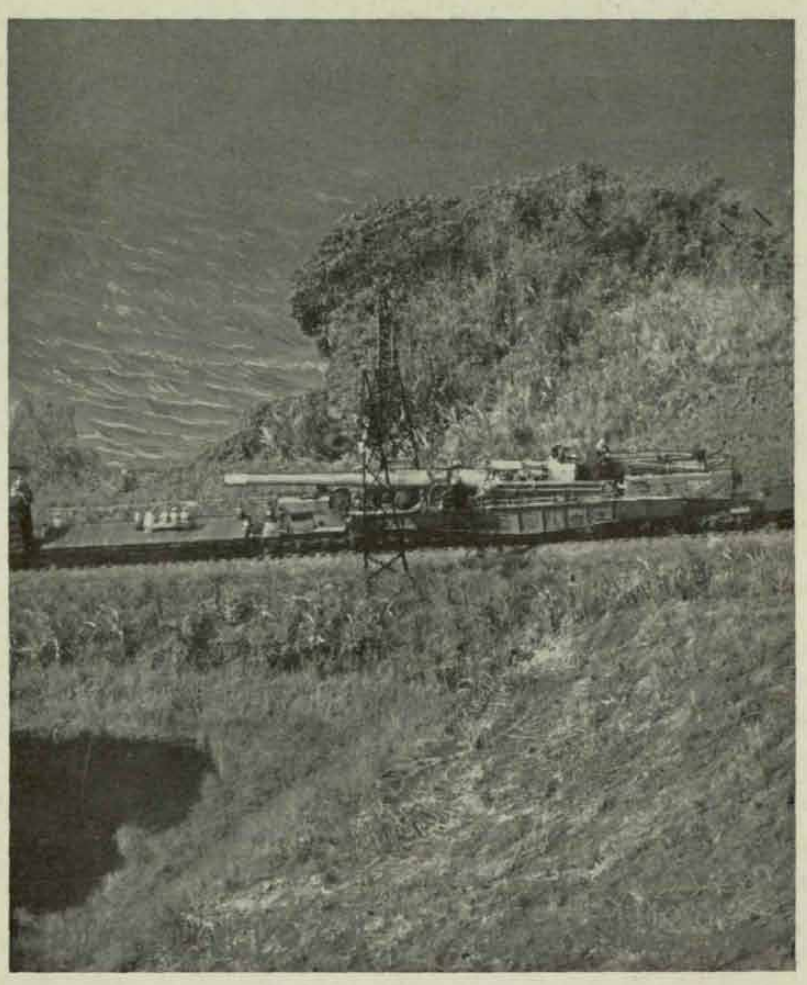
COAST ARTILLERY JOURNAL



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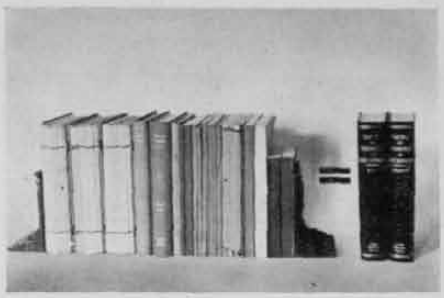

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THE UNITED STATES COAST ARTILLERY ASSOCIATION

"The purpose of the Association shall be to promote the efficiency of the Coast Artillery Corps by maintaining its standards and traditions, by disseminating professional knowledge, by inspiring greater effort towards the improvement of materiel and methods of training, and by fostering mutual understanding, respect and cooperation among all arms, branches and components of the Regular Army, National Guard, Organized Reserve and Reserve Officers' Training Corps."

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Camp Edmands, First Corps of Cadets (211th C. A. (AA), Mass. N. G.), Peters Pond, Sandwich, Mass.

The R.O.T.C.—Key to National Defense

By Major General Johnson Hagood, U. S. Army

I

WAR has been described as a migration of creatures who force their way into territory occupied by other creatures and are met by resistance. In some forms of life, as with germs, all the invaders become engaged with all the defenders. In other forms—ants, for example—some of the creatures are developed as soldiers, some as workers, etc. Among savages all men fight until they get too old. Among civilized peoples wars were formerly conducted by standing armies, the civilian population not participating nor caring very much as to the outcome. Now the entire resources of nations are pitted against each other—moral, physical and industrial.

And war will continue as long as creatures have different ideas as to their rights and are willing to fight for them.

II

Necessity knows no law—and Military Necessity is supreme. In appraising an R. O. T. C. graduate as a prospective officer, we should not ask "Is he qualified?" We should ask, "Is he the best material available?" and "How can he be improved?"

The first question is answered in the affirmative. Young college graduates with two years' military training under federal supervision are far and away the best material that America could ever have for the quantity production of company officers in time of war.

The second question is answered by saying that we cannot improve the mental, moral and physical character of these young men by any means at our disposal, but we can improve their military knowledge three hundred per cent by changing the R. O. T. C. courses. This can be done without any increase in present appropriations and without taking any more of their precious time from other studies.

III

The best military law ever written upon the statutes of the United States was the old Militia Act of 1792. The statesmen of those days thought clearly and had the faculty of reducing their thoughts to writing. This act provided that every able-bodied male citizen between eighteen and forty-five should be enrolled in the militia. It provided for organizing these men into regiments, brigades and divisions. It required them to turn out, without pay, for training and inspections, and, under pain of punishment, to furnish their own uniforms, equipment, arms and ammunition. It gave us a national army of citizen soldiers. There was a fatal defect, however, and after languishing on the books for over a hundred years, the law was repealed. The fatal defect was that the execution of the law rested with the governors of the several states instead of with the President.

IV

The present National Defense Act is a good law. Some give it Character "Excellent." I can only hand it "Good." The C. M. T. C. is fine. The National Guard is wonderful. The Regular Army and the Reserve Officers Corps are far from perfect. The fatal defect in the Reserve Officers Corps is that it is organized around the veterans of the World War and there is no provision for replacement. As long as the veterans last all is well and good. When they are gone we shall have a millstone around our neck—a corps of one hundred thousand officers, in grades from second lieutenant to major general, whose only knowledge of the military profession will be what they learned as boys at school, supplemented by subsequent correspondence courses and fourteen meager days in contact with troops once every five years. (This figure is based upon present congressional appropriations.)

V

It goes without saying that exclusive of World War veterans the only men in America, or the best men in America, to exercise high command in time of war are the professional soldiers. In this I am willing to include the National Guard and the Marines, though their employment is not germane to this discussion.

At the outbreak of the Civil War two hundred eighty-one officers resigned from the Regular Army and joined the South. Jefferson Davis, a graduate of West Point and ex-Secretary of War, had the good sense to appoint these officers at once to high command. Samuel Cooper, Adjutant General of the Army (with rank of colonel); Joseph E. Johnston, Quartermaster General; Robert E. Lee, colonel of cavalry; P. T. Beauregard, captain of engineers; and others, were made full four-star generals in the Confederate forces. Regular Army lieutenants became lieutenant generals. Grant in his memoirs regrets the same thing was not done in the northern army and recommended that at the outbreak of another war the Regular Army be disbanded and its personnel distributed among the emergency forces.

General Pershing asked that no brigadier generals be sent to him over forty years of age, and no major generals over forty-five. What shall we do in the next war with paper battalions, regiments, brigades and divisions commanded by men over fifty years of age whose professional knowledge has been acquired by lectures and correspondence and who, in the average case, have not had more than ninety days' actual contact with soldiers during the preceding thirty years?

VI

Congress has provided twelve thousand Regular Army officers, in time of peace, at a cost of over thirty-eight million dollars per year. Six thousand of these are extra. That is, they are not required for the tactical or administrative organization of the Regular Army. They are used, in time of peace, to train the civilian components. What are they going to do in time of war? Are they going to lead these men in battle or are they going to stand and coach them from the side lines?

VII

At the date of the Armistice General Pershing was asking for an army of one hundred divisions in France. This together with the overhead at home would have required half a million officers, three hundred thousand in the combatant branches of the line and two hundred thousand in the services of supply. By properly distributing our professional soldiers, by reorganizing the R. O. T. C., and by a more intelligent organization of our S. O. S. personnel, we could provide an Emergency Officers Corps four hundred thousand strong, without increasing present appropriations for National Defense. This corps would be much more efficient than the present Reserve Officers Corps (excluding World War veterans) and could stand the analysis of cold logic upon its merits.

The general outline of this scheme for an Emergency Officers Corps is as follows:

a. From certain R. O. T. C. institutions (hereafter indicated) commission all graduates, Basic as well as Advance Students, as lieutenants and captains in the Emergency Officers Corps. These young officers should be required to take no training and have no obligation except in case of war. At the end of five years their commissions should expire, unless they voluntarily choose to take training and compete for promotion. This would give us an annual crop of forty thousand fine young men, with a total of two hundred thousand at an average age of twenty-five years. Selected C. M. T. C. graduates should be treated in the same way.*

b. From the above classes and from the National Guard, promotions should be made, after five years' service, to the grade of major, all such officers being required to take, in the grade of major, a regular course of training involving annual encampments and to be discharged from the service upon reaching the age of thirty-five. This would give us about thirty thousand majors of the line.

c. From the Regular Army, Marines and National Guard, and from World War veterans as long as they last, we should fill the grades from general officer down to lieutenant colonel. We would need about twenty thousand.

d. From professional men in civil life and without regard to age (up to sixty-four years), we should appoint S. O. S. men. Men whose ordinary vocationMM3 with their army duties, who are already seventy-five per cent trained, would require no peace-time expenditure of public funds for that training. It would not be necessary for them to know the Army red tape, and the essentials of their duties could readily be acquired from simple manuals. We could use about one hundred fifty thousand of these.**

e. The present organization of the Reserve Officers Corps into units higher than the regiment, and even into regiments away from the large cities, is just a paper proposition and has no advantage except for administration. So-called unit training has a sentimental value, but little else. Under the proposed Emergency Officers Corps we would have a paper army for purposes of mobilization—the important thing—and the training would be adapted to the requirements of the individual. When the time is limited this is the best way to utilize it.

More details of this plan will be indicated later.

VIII

The United States Military Academy at West Point may be considered as the number one R. O. T. C. institution in this country. It is the best military school in the world. It has furnished officers for the Regular Army and, in addition, has a high percentage of graduates attaining success in civil life. Other military schools, the Virginia Military Institute and The Citadel, for instance, were created in imitation of West Point to furnish officers for the state forces at a time when the burden of national defense rested upon them.

It has already been indicated that Jefferson Davis, unhampered by promotion lists, precedents and politics, used his Regular Army personnel to better advantage in the organization of the Confederate Army than was possible in the case of those who stood by the Stars and Stripes. Davis received two hundred ninety-six West Point graduates, one hundred ninety-three from the Army and one hundred three from civil life. From these graduates he appointed eight full generals; fifteen lieutenant generals; forty major generals; and eighty-eight brigadier generals. Of the Corps commanders in the Confederate Army only two were non-West Point graduates; of the Army commanders, none. He used the graduates of the state military schools in the same way.

But the North did not go far in the plan of putting their professional soldiers in charge of their volunteer forces. Regular Army "combat teams" were retained intact, and Grant was refused the services of a Regular Army second lieutenant, whom he wanted for colonel of a volunteer regiment, because "he was the only officer on duty with his company."†

IX

The plan of going outside of West Point and accepting the state military schools and other similar insti-

*About ten thousand captains and lieutenants could be had from the warrant officers and soldiers of the Regular Army.

**In France the S.O.S. included everything except the actual fighting at the front—doctors, lawyers, all forms of transportation, construction and forestry, telephone, telegraph, and everything connected with the supply of food, clothing and ammunition.

†Grant, himself, and Sherman were examples in the northern army of R.O.T.C (West Point) graduates called back from civil life to take high command. But the War Department was not responsible for this.

tutions as an integral factor in our system of national defense was not a Regular Army idea. It did not originate with the General Staff. Neither the Regular Army nor the General Staff has ever fully understood these schools or appreciated their tremendous importance. The big idea was first conceived during the Civil War by a member of Congress—Justin S. Morrill—who introduced compulsory military training in the Land Grant Colleges. For fifty years it languished and had no more to do with national defense than did algebra or football; and today the R. O. T. C. stands to the Army as the horseless carriage stood to the automobile. The horse was taken away, the shafts were removed, and something inside made the thing go. The R. O. T. C. boy is just a Regular Army soldier with something left out. He wears the Regular Army uniform, draws the Regular Army ration, studies the Regular Army regulations, and receives a little something of Regular Army training. At the end of the first year, future bankers and big business men are qualified to serve as privates in the ranks of an emergency army. At the end the second year they are qualified to serve as corporals and sergeants. Having then completed the compulsory military training under the Morrill Act, they are free to take two more years of advanced work—voluntary—and qualify as lieutenants in the Officers Reserve Corps.

An average young American with a fourteen-year-old mind and an eighth grade education can qualify as an expert with any weapon issued to the American Army within fifteen days after his induction into the military service. During the same time he can be hardened to march with his command, whether afoot, ahorse, or in the back seat of an automobile. He can be taught to obey his officers and to perform the essential duties of a private soldier in the field. Time spent in teaching college men to become private soldiers is time wasted. They learn to tie knots in ropes and to name the parts of obsolete ordnance; to take down and reassemble machine guns blindfolded; to operate motor transportation—when we already have thirteen million licensed chauffeurs at large in the country; and in the case of dentists, they learn to execute the manual of arms. If the clerk at a soda fountain were discovered taking the cash register apart blindfolded, it might cause comment, but we take pride in a class of blindfolded sophomores who can put together the intricate parts of a magazine rifle.

X

General Pershing, in his book on the World War—the greatest book upon any military subject ever written by an American—says:

> "In each succeeding war there is a tendency to proclaim as something new the principles under which it is conducted. Not only those who have never studied or experienced the realities of war, but also professional soldiers frequently fall into the error. But the principles of warfare as I learned them at West Point remain unchanged. They were verified by my experience in our Indian Wars, and also during the campaign against the Spaniards in Cuba. I applied them in the Philippines and observed their application in Manchuria during the Russo-Japanese War."

These immutable principles of the military art were learned by General Pershing at West Point with Upton's Tactics, an old-fashioned breech block rifle, a muzzle-loading artillery. How much of our time with the R. O. T. C. is devoted to teaching immutable principles and how much of it is devoted to teaching the technique of military weapons that will be obsolete before the next war?

R. O. T. C. institutions may be assembled into the following groups:

Group I: Essentially military schools originally modeled after West Point and graduating boys of college age. Entirely independent of the federal government for the support of military instruction. Examples: Norwich University, Pennsylvania Military College, Virginia Military Institute, The Citadel.

Group II: Same as Group I, but for younger boys. Examples: Shattuck, Manlius, Culver.

Group III: Essentially military schools, but with agricultural or mechanical arts as a primary objective. Dependent upon federal aid for the support of military training. Examples: Virginia, Texas and Clemson Agricultural and Mechanical colleges.

Group IV: Semi-military colleges which give a course of military training compulsory for all freshmen and sophomores, but optional for juniors and seniors. Some of these are Land Grant Colleges, such as Kansas State Agricultural College; and some are not, such as Coe College, at Cedar Rapids, Iowa.

Group V: Essentially civilian colleges at which a small number of students elect to take military training: Examples: Yale, Harvard.

Group VI: Medical colleges, high schools and other miscellaneous institutions not included in the first five groups are not considered in this discussion.

Group I Institutions.

Norwich University, Pennsylvania Military College, Virginia Military Institute, The Citadel, as indicated above. These institutions came into existence long before the National Defense Act. They were created by the states to provide officers for their own defense—just as Congress at the suggestion of Washington created West Point to provide officers for the defense of the nation. They were developed without federal aid. They were modeled after West Point—had their own courses of instruction, their own traditions, their own methods—and have been impeded rather than advanced by the superimposition of R. O. T. C. units. The Citadel (the one with which I am most familiar) was created in 1843. The state law provided that the Battalion of Cadets should be organized as infantry, but that since it was to be a school of instruction the functions of the other arms should be taught also. Its graduates were eligible for appointment to any office in the state forces below the grade of colonel.

This is the way the Corps of Cadets was organized at West Point, and still is. But not satisfied with this,

in the case of the Citadel the federal government has superimposed upon this four-company infantry battalion a three-company coast artillery formation and has changed the course of instruction from one suitable for cadets (young officers) to one suitable for enlisted men. Thus the institution now looks like the print from a kodak film that has had two exposures. Formerly the textbooks on artillery were the same as at West Point. Now Citadel cadets study the manual for second-class gunners—a wholly unnecessary grade in the Regular Army, created for the sole purpose of giving men two dollars a month extra pay, which is more than it is worth.

These R. O. T. C. units should be withdrawn from these purely military schools Instead of having so-called unit instructors they should have the West Point organization, with Regular Army officers detailed as Commandant of Cadets, tactical officers, etc. Whatever federal assistance they receive—and they should get a plenty—should be in a lump sum and, within reasonable limitations, expendable as the institutions think best. They should be allowed to develop and to manage their own curriculum. We should judge them by results and not hamper them with infinite details that impede their progress. Stonewall Jackson and George C. Marshall will vouch for the V. M. I. Other great soldiers will vouch for the efficiency of the other institutions as they were operated before the days of federal aid contingent upon interference. Graduates should be commissioned as captains in the Emergency Officer's Corps.

Group II Institutions.

Shattuck, Manlius, Culver, etc. The same remarks apply to this group except that the graduates are younger and do not have the mental equipment of college graduates. They should be commissioned upon graduation as second lieutenants in the Emergency Officers Corps and advanced to first lieutenants when they become twenty-one years of age. If they subsequently graduate at college, they should then be commissioned as captains. In the Group II institutions the brightest of the boys will be considerably under twenty-one years of age upon graduation. But that should not prevent their being made lieutenants. Napoleon was a lieutenant at sixteen. Generals Drum and DeWitt were commissioned in the Regular Army before they were nineteen, and a number of officers in the Confederate Army were generals at twenty-one.

Group III Institutions.

Virginia, Texas and Clemson Agricultural and Mechanical colleges. Their military courses approximate very closely to those of Group I, but since these are Land Grant Colleges and have an objective other than military they should be given more federal supervision than those of Groups I and II. But even the Group III schools should be allowed great latitude. The graduates should be commissioned as captains the same as for Group I.

Group IV Institutions.

Under the Morrill Act, passed in 1862, Land Grant Colleges such as the Kansas State Agricultural College are required to give military instruction; and a number of others, like Coe College, have adopted the same system, in consideration of which they receive federal aid. It is to this group and to the following group that the principal discussion of this paper is directed, because most of the energy and funds expended by the government is directed towards these colleges.

The course of instruction in the Group IV colleges is divided into Basic and Advanced. The Basic is compulsory and the Advanced is optional. Instruction is provided for by the establishment of so-called R. O. T. C. units peculiar to the several arms; such as an infantry unit, a coast artillery unit, etc. The freshmen and sophomores are taught the duties of private soldiers in these several arms and receive certificates of qualification as noncommissioned officers. The juniors and seniors are trained as officers and upon graduation are commissioned in the Reserve Corps. But only twenty per cent of the Basic students pass up to the Advanced Course, so that eighty per cent of all this effort is wasted. And thirty thousand young college graduates, with two years' military instruction under federal supervision and at government expense, pass out of these schools every year with no obligation to serve the country in case of emergency. The two hundred hours of military instruction received by them is equivalent to a two-year enlistment in the National Guard. What folly to waste such opportunity and such material!

The time available is not devoted to teaching the simple fundamental principles of the military profession. It is padded out with the National Defense Act, Customs of the Service, and the little non-essential details that make up the routine of a soldier's three-year enlistment. We should recognize these young college men as cadets and should go directly to the point of qualifying them as officers of an emergency army. So-called R. O. T. C. units should be abolished and there should be one fundamental basic course for all Group IV institutions. This course should comprise the fundamental principles common to all arms. It should be contained in a textbook prepared by a competent author under the auspices of the War Department. The present course of instruction is indicated by eleven hundred forty-six separate references to various official publications—a sentence here, a paragraph there, and a page somewhere else. Out of this tangled mass of Army red tape civilian publishers, ahead of the Army in recognizing the necessities of the case, have collected these scraps of paper, digested and compiled them in the form of R. O. T. C. manuals which they sell to students.

