics of Projectors; Advantages and disadvantages of the Projector Attacks; The Tactics of the Chemical Mortar.)

War Department. Chemical Warfare Service. - SUGGESTIONS FOR TACTICAL FIELD EXERCISES INVOLVING CHEMICAL WARFARE MATERIEL AND MUNITIONS. 1932.

Contents: Index; Preface; Influence of smoke on aimed rifle fire; Smoke to cover an infantry attack; Smoke to cover an infantry withdrawal; The use of smoke in river crossings; The use of smoke in cavalry attack; The use of smoke in cavalry withdrawal; Influence of smoke on artillery fire; Influence of smoke and gas on anti-aircraft artillery fire; The use of non-persistent gas in preparation for hostile attack; The employment of gas in counterbattery fire; The employment of gas in interdiction fire; The employment of gas in harassing fire; The use of gas and smoke against coast defenses; The influence of smoke and gas on a motorized column.

REVIEWED BY LIEUTENANT COLONEL A. GIBSON

In the training of troops it is highly desirable to reproduce on the terrain conditions that are as closely analogous to those of war, as can be done without undue expense or danger to the troops.

With most materiel and munitions the expense and danger limit greatly their use in tactical field exercises.

Chemical warfare materiel and munitions are peculiarly adapted to reproduce on the maneuver field, without danger and with the minimum of expense, many of the effects on vision, physical endurance, communications, and morale, that would be produced in war. For example, while wearing the gas mask we estimate that a soldier's physical efficiency is reduced between 25 and 50 per cent.

The giving of commands and the control of a body of men are interfered with greatly. The physical endurance and morale are lowered greatly.

A battalion commander may know this theoretically, but the actual handling of a battalion in a tactical field exercise, under conditions that require the wearing of the mask over a period of time, under varying conditions, will bring home to him what modifica-

tions these conditions will make in the handling of his men as nothing short of war could do. Higher commanders may likewise see for themselves what they may reasonably expect of troops when handicapped by wearing the gas mask. In addition the chemical warfare service will learn how suitable the gas mask, as now constructed, actually is for war use and what modifications, if any, should be made in the mask.

The general tactical use of smoke in war was being developed for the first time in the World War. The increased fire power of weapons and improved means of observation make the future importance of smoke very great. Few officers know from actual experience the powers and limitations of the tactical use of smoke.

Chemical munitions can produce on the training ground, without great expense and without danger, effects closely analogous to those of artillery or of chemical mortars firing smoke. An officer who has actually handled a battalion maneuvering with either the handicap or the assistance of smoke, will gain an appreciation of its tactical value as nothing short of war would give him.

This manual contains fifteen examples of tactical field exercises applicable to units not larger than a battalion, and so drawn as to be suitable for terrain available at the average post. The chemical means and methods are such as are practicable of use in normal training.

The purpose of the exercise, the means to be used, the methods, and the principles to be demonstrated form a part of each exercise.

It is believed these tactical exercises afford definite, valuable suggestions for use in chemical warfare training throughout the service.

By the use of these exercises as a logical integral part of field training, in which chemical warfare means and methods are coordinated with the normal means of combat, officers and men will gain experience that will approach more closely the realism of war than is possible in time of peace by any other methods.

This manual has practical value for all officers engaged in the training of troops.

1ST CHEMICAL REGIMENT

The First Chemical Regiment celebrated Armistice Day with a reunion of the 1st Gas Regiment at the Memorial Monument. About 30 of the old organization arrived by bus. After the Memorial services, at which Mrs. Whipple, mother of one of our honored dead, placed a wreath at the Monument in remembrance of our war dead. A Regimental dinner was served in Company "B" mess hall. The old members of the Regiment visited the Technical Museum under guidance of Sgt. Major Martin and Tech. Sgt. Harding, who were members of the old 1st Gas Regiment during the war and are with the present First Chemical Regiment.

Upon the return from the Corps Area Maneuvers at Fort Meade in October, the Regiment completed the Gunner's Examination, qualifying 100% with 12 Expert Gunners, 53 First Class Gunners and 63 Second Class Gunners.

The First Chemical Regiment has now been equipped with the new style uniform and presents a fine appearance. Usual routine duties have occupied the month.

The winter athletic season opened in December, with the Post Basket-Ball League of seven Battery Teams from Fort Hoyle, and three Company Teams from Edgewood Arsenal. "A" Company, 1st Chemical Regiment, and "C" Battery, 6th Field Artillery, reached the finals which were played on December 12 and 13 - "A" Company winning both games to take the Championship Cup. Headquarters and Service Company's basket-ball team lost but one game during the inter-company and inter-battery league games. This game with Battery "C", Fort Hoyle, was closely contested, our team losing by one point, after an overtime period, by a score of 25-24.