In selecting a course of instruction for the R. O. T. C. we must use the time to the best advantage and from the many subjects of military value should take those that are interesting, dignified and of definite value to the student in his civil vocation. We must remember that these students are preparing themselves for the keen competition of civil life. That is their main objective. The Army is a side line. They have got to make a living, support a family and reap the joy of

success. The best men have no time to waste and will demand value received for every hour they spend at college. You can hear a successful business man or a lawyer or a doctor say that the military bearing, the orderly habits and the respect for authority that he learned at military school had served him well in after life. But you cannot hear him say the same thing about the nomenclature of the Mortar Deflection Board.*

We must also bear in mind that we are dealing with college boys and not with enlisted men. Youth attaches great importance to matters of little import to maturer minds. The Honorary Colonel, the Company Sponsors, express the spirit of the R.O.T.C. They extend a wholesome influence and those in authority should take the greatest possible advantage of the inspiration behind this idea. R. O. T. C. students are young officers in the making—the War Department notwithstanding. They are cadets. They should be treated like cadets, and dressed like cadets. Their organizations should be called Cadet Corps. The names of the institutions should be attached—thus: "The Kansas State Cadet Corps." Their officers should be called Cadet Captain, Cadet Colonel, etc.

The criticism of this paper is directed principally toward the Basic Courses, designed to qualify the students to serve as enlisted men. The Advanced Courses might be retained somewhat along present lines, with such modifications as naturally follow from the changes made in the Basic and substituting Essentials, of course, for Non-essentials.

Upon graduation from a college of the Group IV class, each student should be commissioned as an officer in the Emergency Officers Corps, the Basics as second lieutenants and those who have completed the Advanced Course as first lieutenants or captains, according to their aptitude and accomplishments.

Group V Institutions.

These should be handled along the same lines as those of Group IV, with such modifications as obviously follow on the fact that all students do not take the course of military training.

*The inventor takes occasion to apologize to the R.O.T.C for the twenty-eight technical names attached to the various parts of this device, none of which he knows himself.—J. H.

Distribution of Graduates.

Commissions should be prepared in advance and handed out with diplomas on graduation day. As indicated above they should run for five years, without any obligation for training or service except in case of war. This would give us a stock of two hundred thousand company officers with a twenty per cent turnover each year—new blood—and distributed as follows:

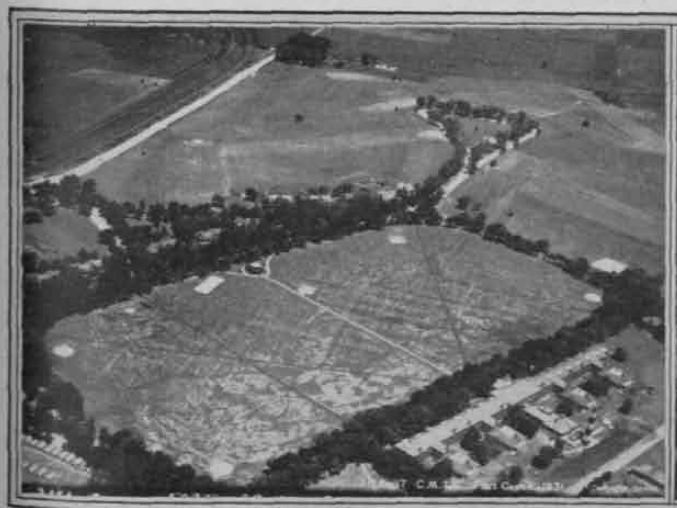
Captains:		
Graduates, military colleges	6,500	
Selected graduates from military schools and from Advanced Course Land Grant Colleges* .	8,500	15,000
First Lieutenants:		
Selected graduates, military schools	3,000	
Graduates, Basic Course, Land Grant Colleges	25,000	28,000
Second Lieutenants:		
Graduates, military schools	5,000	
Graduates, Basic Course, Land Grant Colleges	152,000	157,000
GRAND TOTAL		200,000

*In this tabulation the term Land Grant Colleges includes Group V institutions.

XII

Thirty years ago the Adjutant General—afterwards Premier—of Australia visited America in a world-wide search for a military system adapted to the genius of his people. It was he who first suggested to me that America had the best military school in the world and more military schools than all the rest of the world together, but that outside of West Point none of the American military schools were incorporated in our military system.

I think we can say that this great R. O. T. C. system, peculiarly American, peculiarly adapted to the genius of our people and to the youth of our land, is not fully developed—not half developed—and that we Regular Army soldiers, on the whole, do not understand these boys nor sympathize with their problems.



Parade Ground.

FORT CROOK, NEBRASKA. 1931 C. M. T. C. Camp of 640 Candidates.

An Ideal System of Fire Control for Seacoast Artillery

By Colonel J. C. Ohnstad, Coast Artillery Corps

THE Coast Artillery employs for the accomplishment of its mission submarine mines and cannon. The equipment which serves to direct cannon fire on appropriate targets and furnishes the data for laying the guns so as to cause the projectiles to strike those targets is, for the purpose of this article, the fire control equipment. Fire control equipment, therefore, includes such Ordnance materiel as determines range and direction, and such Signal equipment as is necessary for the transmission of firing data and orders for the direction of fire. Both of these classes of equipment will be considered.

Our Coast Artillery mission can be accomplished only if our projectiles strike the enemy, and especially that portion of the enemy force most dangerous to the defenders. Therefore, we must have, in addition to adequate firing data, means for coordinating the fire and directing it in accordance with the principles of tactics. Hence, the requirements to be fulfilled by a fire control system may be stated, briefly, as:

> To furnish to the tactical commanders the data required for selecting the proper target; to supply to the guns the data for laying, fast enough that the gun need never wait to fire, and accurately enough to obtain the maximum hitting power of which the gun is capable; to furnish accurate information as to the fall of shots so that fire may be adjusted; to continue to function as long as the guns remain in action; and to be capable of operation and maintenance by troops having a limited degree of training.

A fire control system which completely satisfies these requirements is an Ideal Fire Control System for Seacoast Artillery. The principles embodied in the requirements above are not new, rather are they a restatement of ideas which experience has proved to be sound.

With our present fire control system, the proper direction of fire upon selected targets offers considerable difficulty. Effective employment of artillery requires centralization of command combined with decentralization of execution. The intelligence service available to higher tactical commanders for rapidly and certainly locating targets and quickly assigning them to groups or batteries is generally inadequate and in some cases non-existent. From time to time relocating devices have been placed in certain group and higher stations but ordinarily the materiel and personnel required for the operation of group, groupment, or harbor defense intelligence systems have seemed prohibitive. Consequently, there is now, under the direct control of tactical commanders, no consistently effective means for locating and identifying targets under all conditions. Furthermore, the time required for the assignment of targets by telephone is, in many instances, excessive.

The requirement that the Ideal Fire Control System be of an invulnerability equal to that of the guns to which assigned, necessitates either extensive materiel protection or dispersion or both. Dispersion involves extensive communication lines. Protection of materiel dictates that the exposed elements of the system be as small as possible in order to facilitate bombproofing and dispersed in order to limit the probability of enemy hits. Dispersion aids in preventing enemy neutralization but it adds to the communication maintenance difficulties. However, tactical flexibility can be given only by a multiplicity of stations and therefore further dispersion of these stations is unnecessary for the purpose of protection. The often mentioned "Battery Commander's Action" should, from a tactical standpoint, be a last resort and for that reason the fire control system must be as nearly invulnerable as possible.

The employment of data computing apparatus and the direction of fire is now limited by the available means of transmitting data and information—the telephone and the radio set. The telephone, while susceptible of a high degree of development as a speech-conveying instrument, lacks much in accuracy and intelligibility when used by semi-trained personnel. Radio, in its present state of development, is lacking in dependability. Furthermore, the demands for radio service are already beyond the available ether capacity.

The training requirement for an Ideal Fire Control System (that it be capable of operation by average type personnel available in an emergency) demands simplicity in the operations performed by such personnel, minimum number of personnel (to make coordination and teamwork easier and reduce errors), reliability, and ruggedness.

An attempt will now be made to indicate the essentials of a system which will in all respects fulfill the mission laid down for the fire control system. Starting at the top, tactically, we need a network of intelligence observers provided with means of communication to tactical commanders. The observers should be provided with facilities for reporting targets quickly and in such an unmistakable manner that from observers' reports an intelligence map or other device for showing the hostile situation may be kept up and from it targets may be assigned rapidly and clearly

to appropriate elements of the harbor defense. The results of war games and maneuvers show that the delay in passing information by existing telephone systems is frequently so great as to seriously interfere with the opportunities for fire. The ideal system should eliminate such delays. No doubt improvements in present command post equipment could be made so as to make relocation and assignment of targets more easy and certain. The surest way, however, of eliminating difficulties in putting a battery on a target would be to furnish the battery the track of the target in such a way that the target track could be used in the battery's plotting equipment. This should be done by placing a pool of observers under the tactical commander and having such an arrangement of communications as would permit allocating observers to batteries or other tactical units at the same time that the target is assigned. When any observer in the pool discovered a target he would report that target directly to the command post, at the same time keeping the target in his instrument. The tactical commander, through the chain of command, could then give his orders and simultaneously have the observer, or observers, connected to an appropriate unit. The battery command to whom the observer was connected would, in this way, obtain directly the information necessary to promptly get his battery on the target and open fire, and there would be no danger of losing targets. This arrangement would not interfere with the execution of emergency firings by any group or battery since each battery would retain, normally, a base line and spotting observers. Thus, the requisite highly centralized system of command would be provided and at the same time the execution of fire remains decentralized. The higher commander by assigning base line and observers to the lower unit would be released from the conduct of fire and enabled to give his attention to direction of fire. Decentralization of fire execution necessitates that the battery commander have in his own hands the materiel and personnel necessary for determining firing data, the means for determining and applying corrections to that data, and for firing the guns; hence the assignment of an observer or observers to a battery along with the target. Each battery normally would have spotting facilities and whatever observing stations are needed for emergency fire. The operation of connecting the observer to the battery would also include connecting spotting observers to the same battery since both observers and spotters could ordinarily operate from each station. An ideal system such as just outlined contemplates the use of methods and materiel which have not yet been developed. To approach the ideal system in practice would necessitate the development and installation of:

a. Harbor defenses so organized that the necesesary number of observers and spotters may, when desirable, be consolidated under the control of a few tactical commanders in order that intelligence data may flow directly to command posts where tactical decisions as to fire direction are made, and in such manner that observers and spotters may, when required, furnish data for the conduct of fire to the firing units designated by the tactical commander.

b. Switching center or centers designed to permit complete flexibility in the telephone interconnection of command posts, observers, spotters, and plotting rooms.

c. A system of data transmission, by whatever method, capable of operating reliably over distances necessitated by our longest base lines; viz., about 50,000 yards, and capable of accurately and continuously feeding data to guns or computing devices.

d. Switching center or centers where the data transmission lines may be interconnected at will from any observing station or stations to any battery, or batteries, or command post. These data transmission switching centers preferably to be located with the telephone switching centers.

e. Computing devices capable of furnishing firing data continuously and accurately, with a minimum of personnel, from basic data referred to any base line or directing point as given by any terrestrial or aerial observer or observers.

f. A method of, and materiel for, accurately and quickly determining the location of the fall of shots from each battery.

g. Protection for those elements of the fire control system which are exposed to enemy fire or bombing, either by duplication of stations and means of communication, by concealment or by provision of material protection, or by all three methods.

Each of the observing stations should have means for measuring either range or azimuth of a target, or both, and also means for spotting the fall of shots. Airplane observing stations should be equipped for two-way radio to a ground station or stations. The ground radio station should be so equipped as to facilitate messages reaching the command post or firing unit in a minimum of time. The computing device at each battery in addition to being capable of relocating data from any station to the battery directing point must be capable of making a prediction as to the future position of the target, applying ballistic and fire adjustment corrections, and transmitting the corrected future data continuously to the guns. Each group and groupment should have means for computing continuous ranges and azimuths. The purpose of a group or groupment computor is to enable the group or groupment, when necessary, to concentrate the fire of a number of its batteries upon a single target, employing only one observing station or base line. In all computing and data transmitting devices, it is requisite that there shall be no dead time, hence, oral or telephonic means of transmission of data are precluded from being considered ideal.

The ideal system outlined in the foregoing paragraphs will probably recall, to some readers, a project of the Coast Artillery Board, tested about ten years ago at the Harbor Defenses of Cristobal, and many readers will doubtless feel that the "Ideal System" would attain no better success than its prede-

cessor. However, the ideal system herein outlined avoids the most serious defect of the earlier proposal; namely, that fire could be concentrated but never distributed. The "Ideal" herein expressed provides for either concentration or distribution of fire and at the same time permits fully decentralized execution of fire.

Having defined the object to be accomplished by the fire control system, the present fire control system and the new fire control materiel now being developed or manufactured will be briefly reviewed in order to bring out improvements desirable and show to what extent the trend of development approaches the ideal. It may be said in defense of our present Coast Artillery methods that firing data can be turned out more frequently and at shorter intervals than the guns can be fired. Although this is true, nevertheless the guns are kept waiting to fire and time is lost because, in practice, the loading must be so timed that the gun is ready to fire appreciably earlier than the bell rings. There is furthermore, considerable lost time for the gun in opening fire or changing target while the range section is waiting for several bells to get the track straightened out and the prediction made. Shortening or elimination of observing intervals by means of continuous data transmitting and computing devices would tend to eliminate delays in opening fire.

With regard to the requirement that continuous data be furnished the guns, present types of apparatus fail in all respects. In the first place the gun must be kept waiting until the appropriate bell rings to fire. This delay is inherent in any system which is based on the intermittent transmission, by telephone, of data from the plotting room to the guns. Various types of extrapolating devices have been devised, some of which are in use, which reduce the time for relays, but as long as they are associated with telephone transmission of the data, the reduction in relay time is necessarily obtained at the expense of more involved processes in the plotting room. The electrical transmission of data by means of self-synchronous motors has proved successful in antiaircraft fire control apparatus, and there is now being manufactured for the Coast Artillery a self-synchronous transmission system which will transmit data from the plotting room to follow-the-pointer receivers on the guns. To the extent of providing a continuous flow of data, such a transmission system will fulfill the requirements of an ideal system.

The materiel now in use is unsatisfactory with regard to the capabilities of computing devices for furnishing firing data "from basic data referred to any base line or directing point." Ability to use any station or stations for fire control purposes is necessary to provide tactical flexibility and to minimize the effects of enemy action. To change from one base line to another on present types of plotting boards requires considerable time. The Cloke Plotting and Relocating Board is more nearly adapted to universality than any other type of plotting board. In the case of the Cloke board, it requires approximately five minutes to change from one base line to another, provided fixed platens are available for each base line to be used and assuming either that the azimuth scales do not have to be changed or that the board is provided with a chain type azimuth scale. If only a universal platen were available, some fifteen minutes would be required to make the change from one base line to another. Insofar as the requirements of ideality involve a means for transferring data from one directing point to another, that is, in relocating data, the Cloke board is satisfactory, provided a sufficient number of fixed platens are available. Within certain limits of construction of the individual board, it makes no provision for relocating data from one reference point to another other than between the stations for which plugs are provided.

In general, the necessity that data computing devices be capable of using data from any source demands either further improvements in types of apparatus now in use, or instruments of entirely new design. A seacoast data computor has been under study for some time and designs have been outlined which promise to satisfy the flexibility requirement in all respects. Within relatively wide limits, this instrument is expected to compute data with respect to any base line and for any directing point. Data pertaining to the relative position of the base line and directing point are set up on the machine by means of graduated dials. The only delay in transferring from one base line situation to another is the time required to set into the machine the base line—directing point data and in addition a small interval of time necessary to establish the rates. The over-all delay should not exceed one and one-half minutes. Provision is also made for putting into the machine range finding data obtained by aerial observation and for generating the track of the target therefrom.

Much progress has been made in the last few years in aerial observation of fire. Average results indicate that aerial spotting is approximately equal to terrestrial spotting in accuracy. So far as concerns utilization of data obtained by aerial position finding, little progress has been made. Several practices have been conducted entirely by aerial observation but the methods employed were crude and slow, and unlikely to prove successful with a high speed target. Further development of aerial spotting, position finding, and communications is required to solve the problem of long range observation where only low terrestrial sites are available.

It was stated that the Ideal Fire Control Installation should provide accurate data to the guns. So far, this article has avoided this question. It is doubtful whether a system devoid of error will ever be devised. Since any piece of fire control apparatus will give rise to instrumental errors which will have the effect of augmenting the dispersion of the guns, all that will be attempted here will be to indicate the extent to which errors will be eliminated or reduced in the types of apparatus suggested above.

On account of the number of operators employed and the great amount of oral repetition of data the present system is encumbered by frequent opportun-

ities of making mistakes. Whenever data are transmitted by word of mouth mistakes are bound to occur. The reduction of the number of gadgets in the plotting room with the consequent elimination of transfers of data and the substitution of electrical transmission systems for telephone transmission will reduce the possibilities of errors. Certain data, however, must still be transmitted by word of mouth. Corrections based on observation of fire come under this heading. A common error is to apply a correction in the wrong sense. A data computor was proposed several years ago which incorporated spotting and adjustment features in the data computor itself. A simpler solution, and one which is immediately available, however, is to adopt a suitable system of reference numbers which will be carried through all correction computing devices.

Another source of error lies in the prediction of future target position. This error occurs whenever the course of the target is other than a straight line and is inherently due to the inability of either men or machines to anticipate the movements of the target. Space is insufficient, in this paper, to discuss the relative advantages and disadvantages of predicting "along the secant" and "along the tangent." It is sufficient to state that where predictions are based on continuous observations the future position of the target (setforward point) will be affected more quickly by changes of direction of a target on a curved course than will be the case where predictions are based on intermittent observations separated by appreciable intervals of time. Whether one method of prediction is actually more accurate than the other is at best debatable and can be determined only by more exhaustive tests than have so far been feasible.

The general principle to be followed in regard to accuracy is, first, to eliminate personnel errors; second, to eliminate systematic errors through accurate spotting. There is little use in trying to over-refine the data computing devices so long as large errors remain in the spotting system as the accuracy of any fire control installation is limited by the spotting system and little is gained by reducing the probable error of the computed data below the probable error of spotting.

The need that provision be made for accurately and quickly determining the location of the fall of shots is more nearly satisfied by present developments than is any other requirement of the ideal system. A spotting board has been designed which is reasonably compact, simple, and accurate. A successful means for identifying shots from different batteries is in sight, although the details are not available for publication. Unfortunately, there is no apparatus which can take the place of the spotting observer. The difficulty with present methods of spotting and the results obtained therefrom has been due to inadequately trained personnel than to any other factor. The motion picture camera will provide a spotting means for making complete and impartial analysis of seacoast target practices, but there is little likelihood that such devices can be adapted as a substitute for spotting observers.

By substituting simple mechanical operations and electrical data transmission for the present manual setting and oral repeating of data, the period of training necessary for the range section to acquire smooth teamwork, will be reduced, enabling troops of short training to fire effectively. The care and maintenance of such materiel, however, is the most serious problem which confronts the Ideal System or any approach thereto, on account of the large quantities of electrical and mechanical equipment involved. Only when the materiel of the ideal system is also ideally rugged can the requirement that the Ideal Fire Control System be suitable for use by briefly trained troops be considered satisfied.

In conclusion it might be well to cite the definition of "ideal" used in this article: "A product of thought and imagination, to which any corresponding real existence is not necessarily attributed, but which appears in consciousness as an object worthy of contemplation or aspiration."

An ideal system such as that herein outlined is, as yet, very far from realization on account of practical difficulties, not only mechanical and electrical, but also financial. It is merely the intention of this article to suggest the trend which development should take in order that our Coast Artillery system of fire control shall ultimately comply in full with the requirements prescribed by its mission.

Thirty Years of Seacoast Target Practices

By Major J. B. Crawford, Coast Artillery Corps

OUR training regulations set forth as the object of target practices the training of the command for battle. There is little doubt that Coast Artillery officers, particularly of the battery grades, look uponthe annual target practice as the outstanding training feature of the year. Probably no publication issued by the War Department is looked forward to with such interest by Coast Artillery personnel as the annual bulletine known as "COAST ARTILLERY TARGET PRACTICE RESULTS" in which the scores of the individual batteries, as well as pertinent comments on target practices, are published. The intense interest shown by all in target practices is indeed a healthy sign. Incident to this interest continual debates are carried on in the COAST ARTILLERY JOURNAL and through unofficial as well as official correspondence relative to the justice of the regulations covering target practice.

Referring to our training regulations on target practices, we read—

> "From a gunnery standpoint the best that can be accomplished by a battery commander is to eliminate all personnel errors, reduce the dispersion of his guns to a minimum, place the center of impact of his shots on the center of the danger space in the minimum time with the minimum expenditure of ammunition, and keep it there throughout the practice."

"Why then," says the advocate of the idea that hits are all a matter of luck, "should there be a hitting component in the formula for the score?" On the other hand, an eminent artilleryman, an officer of high rank, has recently expressed himself as follows—

> "I am still of the opinion that the score should be simplified so that a battery would be given credit only for the frequency of hits on the target as actually presented to it."

The writer of this article has been fortunate enough to have had referred to him for his consideration many recommendations of this nature. The wide variation in views regarding the conduct and the scoring of target practices advanced by officers whose abilities are unquestioned has led him to delve in a very superficial manner into the evolution of the seacoast target practice. This article has resulted from this study and is submitted to the JOURNAL for publication in the belief that, while perhaps of little practical value, it may be of some interest to the personnel of the Corps.

From records available in the office of the Chief of Coast Artillery, we find that as early as 1898 rules were laid down for the firing of target practices at moving targets and a method for scoring was prescribed. At this time firing at moving targets was not permitted at ranges of over 3000 yards. Hits for large caliber guns were determined with reference to a hypothetical target which is described as "a ship of war 360 feet long, 72 feet beam and 15 feet freeboard." At this early date the hypothetical target was considered, first, broadside on to the battery, and second, end-on to the battery. A table of deviations provided a simple method of determining whether or not a hit had been scored.

In Coast Artillery Drill Regulations, 1903, we find little change as regards regulations for target practice from those prescribed five years previous. To quote from the regulations—

> "Fire should be opened on the target under the following conditions:
>
> (1) When the target is moving on a line roughly parallel to the front of the battery, or an arc of which the battery is the center.
>
> (2) When the target is approaching the battery at an angle of not less than 45 degrees to the line of fire.
>
> Under no circumstances whatever shall fire be opened on a towed target when—
>
> (1) It is being towed from the battery.
>
> (2) It is outside the buoyed or prearranged course.
>
> (3) It is at a greater range than 3,000 yards. This limit may be increased to 4,000 yards with a tow rope of 400 yards, provided the guns are mounted at a height of 400 feet or over above mean tide level."

The same broadside and bow-on targets are still in use.

An impetus to the development of seacoast artillery target practice is indicated by General Orders No. 100, July 9, 1903. In this publication we find, among other things, that all service practices will be at moving targets and that the larger caliber guns and the 12-inch mortars will be fired at ranges exceeding 7500 yards. For guns, the bow-on and the broadside target are still in effect but for mortars we find prescribed a hypothetical target which consists of an area bounded by a circumference of 40 yard radius. A hit within this area was to be given a numerical value of one; while any hit within the circular area bounded by a circumference whose radius is 60 yards but outside the 40 yard circle is given a numerical value of 0.2.

By 1904 the bow-on target has passed out of existence and the hypothetical target is assumed to be in a position with its axis tangent to the path of the towed target. During the next few years while new target practice regulations appear annually in the

form of General Orders, the changes in methods are slight. We find the hypothetical battleship target increased somewhat in length and breadth while the determination of locating a hit on this target, which had previously been done from tables, is now determined by a method prescribed in much detail. The target for mortars still remains the area enclosed in a circle, the circle at this time being one of 50-yard radius and an impact occurring anywhere in the area being considered a full hit.

In 1907 an innovation regarding the target is noted. For all guns of 6-inch caliber and above, three standard pyramidal targets are arranged on one towline; the first 200 yards from the tug, the third 145 yards from the first, and the second midway between the first and third. The hypothetical battleship target now 145 yards long is in use but by the employment of the three pyramidal targets the length of broadside battleship target is represented.

In 1909 a material target 60 feet long by 30 feet high for large caliber guns was introduced. This was a costly innovation and a hypothetical target was again in general use by 1915. This target for guns was a battleship silhouette, no allowance being made for deck hits and a hit made at ends of the silhouette counting but half of a center hit.

In looking back over the thirty years of firing under discussion we find that the ranges have been consistently increased, and where in 1900 the limiting range for all practices was set at 3000 yards a 14-inch gun practice was fired during the present fiscal year at a range of 41,000 yards. On the other hand while there has been quite a variety of targets used during the period we now use a hypothetical rectangular parallelopiped to represent broadside and end-on targets just as we did in 1898. The same simple method of determining hits from a table has again come into use replacing the more complicated graphical method which was in vogue for many years.

Early in this period we find the instructions for target practice published by the War Department growing more detailed regarding trial shots. In view of our present instructions regarding trial shots it is interesting to note that at one time regulations prescribed that trial shots be fired at least twenty-four hours prior to the opening of a record practice. Prior to 1925 we find little reference to the use of spotting during record fire and the resulting adjustment corrections to be ordered. On the contrary the provisions of certain of the regulations practically prohibited the adjustment of fire based on the observation of record shots. In these regulations the contention was held that trial shots having been fired in a careful manner it would be erroneous to make further corrections based on observations the accuracy of which would be questionable. Our present regulations encourage the development of efficient observation of fire and the adjustment of fire based on these observations when the principles of gunnery warrant such adjustment.

It is evident that the question of eliminating excessive dispersion had been given much consideration and in 1913 we find the following provisions concerning ramming:

> "The shot truck carrying the projectile will be brought up to the face of the breech and the projectile pushed carefully off the truck until the base of the projectile is just inside the powder chamber. The truck will then be withdrawn and run off to one side. The projectile will then be rammed home."

In the case of mortars, where the travel of the projectile is so short, this provision resulted in mortar projectiles not being seated properly and they occasionally dropped back on the powder charges when the mortars were elevated. In the following year the preceding requirement was rescinded as far as mortars were concerned. This too was a great period for powder blending. All powder, whether of the same or different lots, was blended in the most careful manner and then having been put up in charges was placed upon wooden trays and not handled until actually pushed into the powder chamber, the wooden trays being carefully carried up to the breech of the piece to ensure that the charges were in no way molested. The Ordnance Department now believes that unless different lots of powder are used, blending will have a tendency to increase dispersion rather than reduce it, this because the remade powder charges will probably lack uniformity in conformation and possibly in weight.

Today there are artillerymen, not all of whom come from Missouri, who advocate the return to a material target. Others advance the claim that our firings are being conducted at ranges which are excessive, a practice which they insist will inculcate false tactical ideas in the minds of our commissioned personnel. There are a greater number who firmly believe that adjustment from observation of fire can never be accomplished effectively in battle, and should be wholly eliminated or at least discouraged. But there is no feature of our present target practice instructions which is submitted to such persistent criticism and for which so many recommendations for improvement are received as the scoring formula.

The score of the battery in 1898 was determined as follows: the total number of broadside and end-on hits was divided by two; the number of hits thus arrived at compared with the number of rounds fired gave a percentage of hits by means of which the comparative effect of the firings of different batteries was determined. No mention of dispersion and no reference to the location of the center of impact of the shots fired are found. In other words the hit was the thing and all other elements were disregarded.

By 1903 the advocates of speed have begun to make their influence felt. To quote from General Orders No. 100 of that year:

> "Accuracy must not be sacrificed in an attempt at great speed, but every effort, particularly at short range, will be made to secure both speed

and accuracy, and the relative efficiency of companies will be determined accordingly.

"* * * Deductions of time during the firing of a series will be allowed only for obscuration of target, the interference of vessels, interruption of communication, delays due to breaking of material."

In addition we find that any shot resulting in a hit but fired after the expiration of the time limit will not be considered as a hit or a round fired.

In 1905 the score is determined by multiplying the number of hits in a practice by a time factor $\frac{T-t}{T}$ in which T is the prescribed time for the series and t the time consumed in excess of the prescribed time. As an indication of the speed expected at that time it is interesting to note that the K factor which is the time per round for the 12-inch D.C. was 60 seconds, while the same factor today is 45 seconds.

By 1907 we begin to find probability playing a part in the scort and a figure of merit is prescribed which is given by the formula $F = \frac{10 \times H}{P}$

H is hits per gun per minute

P is the probability of hitting

The same probability table is used for all guns, the probability factor varying only with the range.

Not until 1914 do we find adjustment and dispersion entering into the score. In this year the figure of merit has become quite complicated and for guns is given by the following formula—

$$M = \frac{C \times H^2}{P g t n \sin B} + \frac{2500}{D + E}$$

In the above formula for the figure of merit—

C=constant for particular mount and caliber.

D=distance (in yards) center of impact from target.

E=mean error (in yards) developed.

H=the total number of hits for the series.

B=mean angle in degrees of track of target with line of direction.

n=number of shots fired.

The regulations state that the second term of this second member is introduced for the purpose of allowing credit to those companies which make a low score of hits on the hypothetical target, but which group their shots well about the center of impact and place this center near the target. Credit is given for this, inasmuch as good grouping of shots, apart from the number of hits made, is in itself indicative of good company teamwork. The first term, or hitting factor, was limited to the value 75; the second term to 25.

The next year this figure of merit became—

$$M = \frac{CH}{P \sin B + \frac{gt}{100}} + \frac{500}{E}$$

with the second term limited to a value of 10 and no limit placed on the hitting factor.

Thus we see that from 1898 to the opening of the World War the regulations covering seacoast artillery target practices had grown more detailed in their nature and the tendency had been to develop a score which would afford an efficient means of rating the firing batteries. This score had developed in that time from a very simple one based only on the ratio of the number of hits made to the number of shots fired, to a figure of merit into which entered the elements of time, dispersion, and adjustment, in addition to the hitting factor.

In 1920 a great move toward decentralization developed. The instructions for target practice for that year are contained in War Department Document 1007. This publication is extremely general in its nature, the provisions for practices being left almost entirely to Coast Artillery District and Brigade Commanders, who were instructed to exercise fully their initiative in prescribing the methods of holding target practice. At that time no hypothetical targets were prescribed and deviations were merely measured with regard to a pyramidal target. No score was required and with no prescribed target the number of hits made in any practice was not called for in reports.

The comments on target practice contained in Coast Artillery Memorandum No. 2, May 14, 1921, would seem to indicate that the results of such a system were not highly satisfactory. It became common for firings to be conducted in such a deliberate manner that they extended over periods of days. The standard fire control installations of certain batteries remained idle while base lines determined by captive balloons were employed in their place.

The following quotations from Coast Artillery Memorandum No. 4, is of interest:

> "The areas from which . . . might have been bombarded, successfully, could be determined more readily and more accurately by the study of charts; in fact, it is not understood in what manner the firing of ammunition would assist in the solution of the problem. The fact that no position finding service adequately covers an area can be determined by the study of charts and by the tracking of vessels under various conditions. The purpose of target practice should be understood by all Coast Artillery officers. Target practice ammunition is not furnished for the purpose of conducting experiments but for the instruction of the personnel in the conduct of fire."

At this time the principle that hitting is entirely a matter of luck, and is a factor that should not enter into the determination of the relative efficiency of organization, is illustrated in the following extract from the same Memorandum:—

> "The results of practice were judged by the number of hits obtained on a hypothetical target. The number of hits is not a proper measure of the efficiency of an organization, too many hits are traceable to luck; it was for this reason that the 'figure of merit' was abandoned. It is not at all uncommon for a hit to be the direct result of per-

sonnel errors. The efficiency of an organization, in artillery fire, is judged by the personnel errors, the condition of the materiel, and by the skill of the battery commander in adjusting his fire."

In the fall of 1926, Coast Artillery Memorandum No. 7 was published. In this publication we find a decided trend toward a more detailed control of battery target practices by War Department regulations. The score for that year consisted of four components, namely: hitting, calibration, adjustment, and penalty components, with maximum values respectively, of 50, 10, 15, and 25. The following year the advocates of great speed made their power felt and the time factor of the hitting component for that year was prescribed as shown in the following formula:—

A Component:

$$A = \frac{KH}{Pgt} \times 20 + \frac{(KS)^2}{(gt)^2} \times 20$$

(Maximum values = first term = 20)

This factor made hitting, adjustment, and the total elimination of personnel errors play minor parts in the score as compared to the time element. With this in force it was possible to fire a practice in which no hits were made and one characterized by excessive dispersion and poor adjustment, and still attain a score calling for an "excellent" rating; this by firing at high speed.

In examining our present score we find that the hitting component has a normal value of 30, the adjustment and dispersion component 50, and the time component 20. By including a hitting term consideration has been given to the thought that the main object of firing is to make hits.

At the same time it is realized that a score based entirely on the number of hits made would do great injustice to a battery commander who had accomplished adjustment but had failed to secure hits because the law of chance had fallen down. With out limited ammunition allowances in the case of our large caliber batteries it is reasonable to assume that the law of chance will fall down in many practices. Therefore, in our present score, cognizance is taken of the fact that when a great number of rounds is fired the battery which keeps its center of impact on the target with small dispersion will attain hits; the factor that measures this feature of the target practice is given prime importance.

Accurate fire placed on the target at a high rate of speed is more effective than accurate fire placed more deliberately. For this reason a time factor has been included in our present score. It is to be noted that the time component of the score now prescribed is so designed as to penalize an organization which fires at a slower rate than that prescribed by regulations; it gives very little bonus where a greater speed is attained. Furthermore, the speeds prescribed for many calibers have been lowered considerably from those in force during past years. The normal value of the time factor is 20 and it can never be greatly increased over this. In fact, even were the time reduced to zero the time component would amount to but 30. Judging from target practice reports it would seem that many battery commanders have lost sight of the fact that speed plays such a small part in the present score. In many cases, where a high rate of unadjusted fire was maintained, had the fire been slowed up to permit adjustment, large increases in the mitting and adjustment factors would have been gained at the expense of but a small loss in the time factor.

It was not purposed that this article be controversial in any respect but when one considers the history of seacoast target practices it is believed that hitting, adjustment, dispersion, and rate of fire should all play parts in the score. One can not help but derive satisfaction from the knowledge that the evolution of gunnery regulations in our sister service has resulted in a method of scoring very similar to our own. For in our Navy we find hitting, dispersion, and time entering into the score with maximum values of 50, 40, and 10. And even the fact that the hitting factor outweighs dispersion does not seem to conflict with our own views when one considers that 84 rounds are fired in a single long range naval practice. Under such conditions hitting is far less a matter of luck than in the case of our own service where small ammunition allowances result in firing practices of a very limited number of record shots.

"AS long as ships carry guns and airplanes an efficient system of harbor defenses, supplemented by railway, mobile, and antiaircraft artillery, will be essential. There is nothing in the future to disturb any Coast Artilleryman. On the contrary we should look forward to the future with confidence and should devote our best efforts to the improvement of our arm and its technique."—*From the address of Major General John W. Gulick, Chief of Coast Artillery, at the Graduation Exercises, C.A.S., 1931.*

The Tactics of Bush Warfare

By Major Roger W. Peard, U. S. Marine Corps

PROBABLY the greatest shock received by any officer on his first tour of expeditionary duty in the West Indies, Central America, or other similar duty in any part of the world, where in time of peace he encounters actual guerilla warfare, is his apparent inability to apply directly to each situation those principles of war which have been so diligently instilled into him by the instructors of our various service schools and by study of historical precedents.

The very nature of the enemy's tactics drives us to somewhat similar methods. The enemy forces are usually guerilla or bandit groups, these groups consist of from twenty to seventy irregulars, and at best are indifferently armed. The enemy has no regular lines of communication and supply. The enemy has no permanent strongholds or other prepared bases of operations. As a result we can not hope to attack any fixed objective or use any carefully prepared plan of maneuver. Hence, for the offensive, we must adopt methods that are simewhat similar. When we take the offensive and put on the trail combat patrols of any size whatever, no one can foresee the moment when our avowed offensive may switch in an instant into the grimmest sort of a life and death defensive.

We have regular garrisoned towns, outposts, routes of supply and communication, etc., to protect and maintain, while the roving nature of the enemy forces, living off the country as they regularly do, permits them to concentrate their entire force, when and where they will, to attack or harass our garrisons, supply trains and patrols, as they may deem advisable; to start the action at the time and place most favorable for them and to break off contact whenever the fire fight becomes too heavy and they have inflicted the maximum of damage on our forces, and with little or no danger from any pursuit we may be able to launch, due to the almost impenetrable tropical forests, rough terrain and total lack of roads, other than foot paths.

The bandits' superior knowledge of the terrain, operating as they do in unmapped, outlying parts, sparsely populated, and with the sympathy and information system well perfected among friendly noncombatants, makes it indeed fortunate that we are able to compensate somewhat for our lack of numbers by our superior armament, training, morale, and education.

The trails and so-called roads in these outlying parts are indescribable; unless once seen and traversed, they are difficult to visualize, even if an adequate description were possible. They are impassable except for foot troops, mounted infantry, pack animals, and bullcarts, and the latter can only negotiate those roads shown on the unreliable native maps as "improved." Practically all troop movements must be made in single file.

It is very evident to interested observers over a period of years, that these formerly ignorant and untrained bandit forces are steadily improving, both as to armament and training. Their morale is an ever varying item to be carefully estimated from each special situation as it arises.

All troops operating in the rainy season, as well as troop convoys for supply trains etc., are mounted on native animals whenever mounts are available. Dry season operations include more foot troops, but even then, the men's blanket rolls are carried on pack animals, the soldier carrying only his arms and fighting equipment.

In our most recent operations in Nicaragua from 1927 to date, we find ourselves often encountering leaders of considerable military training and experience, whose troops are well armed with up-to-date rifles and ammunition, machine guns, Thompson submachine guns, and bombs and whose campaign is not restricted by any rules of civilized warfare, while our actions are always subject to the closest scrutiny of ambitious publicity seekers and over-zealous pacificists in the United States, which requires our campaign to follow strictly the recognized rules of land warfare, to the protection of which these unscrupulous guerillas have no shadow of a legal right.

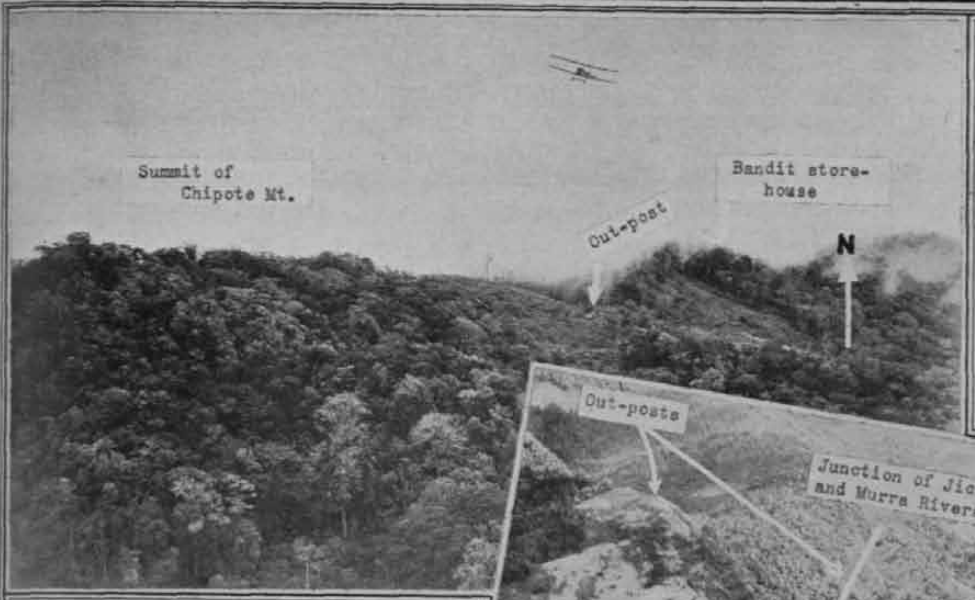
As the last Nicaraguan campaign has furnished the most extensive operations of bush warfare in recent years and has been conducted under the most adverse conditions of climate and terrain, a more detailed account of these operations may be of interest.

Occupation and Defense of Towns with the Primary Mission of Denying Such Towns to the Bandits

This form of occupation became necessary in Nicaragua in the summer and fall of 1927, for the reason that our available troops were insufficient to completely occupy the entire country, but the protection of the citizens of Nicaragua, foreigners and established business, in the various cities and towns, was essential. Furthermore, our forces had not yet been committed to a definite offensive, and the newly formed constabulary had not yet reached a sufficient size to take over operations of any magnitude. Our delay in taking up a definite offensive was largely based on the continuing effort of all concerned to induce all possible bandits to accept immunity and lay down their arms. This effort was pursued diligently for some time after the expiration of the time limit for disarmament as set by the Stimson-Moncada Agreement.

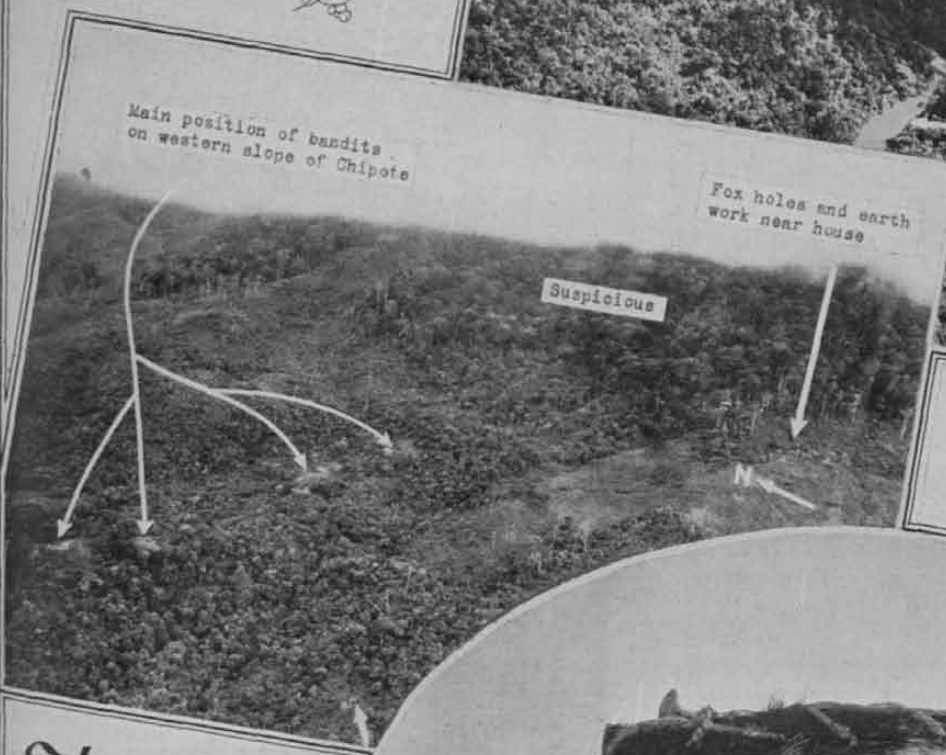
As the bandit operations in 1927 were confined almost entirely to the Northern Area, it was unavoidable that some sort of protection be given the law-abiding

[1]These minor warfare tactics are the author's opinions and are based on expeditionary duty during the last fifteen years. The author is an instructor in these tactics at the Marine Corps Schools.

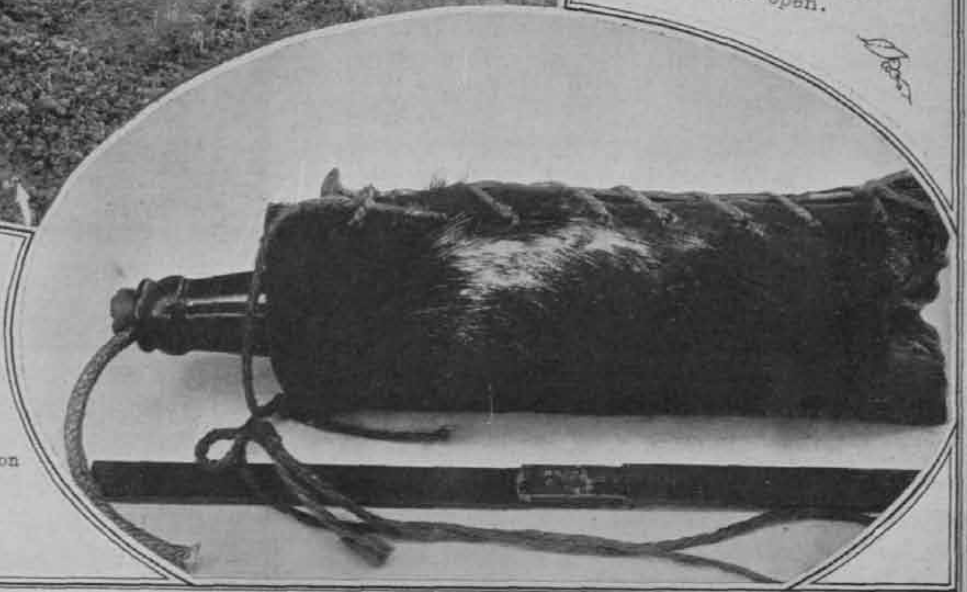


Summit of Chipote Mountain. Bandit positions entirely hidden by woods, disclosed by hostile fire.

Valley of the Jicaro and Murra Rivers, looking north from Quilali. Chipote on the right, Sapatillal Ridge on the left.



Western slope of Chipote Mountain. Terrain is seldom found so open.



Homemade bandit dynamite bomb, loaded with broken glass, nails, and metal slugs.

Note how clouds rest on mountain tops, usual condition making aerial photography difficult.

citizens of this area and their commercial interests. Thus the original occupation of Ocotal, Jicaro, Somoto, Pueblo Nuevo, San Fernando, and Telpaneca, was accomplished by small detachments of marines and native troops, which were insufficient to control the surrounding country or rid it of bandits. Prior to Sandino's concentrated attack on Ocotal in July of 1927, and as late as November of 1927, this policy remained in effect. Every effort was made to rid the country of armed irregulars without bloodshed, for humanitarian reasons as well as military necessity, since our forces were insufficient in number for a complete occupation of the area. We were greatly overextended and without adequate lines of communication.

Machine gun emplacement, with protected sniper's post above. Norvil Barracks, Somoto, Nicaragua.

At this time all supplies not obtainable locally, had to be hauled from Managua to Esteli by bull-carts, a distance of about eighty-five miles, and thence north to all other posts by pack animals. In some cases the pack animal route was over one hundred miles from Esteli.

At this time the Marine Air Force consisted of only five old wartime DH two-passenger planes. When they had completed their regular hazardous missions of communication, combat and photography, they had little time or ability to help out in the supply situation.

In all towns occupied in the Northern Area of Nicaragua, bullet proof adobe buildings had to be procured as barracks. Tents were unsatisfactory in the rainy season; their procurement by bull-carts would have taken up valuable cargo space, which was already inadequate for supply purposes, and quartering troops in tents would have invited sniping and night attacks. In some instances, inactive Catholic churches had to be utilized as barracks.

Every member of these garrisons was assigned a definite battle station and a sector of fire; men were thus trained until battle stations could be occupied in utter darkness in a very few seconds. Their training along these lines was largely responsible, in my opinion, for the successful defense of Telpaneca, to be discussed in detail later.

This period ended about November 1, 1927, at which time a definite offensive mission was assigned to all troops in the Northern Area.

Surprise Attacks by Bandits on Garrisoned Towns

There were two outstanding examples of this class of warfare in Nicaragua that deserve detailed accounts.

Attack on Ocotal: At 1:00 A.M., on July 17, 1927, the bandit forces combined under Sandino and attacked Ocotal with a force of about six hundred men. Sandino issued a written attack order definitely assigning the duties of each group. These groups consisted roughly of about seventy-five men each and had separate leaders. An original copy of this order later fell into the hands of the marines.

The defending troops at Ocotal consisted of thirty-five enlisted marines with two commissioned officers, and forty native soldiers of the Guardia Nacional with two American officers. The marines had one Browning machine gun and two Browning automatic rifles, but no Thompson machine gun, no rifle grenades, no hand grenades of any kind, and no trench mortars or 37-mm. guns. The guardia garrison had one Lewis machine gun and nothing else but their Krag rifles. The ammunition supply of all troops was inadequate for a prolonged siege.

Sketch No. 2.

Garrisoned towns (1927-1928) of the Northern (bandit) area of Nicaragua, showing trails connecting these garrisons, and route of supply overland from Managua.

Both garrisons, marine and guardia, kept up an intense defensive fire until daylight but were unable to sally forth in the dark and close with the attackers, as their numbers were only sufficient to protect their

barracks buildings, the attacking force so greatly outnumbered them.

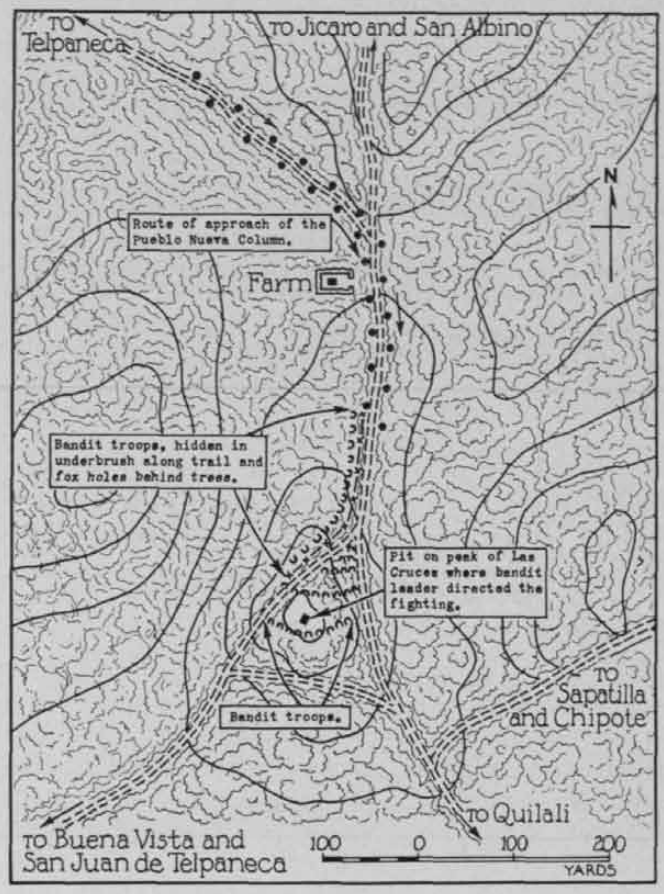
At daylight, the attackers occupied protected sniping posts completely surrounding both barracks buildings and had one machine gun in the belfry of the Catholic church about seventy-five yards from the marine barracks. Their plan was to hold the garrisons in their quarters until night and then renew the attack, as the attackers had a healthy respect for our marksmanship and made no pretense of an open daylight attack. Their well-chosen and protected sniping posts and their superior numbers made it suicide for the garrisons to attempt a daylight counterattack.

Either by chance or careful planning, the bandit attack occurred on Sunday, the only day of the week that regular airplane trips from Managua to Ocotal were not scheduled. Purely by chance, two planes on a photographic mission were sent to Ocotal on the morning of July 17th and immediately returned to Managua with news of the siege. About 3.30 P.M., five combat planes reached Ocotal with a capacity load of bombs and machine guns. Their targets were like a moving picture scenario; most of the bandits had withdrawn to the edge of town to hold a consultation concerning the operations for the coming night and were bunched, several hundred of them, in a deep high-walled river bed. The planes were able to drop all their bombs before the attackers could leave this ravine; then the planes chased them over the country trails, ground strafing the bandits until all machine gun ammunition had been expended. The airplane casualties were estimated at two hundred bandits and completely broke up the siege.

Shortage of ammunition, lack of auxiliary weapons, and the overwhelming numbers of the attackers would have placed the defending troops in a very bad situation the second night, had these planes not arrived as they did.

However, contrary to the general belief and to published arictles on this subject, the battle of Ocotal was the only action in Nicaragua in which airplanes were the deciding factor or even essential from a purely combat standpoint. The bandits had learned their lesson, and future attacks on towns and the ambushing of patrols on the trail, etc., were always commenced and broken off before the planes could reach the fighting.

Attack on Telpaneca: It is interesting to note the facts leading up to this attack. After the battle of Ocotal, Salgado, one of Sandino's leading sub-chiefs, split with Sandino and withdrew to Somoto with about seventy-five men. This was before Somoto had been occupied by our troops. Salgado was disgruntled because Sandino had called him by the title of "Colonel" in his attack order for the Ocotal battle, instead of "General"; however, upon leaving Sandino, Salgado stated he would not fight for a general who could not win battles. After the marines occupied Somoto, that area became too hot for Salgado; he had lost several men killed and wounded, and there had been considerable desertion from his ranks until his force did not number more than about thirty. Salgado was a typical negroid-indian type, untrained in modern warfare but cunning and experienced in bush warfare. Those who knew him personally said he could be recognized anywhere, as he was an exact counterpart of the Indian head on our American five-cent piece.



Sketch No. 3.

NOTE: The top of Las Cruces Mountain was sparsely weeded. Large pine trees had fox holes dug behind them that afforded an excellent field of fire along the trail from the north.

Bandit positions on west of trail behind barbed wire fence, were in a drainage ditch about three feet deep and ditch was not visible from the trail on account of heavy brush.

Bandits were finally driven off by well directed machine gun and trench mortar fire from farm yard surrounded by a low rock wall, about three hundred yards north of the peak of Las Cruces.

We later learned from native sources that, when Salgado rejoined Sandino, he asked Sandino for a chance to show him how a successful attack on a town should be made.

At 1:00 A.M., on October 19, 1927, a bandit force of three hundred men under Salgado, attacked the marine and guardia garrison at Telpaneca, which consisted of twenty enlisted marines and twenty-five enlisted guardias, with only one marine officer present, commanding both detachments. It will be noted that 1:00 A.M. was also the exact hour the attack on Ocotal commenced. The hour chosen for these attacks was sufficiently late in the night to permit the garrison to get well settled for the night and early enough to permit the attackers to have several hours of darkness in which to carry on the attack before daylight. Whereas the Ocotal attack was launched in bright

moonlight, Salgado chose a very dark and foggy night for the Telpaneca attack. Partly on account of this darkness and fog, the attackers were at the doors and windows of the barracks buildings and the officers' quarters, pouring in an automatic fire, when first discovered. On the night of this attack, the officer in charge had taken special precautions and had posted two sentries on each post, but the bandits completely eluded these double sentry posts and launched the attack as a complete surprise. Had the bandits withheld all fire, entered the buildings and attacked with machetes only, I believe their chances of success would have been much better. In this connection, the advisability of double sentry posts is well worth considering. While the assignment of two men to each post under conditions of severe nervous strain does alleviate this strain on the sentries, I believe that it also decreases their alertness; they are too prone to be careless and while away in conversation the time that should be employed in strict observation; it would appear preferable to double the number of posts and decrease their size accordingly, thus assuring increased alertness over a smaller post for which each sentry is entirely responsible.

Within an incredibly short time and in utter darkness, all men of the garrison were at their battle stations; the one machine gun, from a well-protected emplacement, was delivering a steady traversing fire over a prearranged and maximum field of fire. The garrison was well supplied with hand grenades and automatic weapons, and, after the bandits' failure to capitalize to the utmost their surprise attack, their efforts became steadily less effective and more costly, until daylight forced them to withdraw about 4:30 A.M. Except in carefully prepared ambushes along the trails where ample cover was available and practically no clear targets were presented to the ambushed, the bandits never showed an inclination to fight in daylight against the superior marksmanship of the marines and the well-trained native troops.

During this Telpaneca attack, the bandits made a concerted and well planned effort to induce the native troops to mutiny, by offering immunity, money for their arms, good positions in the bandit army, and by using a continuous stream of well thought out propaganda against the Americans. Their efforts along this line proved a complete failure. It is believed that the loyalty of native troops generally is directly dependent on their liking for and confidence in their officers. In this case, the one officer present was a first lieutenant in the Marine Corps who held a commission as a captain in the guardia and was extremely popular and efficient.

The attack on Telpaneca was the second and last attempt by Sandino's forces to attack garrisoned towns. His second failure with severe losses taught him a lesson, and thereafter his entire campaign concentrated on ambushing patrols on roads and trails.

An amusing incident of this Telpaneca attack occurred about a half hour before daylight; the guardia soldier in charge of the corral and pasture slipped out in fatigue clothing without informing anyone as to his intentions, his interest in his mules entirely obscuring or overcoming the personal danger involved. He secured nine of his best mules from a nearby pasture; drove them nine miles on foot to a friendly farmer; hid the mules and continued on foot the balance of the forty-five miles to the nearest post, to bring in the first information of this attack, six hours before this information was received from any other source. His exploit permitted a relief column to be formed and well on the way before the airplanes or telegraph brought word of this attack. Telpaneca had no radio, telegraph, or telephone communication, and was entirely dependent on mounted patrols and airplanes for its communications.

After the attack on Ocotal and Telpaneca both, rumors were received from apparently reliable native sources that a second attack would be forthcoming, but such never materialized.

Surprise Attacks on Bandit Camps

Our first successful attack of this nature in Nicaragua occurred in the first part of October, 1927, when a patrol of twenty-five marines from Somoto, after traveling all night in a rainstorm, attacked a bandit group under Santos Lobo, at Mal Paso killing seven bandits and capturing a large number of rifles, animals, stores, etc.

For this kind of attack, reliable native information is essential. Due to the large number of bandit sympathizers among the non-combatant civilian population and fear of reprisals among the few friendly natives, reliable information was extremely difficult to obtain. As the number of our troops increased and the bandit operations grew less successful, this avenue of information improved, until several posts had on their payrolls from two to four native intelligence agents, who were able regularly to penetrate the bandit camps and return with definite information as to the location of the bandits. The difficulty of attacking bandit camps was increased because they were constantly being moved; the bandits scarcely ever camped for more than two nights in the same place, and such information has to be fresh to be of any use.

It was found necessary for our troops to always travel at night and only for such distances as could be traversed before daylight, if a surprise attack was contemplated. Any daylight travel was immediately known to the bandits; their spies were numerous, and even our preparations for the night travel had to be delayed until the native inhabitants of the garrison town had retired for the night. The garrisons at Pataste and Telpaneca were particularly successful in such operations, their native intelligence service being excellent and their officers energetic.

This warfare was particularly effective on the morale of the bandits, as these bandit groups after an attack lost more men by desertion than they had by casualties in the attack itself. In these surprise attacks, we never had a casualty; even when their force was far superior, the bandits' one thought was to get away safely, when taken by surprise. They seldom waited to ascertain the size of the attacking force.

The morale of the enlisted men in the posts, where these successful operations were numerous, mounted with each success until the men complained to their officers if many nights passed without a patrol to make, and this in spite of the inclement weather and strenuous marches involved.

In the fall of 1927, Sandino divided into districts all territory not occupied by marines and guardia. He gave definite boundaries for these districts and placed a certain sub-chief with a group of men in charge of each district, with orders not to leave their districts without his permission. These district chiefs, in addition to their combat missions, forwarded supplies to the larger bandit groups. A district chief named Polanco had the district immediately east of Telpaneca, around Pericon. His district was only about twenty miles square. Patrols from Telpaneca, with an excellent native intelligence service, hit his camps at daybreak three times in ten days, killing several of his men each time and capturing most of his equipment and supplies. He was afraid to leave his district, as this would have incurred the displeasure of Sandino, and he felt certain his movements were being accurately reported to the marines. When his force of thirty-five had finally been reduced to twelve, he gave up and left.

One post had a cur dog that went out with all patrols. He preceded the patrol; never barked or made a sound, but if he spotted a man, horse, or anything unusual, he made a perfect point like a well trained bird dog and held the point until the leading element arrived. One morning just before dawn as a patrol was approaching a bandit camp for a surprise attack, this dog pointed a sleeping bandit sentry who was concealed in the brush beside the road and would undoubtedly have awakened and given the alarm when the patrol passed, if the dog had not spotted him and prepared the way for his quiet capture. At night when no patrols were out, this dog walked post with the various sentries. Anyone trying to take this dog with him when transferred to another post would have started a riot or mutiny.

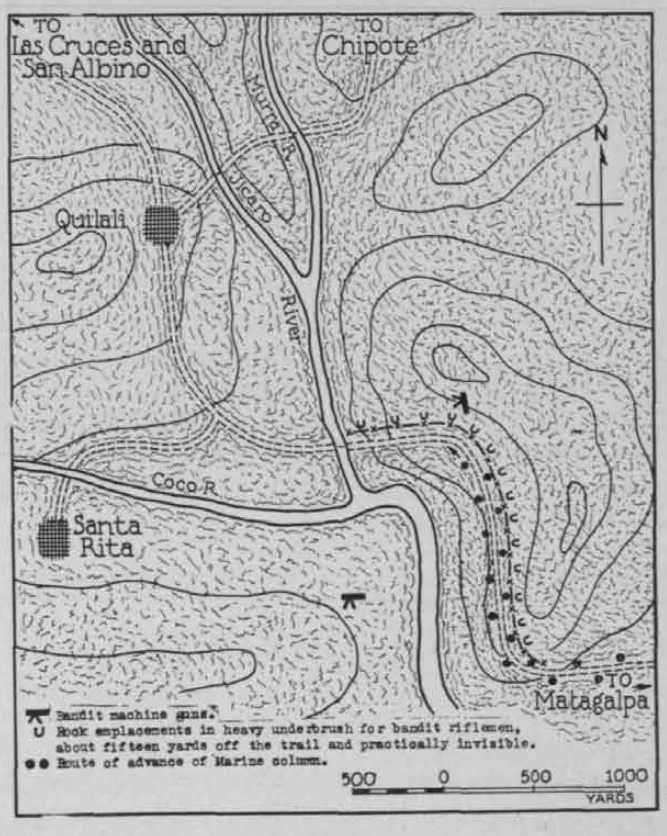
This district plan of Sandino's remained in effect until about January, 1928, when the arrival of an additional regiment of marines in the northern area made it impracticable. He then withdrew most of his troops to the unoccupied eastern part of Nueva Segovia and operated them in larger groups, with headquarters on Chipote Mountain and Sapotillal Ridge.

Offensive Operations Against Known Bandit Strongholds

Our occupation of Chipote Mountain and the destruction of all bandit works thereon in February of 1928 is the best illustration of this class of warfare encountered in Nicaragua.

A column of about one hundred and eighty marines and guardia cleared Matagalpa on December 19, 1927, with three hundred loaded pack animals, and was to make a junction at Quilali with another column of forty marines and twenty guardia from Pueblo Nuevo. Quilali was an unoccupied village within about fifteen miles of Chipote and was to be used as a base of operations against Chipote. This combined force of 240 men and officers was considered sufficient to garrison the village of Quilali, keep themselves supplied by pack train from Telpaneca, and form an offensive force to capture Chipote, with airplane support from Managua via Ocotal. The bandits ambushed the Pueblo Nuevo column at Las Cruces, when, after three days of travel, they were within two hours' march of Quilali. One officer was killed and one severely wounded, leaving a sergeant in command.

In such operations, where the trails traversed force the entire patrol to proceed in single file, through heavily wooded, mountainous and winding trails, the importance of protective fire (reconnaissance by fire) by automatic weapons ahead and to the flanks of the advance guard cannot be stressed too strongly, whenever a possible ambush locality is reached. The results never vary; if the ambush actually exists, the



Sketch No. 4.

bandits always think their position has been disclosed and return our fire. If this reconnaissance fire has been properly managed, the ensuing fire fight is always at ranges entirely to our advantage. On long patrols or any kind of a daylight move where a bandit ambush is possible in Nicaragua, the bandits knew our every move and thus the laying down of this reconnaissance fire did not force us to forego the element of surprise, as such did not exist. The main drawback of this plan is the expenditure of ammunition involved. Reserve ammunition must be taken on pack animals and its expenditure closely supervised by an efficient advance guard commander. On such operations you

have only one decision to make; will you expend ammunition or men?

Another unusual factor of operations conducted in single file is that the best results can be obtained by marching the elements of your command without distance. On these winding, hilly, wooded trails, only a

Ocotal.

few of your men can come under enemy fire at any one time and place, and, if your elements are marched with normal distances, one part of your command can very easily and unknowingly reach a position out of supporting distance of the other elements.

A great deal of the terrain in Nicaragua would not permit the sending out of security groups on the flanks, etc. In many cases where this manner of flank protection was possible, it was impracticable on account of the delay involved, as it was usually imperative to reach a certain camp site where water and forage were obtainable before dark.

It is difficult to get away from the large war idea. In these "small time" peace wars, the successful operations are those in which the enemy suffers severe casualties but our side has none. Even one severely wounded man becomes an inconceivable burden to an operating patrol; he has to be taken along on a hand carried litter for the balance of the operation, or the entire patrol must abandon its present duty and convey him to the nearest post. Few patrols can spare sufficient men to safely conduct the wounded into camp and still carry on their mission without delay. The patrol has probably been cut to the minimum for the mission assigned at the outset, as the garrison left behind where the patrol was formed must always remain sufficiently large to successfully defend itself against a concentrated attack of the entire bandit force.

This ambush of the Pueblo Nuevo column occurred about 3:00 P.M. on December 30, 1927. Due to the number of wounded and the size of the attacking bandit force, the column was forced to take up a defensive position on Las Cruces until a relief column could reach them. No troops could reach them in less than two days, except the Matagalpa column which was due to arrive in Quilali late on December 31st.

After struggling through the mud and mountain trails for twelve days, this large Matagalpa column arrived across the Jicaro river about one and one-half miles from Quilali without having seen a single bandit. Their objective was clearly visible on a small plateau almost within shouting distance. Quilali appeared to be deserted.

At this psychological moment, as the head of the advance guard made a sharp turn in the ridge trail bordering the Jicaro River, an alert marine saw a hat protruding from behind a tree to his left front and within twenty feet of the trail. He gave the alarm, and the bandits opened fire on the advance guard with one machine gun firing point blank down the marine column and another machine gun swept their flank from across the river. After a twenty minute fire fight the bandits were routed, but the marines and guardia had five dead and fourteen wounded. They proceeded to Quilali with their dead and wounded and made camp. The next morning an airplane dropped them a message as to the plight of the Pueblo Nuevo column and a relief patrol from Quilali was sent to their assistance. Late the same night all troops of these two columns were back in Quilali.

Two guardia officers had been killed; the commanding officer of each column severely wounded and several other officers slightly wounded; three enlisted marines and one guardia enlisted man killed; fourteen wounded enlisted men; seventy-five loaded pack animals were missing from the Matagalpa column and a few from the Pueblo Nuevo column.

Brigade Headquarters in Managua now altered the plan for this Chipote operation. Quilali was evacuated and all officers, men, and animals moved to the San Albino Mines. San Albino was now designated as the base for operations of a special combat battalion of marines plus one guardia company. Fresh troops arrived in San Albino from Ocotal to fill up this battalion, and a new commanding officer arrived. Then, operations against Chipote began in earnest.

The guardia company was used for special independent missions, reconnaissance, and scouts. Two marine rifle companies were assigned offensive missions only and were to operate in two columns. One company was assigned the task of keeping up the route of supply, communication, etc., between the operating forces and San Albino. The machine gun and howitzer company was split up and attached to the offensive operations as the situation demanded.

From San Albino to Chipote was only about ten miles, but two large mountains had to be crossed; the trails were the worst sort of foot-paths, muddy, winding, bordered by woods, and through an area that no marines had yet traveled and for which there were no accurate maps. A few native guides were available but their reliability was unknown, and they performed their duties with great reluctance due to the danger involved.

Troops operating towards Chipote moved slowly with all rations, spare ammunition, guns, etc., on pack animals. Outposts over half way to Chipote had been established and stocked with reserve rations before the final drive into Chipote proper was launched.

Prior to our reaching Chipote, the air forces had laid down a half hour bombardment with all the bombs and machine gun ammunition they could carry at one trip. This plane bombardment either drove the bandits off Chipote entirely, or they had voluntarily withdrawn before our arrival, as the occupation of Chipote by our troops was almost without incident, only a few old men and boys having been left behind by Sandino to slightly harass our advance and make us believe Chipote was still occupied. The capture of Chipote was only important in that it existed in the public mind as an impregnable stronghold, this belief having been engendered by Sandino's many boasts in Central American periodicals that no force of American Marines could ever capture or drive him out of Chipote. If made seriously, Sandino's only possible hope of justification therefor lay in the fact that the difficulties to be surmounted in reaching Chipote would make an operation against it impracticable. We later learned that this vain boast lost him many followers after Chipote fell. Nothing of any importance was found on Chipote and after rendering it impracticable for further bandit occupancy by carrying away or destroying everything of value left behind by the bandits, we abandoned it.

Defensive and Offensive Battles on Roads and Trails

From January, 1928, to the present date, all contacts of any importance between the government forces of Nicaragua and the bandits, or between marines and bandits, fall under this heading.

While the general principle that no commander of troops in the field should ever be taken by surprise is our present day doctrine, the difficulties encountered

Telpanca.

in Nicaraguan trails, the nature of the terrain, climatic conditions, the bandits' superior knowledge of the country, tropical wear and tear on the physical condition of the operating personnel by insects, climate and illness, caused many patrol commanders to look upon this maxim as an ideal never quite attainable. It was seldom that the normal security measures of recognized tactics were possible; even columns operating with a perpetual airplane reconnaissance were never free of the ambush danger, as well concealed ambushes were often equally invisible from the air and from the trail.

The doctrine of maintaining contact with the enemy once such contact has been gained amounts only to a play on words and has no practical application in bush warfare. In bandit fighting in the hills or outlying parts, when contact with the enemy has once been gained, our only procedure was to concentrate the maximum fire on the bandit position and inflict the greatest possible loss in the short time at our disposal before they retired through the gullies and underbrush.

Pursuit as we understand the term was unknown. In most cases a really well managed pursuit would have produced little or no results, as after a contact the bandits scattered in all directions to re-assemble at a prearranged place hours later. To attempt a pursuit often would have required the pack train to be left with an insufficient guard and our pack train loads were most precious to the bandits, as well as containing our entire means of subsistence in the field. To send part of our forces through unknown hills and woods in an attempted pursuit would have courted disaster in many ways; men lost; a possible shooting up of our own troops in the confusion, and a costly and profitless delay in reaching a safe camp site for the night.

In Nicaragua our patrols marched through knee deep mud, rocky mountain trails, sweltering in the valleys, almost freezing on the mountain tops, beset by every class of insect placed on earth to torture man, and, when camp was reached, dead tired, the men could not sleep on account of the insect bites received during the day, which with very little encouragement became tropical ulcers. It was truly, "Marching all day and scratching all night." We often heard war time marines yearning for the trenches of France.

Camp Security for the Night

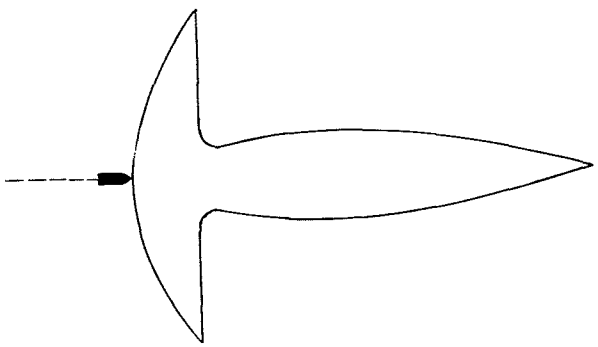
The orthodox camp security methods were adequate generally as to principle but varied slightly as to application. Sentries on the outskirts of a camp are useless if they walk their post in a military manner as they have been taught to do on regular guard duty. They should remain concealed at places giving them the best view of their sectors. The uneven wooded terrain permits a stealthy enemy to close with a sentry before he can give the alarm, if he walks his post openly. I am a strong believer in camp fires. They should be kept burning brightly all night when the command has bullet proof shelters in which to sleep. In Nicaragua patrols usually reached villages or ranches for the night camp. The camp fires increase the morale and cheer of the men immeasurably and, if properly located, furnish lighted avenues of approach through which an attacking enemy must penetrate and become excellent targets, before they can hope to close with the encamped force. The normal confusion resulting from a night attack, of which the attackers expect to take full advantage, is thus avoided.

Precision Methods *vs.* Improvisation in Antiaircraft Fire

By Captain Albert M. Jackson, Coast Artillery Corps

THE analysis of the firing of seacoast batteries has for a number of years been based on the photographic record of the impact of shots with reference to the target. Briefly stated, the deviations of the impacts from the target when stripped of personnel errors have furnished us with a measure of the capabilities of our seacoast armament with regard to the expectancy of hitting.

The same degree of precision is now being obtained by utilizing photographic methods in the analyses of firings of antiaircraft artillery. For each shrapnel burst claimed as a hit against a towed aerial target there can now be furnished, if considered desirable, photographic prints establishing the validity of the claim. To go a step further we can also state, as we do in our seacoast artillery analysis, whether a given shot would have been a hit or a miss had no personnel errors been made.



A cross-section of the pattern formed by the fragments of a bursting high explosive shell.

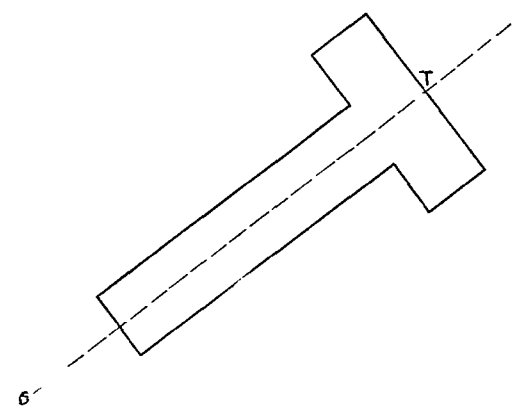


Figure 1.

The "Hypothetical Target," or conventionalization of the actual pattern of fragments. If the material target is at the point T and the line GT represents the direction to the firing battery, then any shots bursting within the boundary of the figure are "hits," that is, the material target would be included in the pattern of any shells bursting within this volume.

The old problem of the segregation of personnel errors from materiel errors, as it applies to antiaircraft firing, is becoming more and more susceptible of solution and one day we will be able to state definitely which is which.

With regard to a given weapon two questions might properly be asked, first what is the expectancy of hitting under various conditions and second, are the units equipped with this weapon in a state of training which will produce results consistent with the established expectancy?

Insofar as the 3 inch antiaircraft gun is concerned the first question has been satisfactorily answered by the series of tests conducted at Aberdeen Proving Ground during the past few years. It is not believed that the second question has been satisfactorily answered, due mostly to the non-uniformity of methods used in arriving at conclusions. All organizations have

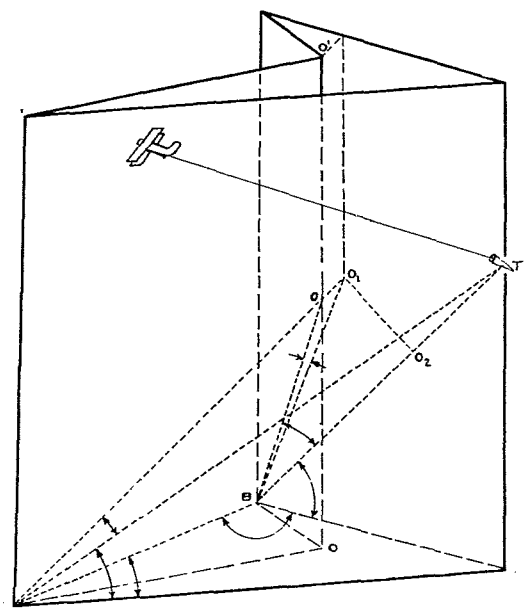


Figure 2.

The Space Diagram.

A battery is located at B and theodolites are located at B and F in the same horizontal plane, FBT." The target lies in the two intersecting vertical planes, BB'T'T" and FF'T'T." As it is seen along BT its position is T. A burst occurs in the two intersecting vertical planes BB'O'O" and FF'O'O" and along BO. Hence O represents the position of the burst. The two theodolites measure and record the angles indicated by the double-headed arrows. Then knowing the distance BF the values of OO_1, O_1O_2 and O_2T can be computed.

In the above diagram the shot burst to the right of the target a distance OO_1, above the line of position a distance O_1O_2 and short of the target a distance O_2T.

not been measured with the same yardstick, hence comparison of their efficiency is difficult if not impossible.

The hopelessness of arriving at a satisfactory solution to this complex problem by the Coast Artilleryman's usual recourse to home-made gadgets has been apparent for a number of years but during this time the development of suitable instruments has gone forward as rapidly as circumstances would permit. This development has led to the standardization of methods and materiel to accomplish this end and inasmuch as standard equipment will soon be issued to the service, it is considered timely to describe the instruments and the methods for interpreting the records obtained by their use.

The standard equipment authorized by Tables of Basic Allowances for issue to antiaircraft regiments in peace and on mobilization consists of the following items:

2 Recording Theodolites, with control boxes
1 Time Interval Device
1 Film Developing Outfit
1 Film Projection Outfit.

Before proceeding to a description of the equipment it might be desirable to state what may be accomplished

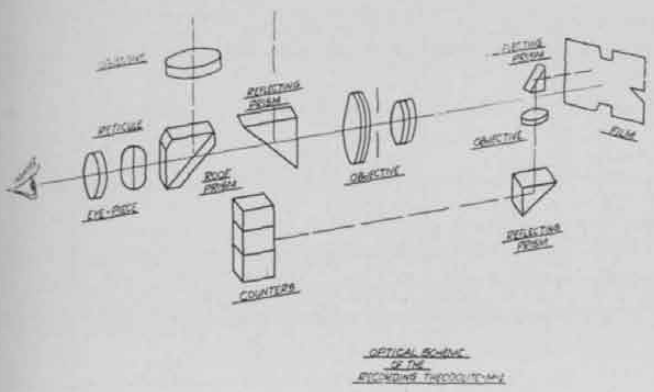


Figure 3.

by the use of this set. As far as its use with antiaircraft artillery is concerned it may be stated that the equipment furnishes the means of accomplishing the following:

The measurement of the angular deviations of a shell burst from an aerial target or from a point in space, by day or night.

The measurement of the angular velocities of an aerial target in horizontal and vertical planes, by day or night.

By the use of two synchronized theodolites the measurement of the linear displacement of a shell burst from an aerial target or from a point in space, by day or night.

By the use of two synchronized theodolites, the determination of the time-altitude relation of an aerial target, by day or night.

By the use of two theodolites the determination of the shape of trajectories of tracer ammunition fired from machine guns, automatic cannon, etc.

Perhaps it would not be out of order at this time to recall to mind just what are the elements of this problem. For a given type of ammunition we can determine its fragmentation pattern and this when conventionalized we will call the "hypothetical target". What we mean is that if we can place a burst within the vol-

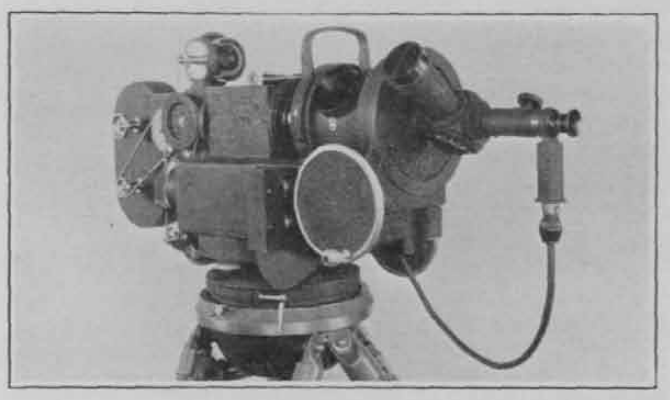


Figure 4. Sperry Recording Theodolite.

ume described by this hypothetical target we have obtained a "hit". In other words had an actual target been there it would have been included in the space occupied by the fragments of the bursting shell. Having thus arrived at the shape and dimensions of this hypothetical target we now have to determine for each shot fired whether it burst within the confines of the volume so described and to do this we have to measure the displacement of the point of burst from the actual target in three mutually perpendicular dimensions. A reference to Figure 2 at this time will clarify what follows. From this figure it will be seen that if we know the length of the base-line and the value of the seven angles indicated by the double-headed arrows we then have sufficient data with which to compute the values of the three required dimensions. The mechanism of this computation will be discussed later.

The operation of the theodolite may best be explained by Figure 3 which shows the arrangement of the optical elements of the instrument. All the optical elements have a common axis which is habitually held in

Figure 5. Sperry Recording Theodolite.

a horizontal plane. The principal elements are a telescopic sight, a reflecting prism and a photographic objective. A secondary optical system consists of several reflecting prisms and an objective.

Two pictures are obtained simultaneously in the the-

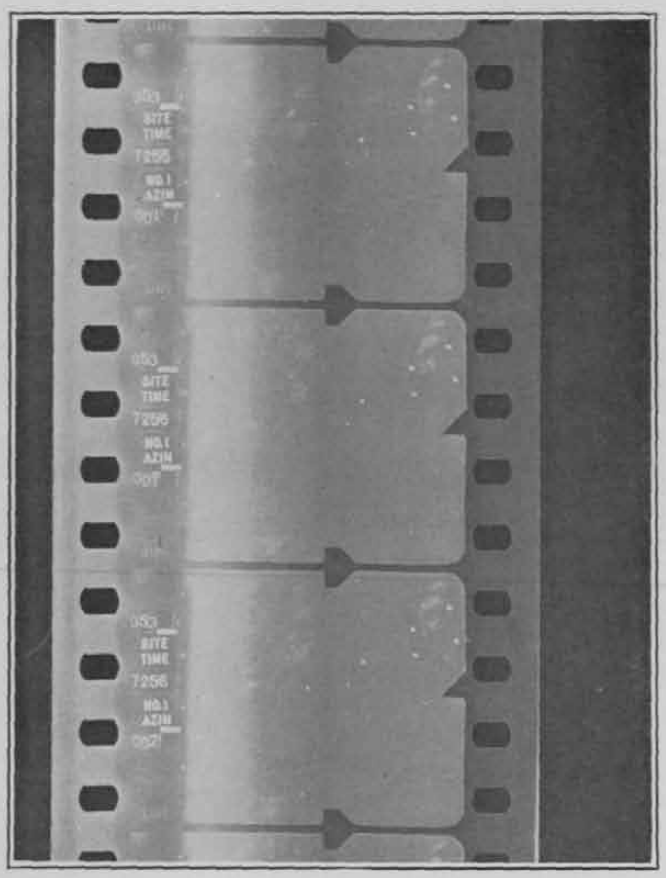


Figure 7.

odolite, one an image of the target and bursts and the other an image of three mechanical counters. Two of the counters record the setting of the instrument in azimuth and angular height and the third records the time of the particular event. The two pictures are adjacent and are recorded on standard width motion picture film at the rate of 10 to 20 exposures per second. When two theodolites are used simultaneously they are connected in series with a special time interval device which operates the time counters in each theodolite, this to synchronize the two films so that the two views of a given event may be paired. Each theodolite is manned by a detail of two men, only one of which needs training in directing the instrument on the target. It is contemplated that the Master Gunner of each regiment will be charged with the operation of this equipment. Figures 4 and 5 show the latest type of theodolite developed for this purpose.

To analyze a firing using this equipment the following operations are necessary:

Recording deviations from two stations using the theodolites.
Developing the films
Measuring deviations from the films
Comuptation of data required to complete the analysis in accordance with Training Regulations.

The two films contain all the basic data necessary to the complete analysis and no other records are required. On the contrary, it is possible to use the films as a basis for verifying the accuracy of the fire control instruments. The development of the films is accomplished by means of the equipment furnished, the only other requirement being the establishment of a dark-room. After the films are finished they are placed in a special projector and enlarged so as to facilitate the measurements. The data obtained from the two films are recorded on a form devised for the purpose.

An enlarged appearance of the film is shown in Figure 7. The shell bursts are clearly visible and the image of the towed target was clearly visible on the original

Target Practice Form No. .....

PHOTOGRAPHIC DEVIATION RECORD

Battery " ", Coast Artillery

Day Preliminary Place .....

Night Record Date .....

Burst No.	BATTERY						FLANK				Time	
	Azimuth	Ang. Ht.	Right	Left	Above	Below	Azimuth	Ang. Ht.	Over	Short		
1	924	415	0	0	6.5	.....	5681	439	.....	9	11	3
2	910	417	.....	3	4	.....	5680	435	.....	13	12	2
3	901	419	.....	1	5	.....	5679	432	.....	25	12	9
4	857	419	0	0	5	.....	5673	412	.....	42	16	2
5	820	417	6	.....	.....	3.5	5668	397	3	.....	18	8
6	797	417	4	.....	2	.....	5665	387	.....	3	20	3
7	782	418	0	0	0	0	5662	383	0	0	21	3
8	578	409	10	.....	.....	3	5646	339	.....	13	35	3

Azimuth Battery-Flank 1683 mils
Distance Battery-Flank 4500 yds.

..... In charge Photo Detail

FIG. 6

negative but due to the several operations necessary to reproduce the picture herein it is feared that the target image will have been lost.

In view of the precision now obtainable with this apparatus it would not seem to be asking too much to require that any method of interpreting these results be of comparable precision. The methods now described in Training Regulations do not take full advantage of this precision and in addition require the use of improvised plotting boards, charts, etc.

In order to provide sufficient precision and for the purpose of establishing uniformity of methods throughout the service, it is suggested that a method similar to the one herein described be adopted for all organizations equipped with the photographic recording device.

The suggested method consists of a work sheet in tabular form. Briefly, the operations for completing the work sheet are as follows. The arguments for the solution of each shot are those obtained from the Photographic Deviation Record. They are:

The azimuth of the target from the battery at the instant of burst.

The angular height of the target from the battery.

The lateral and vertical deviations of the burst from the target as they appear from the battery.

The azimuth of the target from the flank station at the instant of burst.

The angular height of the target from the flank station at the instant of burst.

The lateral deviation of the burst from the target as seen from the flank station.

The time of occurrence of the burst.

These values are entered in their proper columns on the work sheet. By means of simple arithmetic the horizontal triangles battery-target-flank and battery-burst-flank are solved. From this there is obtained the range deviation which when referred to the line of position becomes the absolute longitudinal deviation. Then from the observed lateral and vertical deviations, we compute the corresponding linear values and finally the absolute transverse deviation. By an inspection of the X and Y values for each shot we can tell which shots were hits within the meaning of our definition.

WORK SHEET FOR ANALYSIS OF T.P.A.A.(Guns)

(1)	(2) $B=A_T-A_B$	(3) $F=A_F-A_M$	(4) $T=3200-(B+F)$	(5) ε_B	(6) $\frac{l'_B}{\cos\varepsilon_B}$	(7) $B'=B\pm l'_B$	(8) ε_F	(9) $\frac{l'_F}{\cos\varepsilon_F}$	(10) $F'=F\pm l'_F$	(11) $B'+F'$	(12) $O=3200-(B'+F')$	(13) $R_B=\frac{BASE\sin F}{\sin T}$	(14) $R'_B=\frac{BASE\sin F'}{\sin O}$	(15) $Q=R'_B-R_B$	(16) $L=\frac{l'_B R'_B}{1000}$	(17) $D=\frac{R_B}{\cos\varepsilon_B}$	(18) $V=\frac{\nu D}{1000}$	(19) $X=\frac{Q}{\cos\varepsilon_B}$	(20) $Y=\sqrt{L^2+V^2}$	(21) $H=R_B\tan\varepsilon_B$	(22) $\Delta H=H_0-H$	(23) t		
	1683	5681	3200		0	759		- 9	798	759	3200	5600	5600	3918	0	3955	6.5	- 37	0	3955	1875	11	3	
1	924	4883	1557	415	.9181	0	439	.9085	- 10	788	1547	.7057	.6987	3955	3.918	.9181	4.308	.9181	784	.4315	1706			
												.9991	.9986						784					
	759	798	1643		0	759		- 10	788	1547	1653	3955	3918	- 37	0	4308	28	- 40	28	1706	169			
	1683	5680	3200		- 3	773		- 13	797	776	3200	5600	5600	3896	- 3	3950	4	- 54	144	3950		12	2	
2	910	4883	1570	417	.9173	3	435	.9101	- 14	783	1559	.7050	.6952	3950	3.896	.9173	4.306	.9173	289	.4339				
												.9995	.9991						433					
	773	797	1630		- 3	776		-14	783	1559	1641	3950	3896	- 54	-12	4306	17	- 60	20	1713				
	1683	5679	3200		- 1	782		-25	796	783	3200	5600	5600	3842	- 1	3945	5	-103	16	3945		12	9	
3	901	4883	1578	419	.9165	1	432	.9114	- 27	769	1552	.7043	.6852	3945	3.842	.9165	4.304	.9165	484	4362				
												.9997	.9988						500					
	782	796	1622		- 1	783		-27	769	1552	1648	3945	3842	-103	- 4	4304	22	-112	22	1720				
	1683	5673	3200		0	826		-42	790	826	3200	5600	5600	3736	0	3921	5	-185	0	3921		16	2	
4	857	4883	1616	419	.9165	0	412	.9193	- 46	744	1570	.7001	.6671	3921	3736	.9165	4.278	.9165	441	4362				
												.9998	.9995						441					
	826	790	1584		0	826		-46	744	1570	1630	3921	3736	-185	0	4278	21	-202	21	1710				
	1683	5668	3200		6	863		3	785	856	3200	5600	5600	3916	7	3905	-3.5	11	729	3905		18	8	
5	820	4883	1648	417	.9173	- 7	397	.9250	3	788	1644	.6966	.6987	3905	3.916	.9173	4.257	.9173	225	4339				
												.9988	.9990						954					
	863	785	1552		7	856		3	788	1644	1556	3905	3916	11	27	4257	-15	12	31	1694				
	1683	5665	3200		4	886		- 3	782	882	3200	5600	5600	3883	4	3898	2	-15	225	3898		20	3	
6	797	4883	1668	417	.9173	- 4	387	.9287	- 3	779	1661	.6945	.6923	3898	3.883	.9173	4.249	.9173	64	4339				Hit in plinth
												.9977	.9982						289					
	886	782	1532		4	882		- 3	779	1661	1539	3898	3883	-15	15	4249	8	- 16	17	1691				
	1683	5662	3200		0	901		0	779	901	3200	5600	5600	3889	0	3889	0	0	0	3889		21	3	
7	782	4883	1680	418	.9170	0	383	.9301	0	779	1680	.6923	.6923	3889	3.889	.9170	4.241	.9170	0	4350				Direct Hit
												.9969	.9969						0					on Target
	901	779	1520		0	901		0	779	1680	1520	3889	3889	0	0	4241	0	0	0	1691				
	1683	5646	3200		10	1106		-13	763	1094	3200	5600	5600	3866	10	3949	- 3	- 83	1521	3949	1850	35	3	
8	578	4883	1868	419	.9165	- 11	339	.9451	-14	749	1843	.6809	.6708	3949	3.866	.9165	4.309	.9165	269	4362	1722			
												.9655	.9716						1790					
	1105	763	1332		11	1094		-14	749	1843	1357	3949	3866	-83	39	4309	- 13	-90	42	1722	128			

Symbol	Definition	Where computed
A_B	Azimuth of target from battery	Camera Record
A_F	" " " flank	" "
A_L	" " flank from battery	" "
A_M	" " battery from flank	" "
H	Altitude of target (computed)	Col.(21)
H_0	" " " (instrumental)	Battery Record
ε_B	Ang Hgt of Target From Battery	Camera Record
ε_F	" " " " Flank	" "
D	Slant Range	Col.(17)
Sg	Ground Speed of Target	Solve Formula
R_B	Horizontal Distance Battery-Target	Col.(13)
R'_B	" " -Battery-Burst	Col.(14)
l_B	Observed Lateral Deviation from battery	Camera Record
l_F	" " " " flank	" "
v	" Vertical " " battery	" "
l'_B	Lat. Dev. from Battery in Hor. Plane	Col.(6)

Symbol	Definition	Where computed
l'_F	Lat.Dev. from Flank in Hor. Plane	Col.(9)
L	Lateral Deviation in yards	Col.(16)
V	Vertical " " "	Col.(18)
Q	Longitudinal " " "	Col.(15)
B	Horizontal Angle Target-Btry-Flank	Col.(2)
F	" " Btry-Flank-Target	Col.(3)
T	" " Flank-Target-Btry	Col.(4)
B'	" " Burst-Btry-Flank	Col.(7)
F'	" " Btry-Flank-Burst	Col.(10)
O	" " Flank-Burst-Btry	Col.(12)
t	Time of Occurrence of Burst	Camera Record
X	Absolute Longitudinal Deviation	Col.(19)
Y	" Transverse "	Col.(20)

Figure 8.

Mechanical Solution of Data Computation Problems

By Lieut. G. V. Trichel, Coast Artillery Corps

THE applications of graphical and mechanical methods to the solution of problems of mathematics extends from the kindergarten bead abacus to the Bush-Gage-Stewart integraph capable of solving simultaneous differential equations where the solution cannot be obtained by ordinary mathematical methods. Between these extremes lie a multitude of computing devices whose application to our every day problems is so frequent that we seldom give

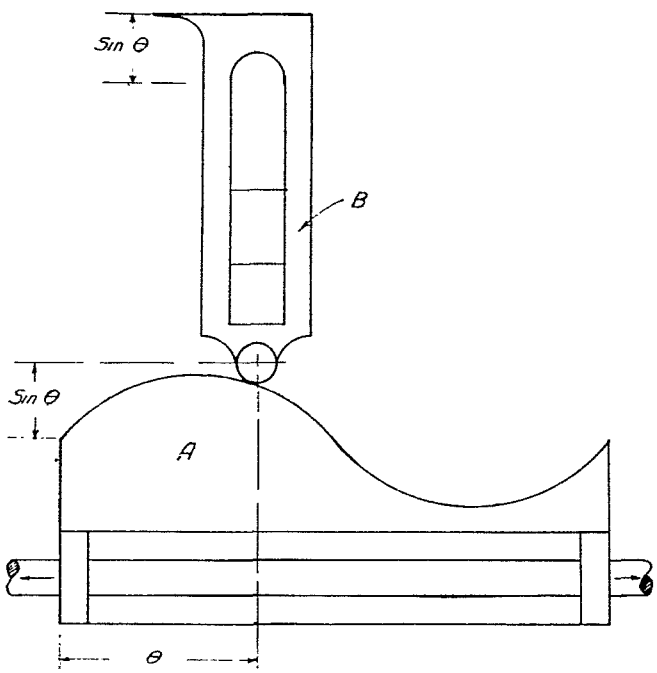


Figure 1.

thought to their origin, construction or modus operandi. The usefulness of these devices is generally due to their ability to perform a routine computation quickly and accurately. Some common examples are:

Slide rules for rapid computation.

Adding machines for rapid and precise accounting.

Firing data computers for speedy solution without mathematical skill on the part of the operator.

An important class of computing devices make use of graphical solutions. One form of graphical solution of a problem consists of a series of geometric figures whose elements are related by the same laws as govern the variables in the problem to be solved. Graphs, nomographs, alignment charts, etc. are examples of this class of computer. Another type of graphical solution of geometric problems consists of a scale reproduction of the problem on paper. An example of such a solution is a plane table survey of a plot of ground from which the area and other dimensions can be determined by measurements on the paper plot.

Mechanical solutions consist of mechanism whose components move in accordance with the variables in the problem to be solved. Fortunately for the designer of computing machines there exists a mechanical analogy to almost any law of mathematics. Many of the simpler laws of mathematics will have a number of mechanical analogies. From such a group the designer selects the one which best fits the other requirements of the machine. Graphical solutions may usually be transformed into mechanical ones by linkwork and two or three dimensional cams. Often for simplicity a mechanism whose movement does not exactly obey the mathematical law demanded in the problem will approximate it with sufficient accuracy within the range of normal expected values. The use of such approximations should be carefully considered before adoption.

In the design of fire control computing devices many factors have to be considered. The first step is to reduce the problem to a logical sequence of unit computations. Each step should be reduced to its simplest mathematical form. In general only single valued functions can be solved mechanically, *i.e.*—a given set of arguments must produce a unique solution.

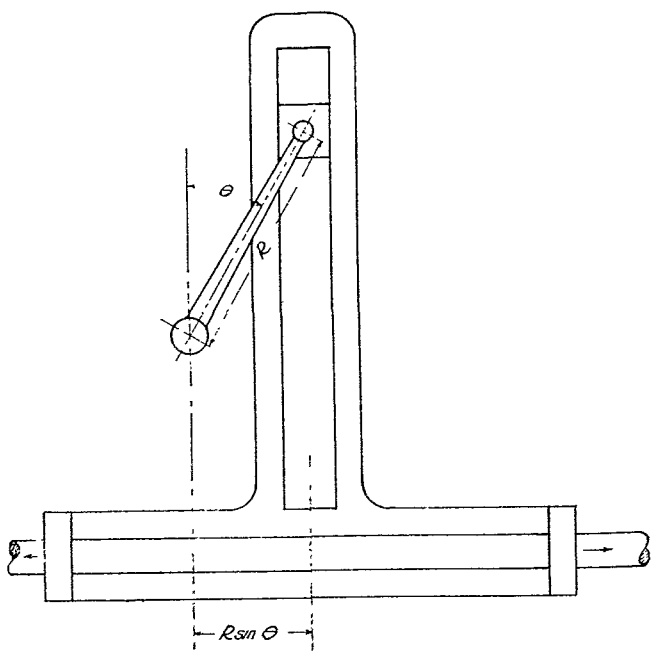


Figure 2.

Functions having points of discontinuity or points at infinity within the range of working values are not acceptable solutions. Points of zero value are not generally objectionable. This leads to a method of handling infinite values by the use of inverse functions. By inversion the infinite values become zero

values. As an important corollary we must not invert a function having zero values as such inversion would produce infinite values in the inverse function.

Having reduced the general solution of the problem to as simple as possible a sequence of unit solutions we must then investigate the limiting values of the known elements and the behavior of each solution within these limits. Inconsistent or double solutions must mean the discard of that function and the substitution of another.

The next step is the selection of mechanical movements to produce each step in the solution. So many factors enter into the selection that the movements finally selected always represent a series of compromises. Some of the more important factors are: working range, precision required, simplicity, weight, durability, and most important, cost. Usually in fire control design cost is inflexible, for mobile equipment weight is also of high importance. Simplicity should be the constant aim of all design. If confronted with the necessity for a complex device to solve a step in a problem it is often better to attempt to avoid the step entirely or approach the problem from a different direction. The elements of precision and durability usually determine the scale and material to be used. At this stage in the design gear ratios, scale and mechanical sequence are determined and schematic drawings made.

MECHANICAL SOLUTION

In the mechanical as well as analytical solutions of mathematical problems, there are two general methods of approach. Thus if $x = y \times z$ we may perform the operation of multiplication directly to obtain x or we may write $\log x = \log y + \log z$, using tables to find the result. If y and z are simple functions or numbers we use the former method; if however, y or z are complex functions or are transcendental we would probably use the latter method for convenience. As an example, few persons using trigonometric functions would know how to compute sin 25° to three decimals, even if they were willing to do so each time this or a similar function was desired. We have tables of values for all common functions readily available for their ranges of continuity. If we desire values lying between tabulated points we interpolate by a method suited to our need for accuracy. Mechanically we may use methods analogous to each of the above. To solve for $y = \sin \theta$ we may construct a link mechanism as in Fig. 1. so that rotation of an arm R translates a slide R sin θ. If we make R equal unity the translation of the slide equals y, which equals sin θ. Or as in the second case above we may make a flat cam A, Fig. 2., from a table of sines so that moving the cam to a position θ the displacement of the slide B $= y = \sin\theta$. This latter is of course, a mechanical table of sines.

Since the mechanical solutions of the type shown in Fig. 1 are not generally available we must resort to the second type shown in Fig. 2. for other than addition, subtraction, multiplication, division and trigonometric functions. These latter cannot be handled near or through points of discontinuity. For this reason we must rely on the second type of solution for complicated functions. By making the cam three dimensional we can solve for functions of two independent variables.

The problems involved in position finding and prediction are capable of solution by devices of the first type. The ballistic functions are complex and recourse must be had to the second type of mechanical solution.

Slides and Linkages for Converting Polar Cooordinates to Rectangular and Vice Versa

The device shown in Fig. 3., consists of two slides A and B constrained to move at right angles to each other. A sliding block P is held in their intersection. P is also pivoted about a center O by a radius arm R of variable length.

To convert from polar coordinates to rectangular the radius arm R is rotated to the angle θ and set to the

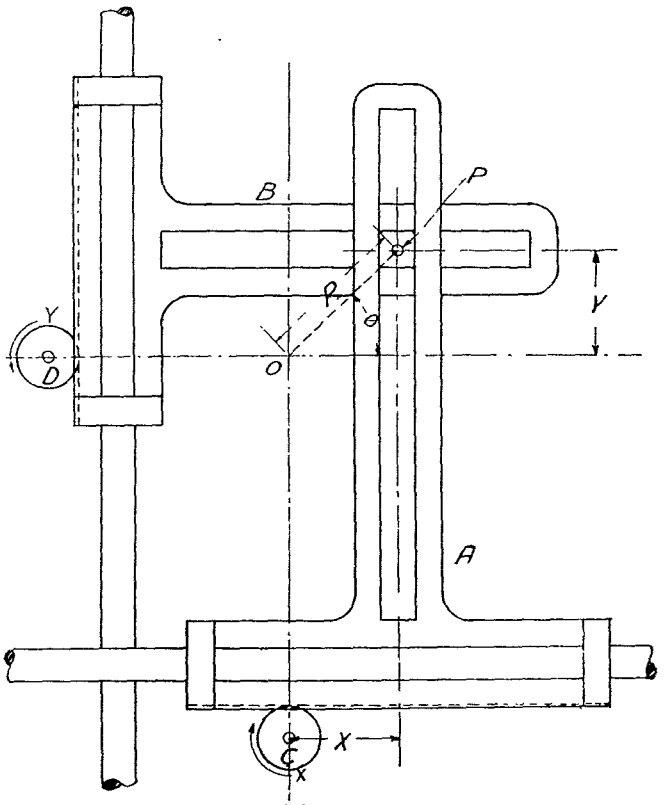


Figure 3.

length R. Slide A is thus moved from its zero position a distance R cos θ = x, and slide B an amount R sin θ = y. The pinions C and D engaging racks on A and B, respectively, are rotated proportional to x any y. The device for changing the length of R and angle θ will be described later.

In Fig. 3 we have seen how the point P positions the rectangular coordinate slides A and B. Let us now see how R and θ are set off on the radius arm attached to P. The essentials are shown in Fig. 4. P is a pivot mounted on the slide K. K is carried in a slot across the top of gear A. Along one side of K is a rack engaging a pinion E carried on a shaft through the center of A but free to turn independent of A.

Rotation of A by the gear C rotates the slide K and OP representing R, in azimuth. Rotation of E slides K in its slot changing the distance R. As an example, let A and E of Figure 4 have 150 and 25 teeth respectively and be independently rotated. Let C have 50 teeth and mesh with A. If C is rotated one revolution, A rotates 1/3 revolution and E remains stationary. Therefore K which is constrained to rotate with A will be pulled along its slide a distance equal to 25/3 or 8 1/3 teeth of the rack.

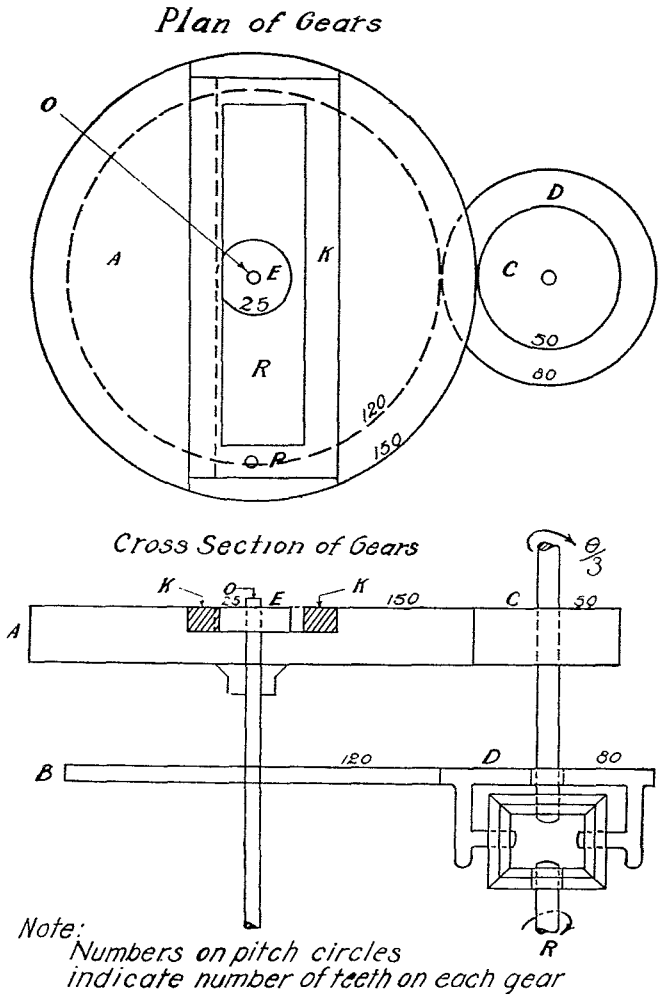


Figure 4.

However, we wish to be able to rotate A through an angle θ without changing R. (See Fig. 3). In practice A and E cannot be rotated independently. Their proper relationship is maintained, through a differential, without their being directly interconnected. This is accomplished by adding the differential D whose housing gear meshes with the gear B on the same shaft as E. The shaft driving C comes in on one side of the differential and the shaft positioning R comes in on the other. Let D have 80 teeth and B 120. If we now rotate C one turn counterclockwise A rotates clockwise 50/150 which equals 1/3 revolution. Also D rotates one half revolution counterclockwise due to the movement of the shaft through C, since R is stationary and the rotation of C is transmitted through the differential gear to D. This rotates B and D an amount $1/2 \times 80/120 = 1/3$ revolution clockwise. Since A and E have been rotated the same amount in the same direction, the position of the rack and the distance R remain unchanged. Rotation of the shaft R transmits motion to D and thence to B and E. C remains stationary. Rotation of E moves the rack positioning K and changes the distance R as desired.

To convert from rectangular coordinates to polar coordinates, slides A and B (Fig. 3) are positioned by setting x and y through the pinions C and D. P is therefore constrained to assume a position such that $R = \sqrt{x^2 + y^2}$ and an angle θ = angle whose tangent is y/x. In order to prevent 180° shifts in orientation, stops must be provided to prevent R assuming negative values, *i.e.*, x and y must not have simultaneous zero values.

Two general methods of adding algebraically two or more components are employed in a director. These are linkages and epicyclic trains or differentials. In the linkage in Fig. 5., the mean motions of A and B are transmitted to C by the bar D. A, B and C must be constrained to move parallel to each other and the distance AC must equal distance BC.

In Fig. 6., a similar linkage is shown for adding three components, A, B, and C. E is located at the intersection of the median of the equilateral triangle ABC, and the bar D in Fig. 5., is replaced by the spider D. As above A, B and C must be kept parallel and equidistant. The movement of E is equal to the mean of the algebraic sum of the movements of A, B and C.

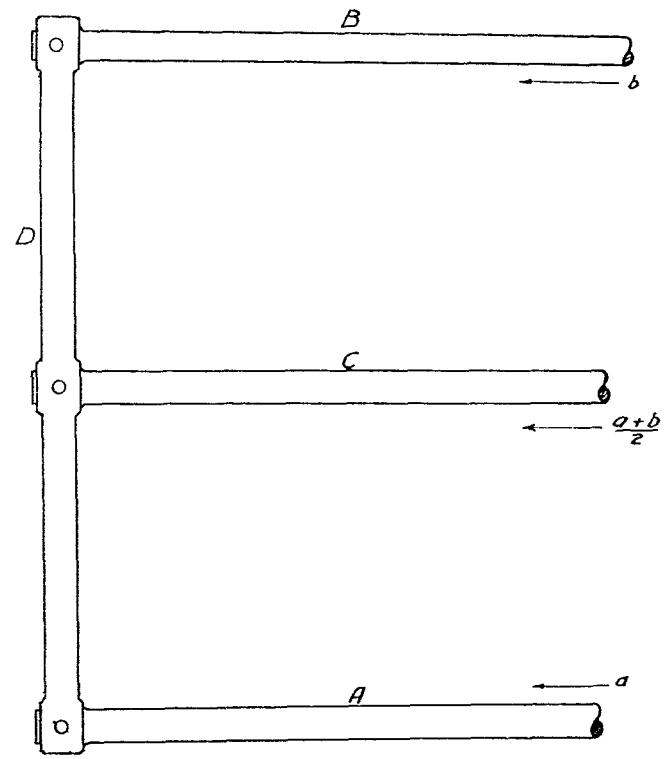


Figure 5.

Adding Mechanisms—Differential Gearing

In Fig. 7 is shown a bevel gear differential of a

common type. The bevel gears G and H are carried on a spider fixed to the shaft F. Meshing with G and H but free to turn on F are two bevels E and D, each having a spur gear rigidly connected to it. These spur gears are driven by the spur gears A and B. Gear C is driven by the gear on shaft F. Rotation of A, one revolution, drives E one revolution and since D remains stationary G and H rotate one half revolu-

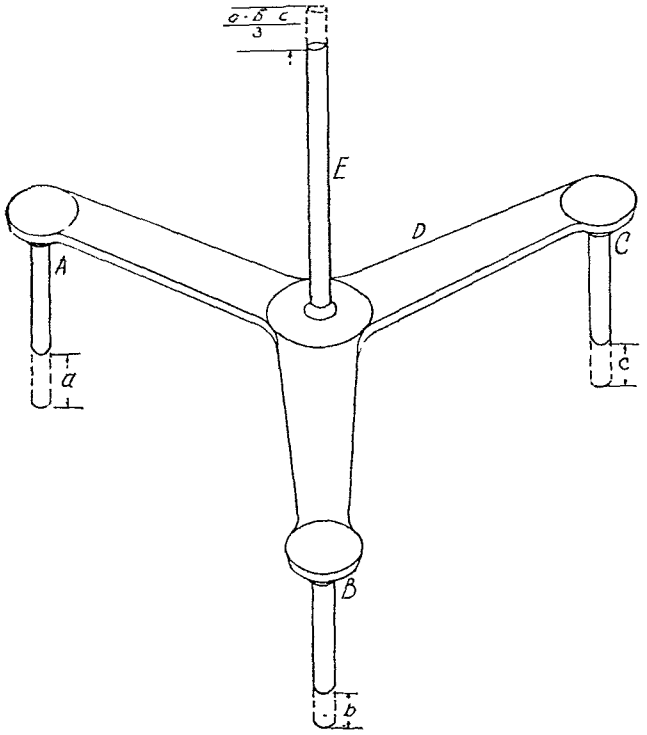


Figure 6.

tion turning shaft F one half revolution through the cross arm. F rotates C and one half revolution or a/2. In a similar manner rotation of B one revolution will rotate C one half revolution or b/2. If A and B are rotated simultaneously C rotates $\frac{a+b}{2}$. If the pinions attached to the bevels gears E and D have the same number of teeth, the movement of the shaft F is one half the rotation of E + D independent of the number of teeth of the bevel gears G and H.

Another type of differential employing spur gears instead of bevel gears is shown in Fig. 8. Shafts A and B carry gears E and D respectively. The pinions H and G are carried on axles through the case K. K also carries fixed to it a ring gear R. The pinion G is in mesh with gear D and pinion H. Pinion H is in mesh also with gear E. In the figure, H and G have an equal number of teeth and are ¼ the size of E and D which are of equal size. If K is held stationary and A rotated one turn in the direction of the arrow, E rotates one turn in the direction of the arrow on E. This will drive H four turns in the direction of the arrow on H. H in turn drives G four turns and G drives D one turn. B being attached to D is rotated one turn in the direction of the arrow, which is the reverse of the direction of rotation of A. Therefore if B is turned one turn A will turn one turn in the reverse direction. If K is held stationary the train transmits movement such that a = — b. If B is held stationary and K is rotated a half turn, gear E and shaft A will be carried along with K the same amount due to the fact that the axis of pinion H is off set from the center of shaft A, the axis of rotation of gear E and case K. For a similar reason, and at the same time, pinion G will roll along D two turns. This motion is transmitted through H to gear E and shaft A giving them an additional half turn. The total movement of A is therefore one complete turn in the same direction as the half turn of K. The same

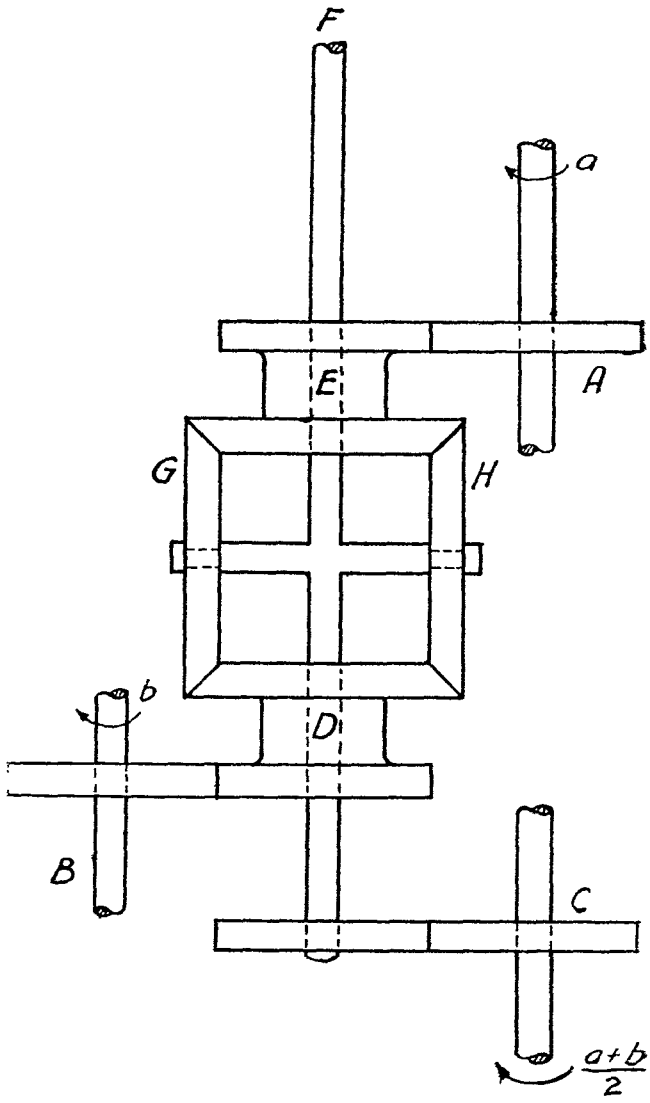


Figure 7.

result is obtained by holding A stationary. When A and B both move R turns $\frac{a+b}{2}$, and C in mesh with R turns $\frac{a+b}{2} \times \frac{R}{C}$.

A third device, which we may call a rack differential, is shown in Fig. 9. This device is used in some anti-aircraft directors to connect present and future posi-

tion slides. It consists of two slides A and C constrained to move parallel to each other. Attached to each is a rack meshing with the pinion B carried by

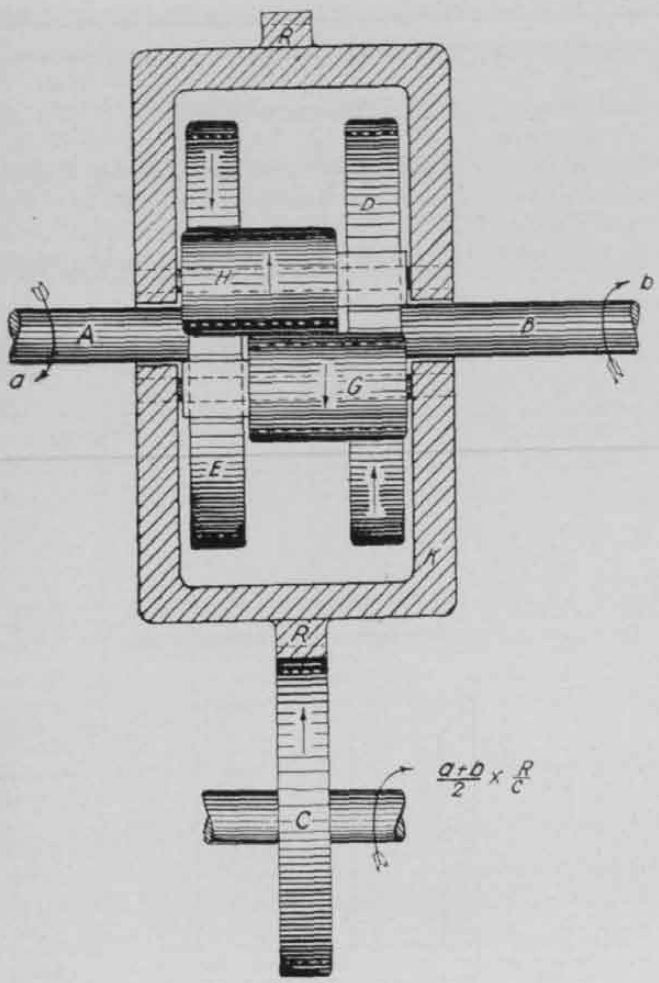


Figure 8.

D. When A moves an amount a, C moves an amount a, D remaining stationary. When D moves an amount b, A remaining stationary, C moves + 2b. When A and B both move, a and b respectively, C moves 2b — a.

Relative Merits of Two Methods of Adding Several Components

For small movements such as the lifts of the ballistic cams the linkage method is better as the sliding parts can be accurately fitted and the short bars required made very rigid. The bar type is limited to small angular movements of the bar so for large quantities the bar must be lengthened. This means very heavy cross-section or undesirable deflection errors.

The bevel gear differential can take care of unlimited movement (rotation) and its percentage error decreases with the increase in movement. It is almost impossible to keep backlash out, on account of the number of moving parts. It must be built rather heavily to make its action smooth. The same objections apply to the spur gear form of differential. This latter form gives smoother action but is more bulky than the bevel type.

Multiplying Mechanisms

There are three general types of multiplying devices, one for multiplying revolutions and two for multiplying straight line movements. In Fig. 10 is shown a type of straight line multiplier of the general type used to multiply the lifts of the correction cams by the proper factors. The bar B is pivoted at O and is held against the sliding pin A by the action of the spring S. A is constrained to move vertically in a

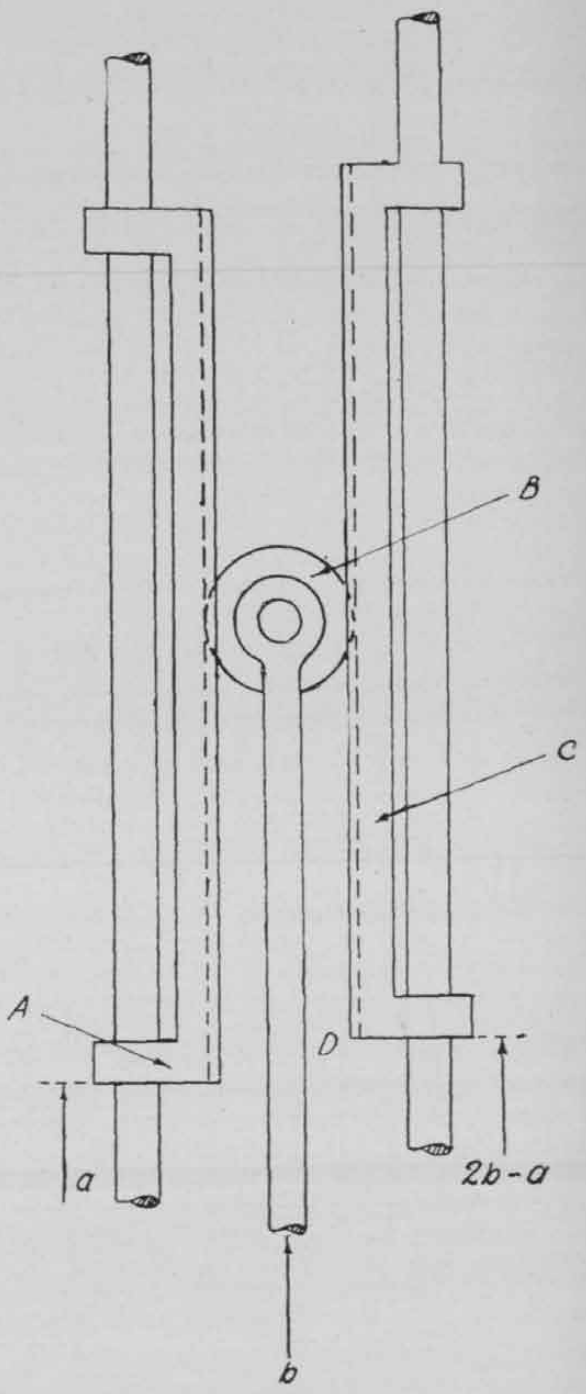


Figure 9.

fixed guide at a constant distance M from O. Pin C is in contact with the top of the bar B and is held vertical by the guide D by means of which it can be

translated along the top of B to any distance N from O. If we lift pin A an amount, a, pin C is lifted a distance (N/M×a). The movement of C will be positive or negative in accordance as N is plus or minus.

In Fig. 11 is shown a slightly different type of multiplying linkage. It is similar to that used to multiply rate per second by time of flight in the prediction mechanism. The slide A is constrained to move perpendicular to the slot carrying D, by the shaft E. The link K is pivoted at the fixed pivot O and carries, pivoted in its slot, sliding bars C and D. C is also constrained to follow its fixed guide, C, a constant distance from O. If C is displaced vertically an amount, a, D will be displaced vertically a distance (N/M×a). N is always positive and the result is plus or minus in accordance as a is plus or minus.

Revolving Multiplying Device

In Fig. 12 is shown a revolving multiplying device similar to that used to multiply the revolutions of a constant speed motor to match the rate of change of x and y of the ground projection of the target's course. The cylinder B rotates on its axis parallel to the surface of the disk A. The axis of rotation of A

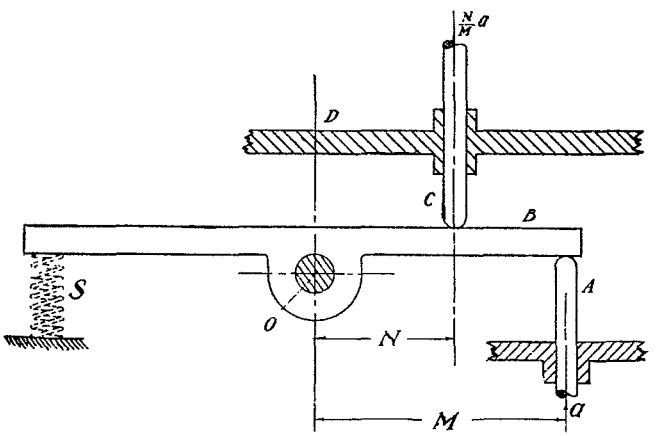


Figure 10.

is in the same plane as the axis of rotation of B. B is driven from A by friction through the idle balls held in a cage of part C. These balls can be displaced a variable amount N parallel to the axis of B and perpendicular to the axis of A. If A is rotated at a rate, a, B will rotate (neglecting slip) at a rate (2N M × a), where M is the diameter of B and N is the distance of the balls from the axis of A. N can have any magnitude from O to ½ the diameter of A. If the rotation of B is positive when C is to the right of O it will be negative when C is to the left of O.

Gear Ratio and Scale

The ratio of input to output of a train of spur or bevel gears can be determined by counted the teeth on each gear of the train. Determine which are driving gears and which are driven gears. Disregard idle gears.

$$\text{Ratio} = \frac{\text{Product of driven gears}}{\text{Product of driving gears}}$$

Ratio of worm gearing can be determined by counting the number of teeth of the gear and the number of threads of the worm, i.e., number of threads per pitch distance (the advance of one turn), of the worm.

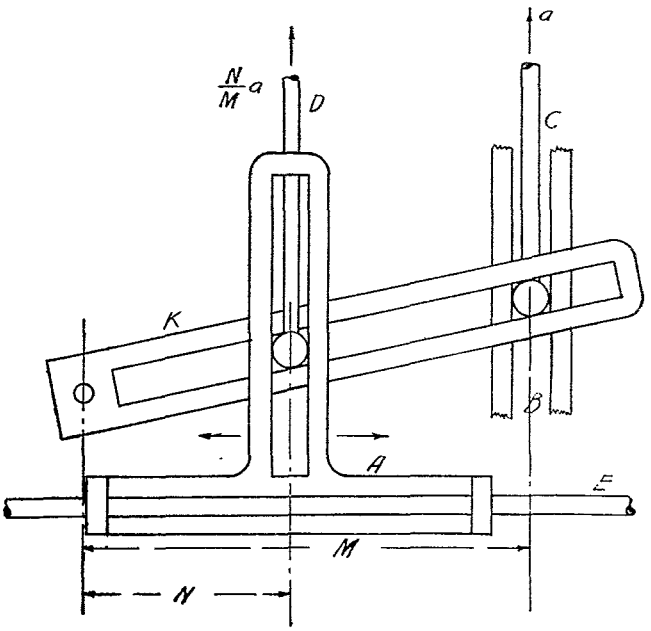


Figure 11.

Worms are usually single, double, or triple thread and may be either right or left hand thread.

$$\text{No. turns to one turn of worm wheels} = \frac{\text{No. teeth of worm wheel}}{\text{No. threads of worm}}$$

The ratio of spiral and helical gears cannot in general be determined from a count of the number of teeth in mating gears. The formulae for spiral gears are too complex to be described in an elementary treatise.

The direction of rotation of output with reference to input of spur gear trains can be determined by counting the number of axles including idle gears. If n is odd, the direction of rotation of output is the same as that of input. If n is even, the direction of rotation of output is the reverse of input.

The effect of gear ratio on a scale is to change the

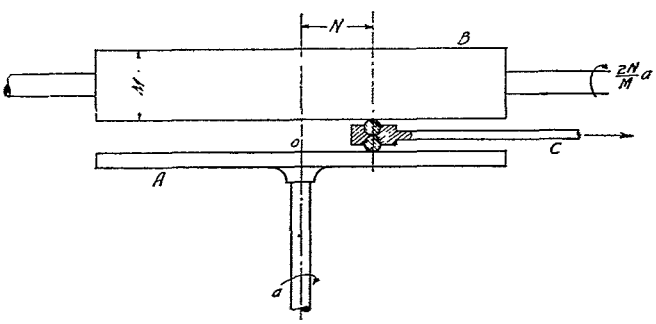


Figure 12.

scale inversely as the gear ratio. For instance if 1 turn = 100 mils at the input of a train of gears and the ratio of the train is 10 to 1 the scale of the output is 1 turn = 10 mils.

Commercial Motor Vehicle Maintenance

By Captain P. W. Lewis, Coast Artillery Corps

EDITOR'S NOTE—*Commercial methods are oftentimes capable of adaptation to the needs of the Army. Many times they are not suitable without alteration and sometimes a fine sense of discrimination is required in shaping a commercial system to answer the requirements of the military. However certain existing commercial practices are so efficient that the Army officer should know them. This is especially true in the field of motor vehicle operation. The author of the following article is a graduate of the Advanced Motor Transportation Course, Coast Artillery School, and is now taking a special course in motor transportation at the University of Michigan. The summer course was devoted to a study of the best accepted methods of motor transportation maintenance. Captain Lewis has recorded observations made during visits to a large commercial garage in Detroit.*

THE Greyhound Management Company at this time controls the operations of 16 operating companies. These companies operate all the associated Greyhound lines east of the Mississippi. They cover about 200 separate routes and have 40 operating garages, with about 700 men in their shops, alone. Their system of maintenance follows the well known unit replacement system, the unit repair depot being located in Chicago.

The system of bookkeeping is unique for motor coach companies, as well as being extremely thorough. The cost of each individual coach is kept as well as the general cost. Each coach has its cost statement by item per month and these items cover the following details:

a. Operating Company
b. Vehicle, number, make and type
c. Material
d. Labor
e. Shop burden (overhead)
f. Fuel and oil—From bulk supply
From authorized stations
From unauthorized stations

All of these items are totaled by account, by vehicle, by miles, by company, by route and by type.

A further cost accounting includes such items as cost of washing, cost of cleaning inside of vehicle, rent, taxes, telephone, overhead, heat, light and many other items. All of these give the company a pretty good cross section of what each vehicle, as well as the company as a whole is costing. The system used includes the burden or overhead charged to each item. For example, maintenance carries its own overhead, gas and oil carry their own overhead, stations carry their own overhead, and so on, so that when it is determined that a certain item costs a certain amount, the company is quite certain that all costs have been included.

Plate 1. Wash Racks.

Plate 2. Garage, Interior View.

All data from all sources are transferred at the head office in Cleveland to small cards, for use in the automatic cost accounting and sorting machines. These machines can sort any appropriate information desired in three different ways in one operation. For example, we may desire to know what various items are costing, by company, by route, and by month; or we may desire to know the cost of material, labor and overhead by coach, by account, per quarter.

As stated before, every item carries its own overhead. Every station must show its own profit; if not, it is discontinued.

An interesting study is their system of "preventive maintenance." Maintenance includes labor, parts, material and overhead. The average run for the vehicles is about 200 miles. Each time a bus returns to the

home operating garage after its run, it enters through an automatically opened doorway where a crew are waiting to wash the outside with soap and water, after which a series of overhead sprays give the vehicle a thorough rinsing with clear water; at the same time

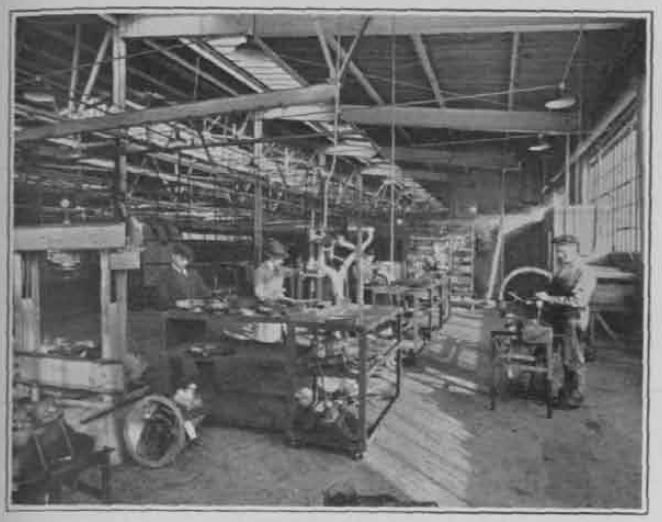


Plate 3. Motor Repair Room—Parts Room in Background.

another crew clean the inside. The vehicle is then moved forward a few feet over a pit where it undergoes an inspection including such items as brakes, springs, shafts, loose nuts and bolts, chassis greasing, oil checking, and filling the gas tank. A representative of a large tire company that sells tires to the operating company, checks the tire pressures, wheel alignment, cuts and abrasions. The driver turns in his trouble card and any repairs needed, as noted by the inspector, are entered on this card. The bus is then run over a pit in the repair section for the necessary repairs. A very close check is kept on tire mileage and condition for this is an appreciable item in obtaining lower mileage costs.

The Greyhound Garage in Detroit is considered a typical example of what a garage should be and offers most of the latest thought that has been given to garage design. This garage is 115 feet wide over all and 379 feet deep. It houses 50 motor vehicles and has adequate space for offices, rooms for personnel, shops and storeroom. There are four doorways in front, two for entrance and two for exit, all operated electrically.

The oil handling and storage system is located in the basement, and includes four 1000 gallon tanks, three oil pumps, one pneumatic grease gun, one heavy oil gun, pneumatically operated and an oil filtering system. The heavy oil and grease are delivered to the pits by compressed air. Two of the storage tanks are for new oil, while one contains crankcase oil which has passed through a filtering process. This filtered crankcase oil, by the way, is considered just as good as new oil and entails quite a saving. The total cost of refiltering is about 11 cents per gallon. Gasoline is supplied to the refilling pit by means of four motor-driven pumps drawing from three underground tanks. These tanks are filled directly from a pipe along a railroad siding in the rear of the garage.

There are about 10 or 12 pits for the repair operation of the 50 buses. These pits are approximately 5 feet deep, 30 feet long and 46 inches wide. They are 11 feet between centers and are illuminated on either side by vapor-proof globes set into the sides of the pit walls. A cone-shaped depression directed upward under the vehicle is molded in the concrete and acts as a reflector for these globes. The pit is painted with white enamel and numerous air and electric outlets are furnished. All of these pits open into a long header-pit in which the work benches are located. Overhead is a trolley, by means of which the heavy parts are removed from the vehicles and taken to various parts of the shop. A small hand elevator, locally constructed, enables the mechanics to hoist and hold a transmission in the proper position for installation. The trouble report of the driver with the notations by the inspector form the basis for the work by the mechanic.

Lighting is an important feature of any modern garage. The so-called "industrial enamel" is a most satisfactory coating for walls and adds greatly to the neat appearance of the garage and shop, and aids materially in the distribution of light. This garage is a one story affair, has skylights for additional illumination and with the white walls gives a very efficient solution to the problem of proper lighting.

A special room is provided for the cleaning of engines, transmissions and rear ends. Here an Oakite tank is used to dissolve the grease and dirt from the treated parts. Some garages prefer the action of a

Plate 4. Tractor Derrick Removing an Engine.

steam hose for this operation, but it is believed that the Oakite tank is the best solution, for it is able to loosen the corrosion and sediment from the oil and water holes.

The tire repair room is separate from the other adjoining rooms and gives ample space for storage as well as for the necessary work. Separate rooms are provided for the carpenter shop, the paint shop, the

machine shop and the storeroom. In the front of the garage are the offices, dispatchers room, tailor shop, sleeping room for drivers off duty, drivers' wash room and mechanics' wash and locker room.

In the Army the replacement of parts for motor ve-

Plate 5. Maintenance Pit Showing Connection with Header Pit. Note overhead Crane Trolley for Removal of Heavy Parts.

hicles is known as the "Unit Replacement System." This is a common commercial custom which is almost universally used. I was interested to see how a large commercial concern made this system actually function. There is no doubt that the system is fundamentally sound. It comprises the supply to the operating garages of unit parts of the vehicle, and the shipment of the worn parts to a central rebuilding plant for overhaul. The idea is to eliminate the rebuilding of parts by the operating garages and thus cut down the enormous inventory costs. Let us see how the system functions for the Greyhound Company.

We will say for example, that a vehicle that needs a new transmission comes into the garage. The mechanic goes to the stockroom and makes known his needs, the stockroom man makes out a slip showing the name of the part, the number, etc., and issues the new part for installation; the worn part is returned to the stockroom. These issue slips are consolidated at the end of the day and mailed to headquarters at Cleveland. Here one man has the sole duty of extracting the data onto cards, one card for each assembly or sub-unit-assembly. This card shows at a glance where the parts are, as well as the number on the shelves. Receipts from the unit repair depot or from any source are reported on similar slips and are entered on the cards at Cleveland. In other words a running inventory is kept and is posted daily. If, for example, the Cleveland garage needed a rear end of a certain type and the replacement had not been received from the Chicago repair depot, they would notify the central office, it in turn would consult the cards and telegraph to the nearest garage having that particular type of rear end on hand. This part is then shipped on the first available transportation. Upon questioning as to what constituted "first available transportation" I was informed that if the part was light, it might be carried in a bus destined for the garage needing the part; the majority of shipments, however, go by commercial freight trucking. In order to facilitate the shipment of parts to other garages as well as to the repair depot, special containers are built and kept on hand to fit the parts. For example, engines are shipped in boxes especially designed and furnished with handles and lock tops, while generators and magnetos are shipped in cardboard containers of the correct size. To illustrate from an actual example of the speed of the furnishing of necessary parts: Boston telegraphed that they needed a certain type of cylinder head and within six hours it was delivered.

This shows how the system works. The main fact behind this system as worked by Greyhound is that one man makes the running inventory talk at head-

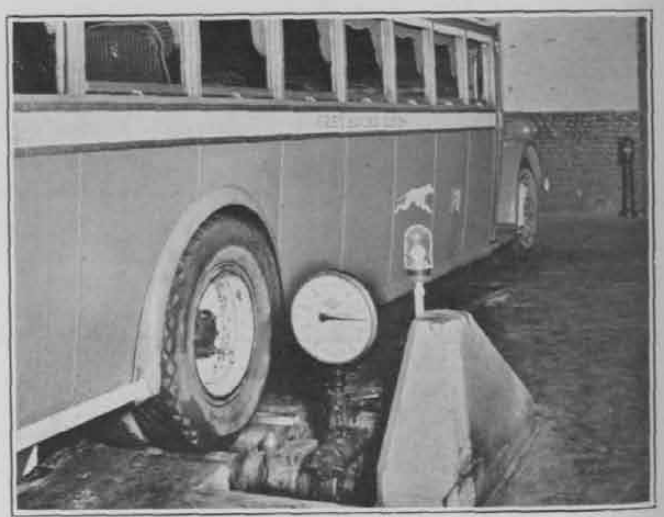


Plate 6. Every Vehicle has its Brakes Tested at the End of Each Run.

quarters. A vehicle lying idle, awaiting parts, can run the loss of a commercial company into hundreds of dollars. Dividends cannot be realized on incapacitated vehicles.

Community Interest in National Guard

By Colonel William H. Waldron, Infantry

"I DO not seem to be able to get the people of this community interested in my company," complained Captain B. Company B was on the skids and sliding. The last field training inspection report rendered on the company was not good and the recent annual armory inspection report did not nearly come up to the Colonel's expectations. The Captain and the Colonel of his regiment were discussing ways and means for the improvement of the outfit which was stationed in a thriving little city of about 12,000 souls.

"Just what do you estimate to be the trouble?" inquired the colonel. "Let's lay all the cards on the table and play them face up—open and above board," he continued.

"No cooperation; no civic pride in this community. People of this town don't care anything about the National Guard," replied Captain B. "We can't get the right kind of young men in the company. Employers don't want National Guardsmen in their organization," he explained.

"All right," replied the colonel. "Now let's analyze the situation and try to arrive at some conclusions that may be of some value to us. You have a good armory here, and I must say it's kept in pretty good shape"—

"One of the best in the State," broke in Captain B. "We do keep it in good shape. You know, I'm a stickler for limiting the use of the armory to the purpose for which it is intended—military training. I don't believe it should be loaned out or rented for all kinds of affairs—dances, carnivals, automobile shows and such things. I turn them down all the time. I figure this armory was built for the training of Company B and is not to be used for a lot of outside things."

Figuratively speaking, the Colonel took a blue chip from the Captain's stack and deposited it on his own. He labeled it "non-cooperator." He continued his questioning.

"Do many of the townspeople turn out for your armory drills, and other company activities?"

"They do not. I have to keep them out of the armory on drill nights. I found that having a lot of people hanging around here on drill nights interfered with my training and I had to put a stop to it."

Another blue chip was added to the Colonel's stack. He earmarked it "exclusiveness."

"I happen to know, Captain, that you are in the insurance business," said the Colonel. "Do you hold a membership in the Chamber of Commerce?" he inquired.

"Chamber of Commerce in this town is a frost, it is absolutely no good," asserted Captain B. "They do not do anything worth while. Besides, sir, I do not see what that has to do with Company B." It was a touchy subject with the Captain. He had had a row in the Chamber of Commerce over the use of the Armory for a big civic affair and was in bad order in that body. A third blue chip from the Captain's pile graced the Colonel's growing stack. It was named "civic interest." He went on leading trumps.

"You have a Rotary Club in town?" asked the Colonel affirmatively.

"Yes, sir, and they claim it is a pretty progressive outfit," admitted the Captain.

"Have you ever been to any of their noonday luncheons?"

"No, sir. As I understand it, the luncheons are confined to members of the club."

"Did you ever consider the idea of trying to get a membership in the Rotary Club?"

"No, sir. Another insurance firm fills the insurance classification there," was the alibi.

"Did it ever occur to you that there is a military classification provided for in the Rotary Club? I think it comes under the heading of National Defense, Land."

"Never heard of that before," declared the Captain.

"Well, that is a fact. As Captain of Company B, you are the head of the element of National Defense in this town, and as such you would be perfectly eligible for membership under the National Defense classification. Better look into it," enjoined the Colonel.

"I will," agreed the Captain reluctantly. "But that is a pretty close corporation and hard to break into. However, I'll do what I can about it."

"You know, your annual dues would be a perfectly legitimate expenditure from your company fund," vouched the Colonel. "It would certainly be classed as for the benefit of the company."

This statement seemed to ease the mind of Captain B. somewhat. But the attitude of the Captain gave the Colonel another chip—a red one this time and he dubbed it "tight-wad" in his own mind. He may have well added the same to his Chamber of Commerce chip.

"You say employers do not want National Guardsmen in their organization. Do you know this to be a fact, or do you just surmise it?" asked the Colonel.

"All I know is that some of my best noncommissioned officers have declined to reenlist when their enlistment expired, and they gave me that as their reason," contended Captain B.

"How do employers get around the law if they discharge a man because of his absence on account of attending a field training period with the National Guard?"

"Perfectly easy to do it," replied the Captain. "No employer will say to a man, 'Jones, if you go to the the training camp I cannot hold your place open for you'. That would be a poor way to put it up to Jones.

What actually happens is this. Several weeks after Jones comes back from camp and returns to work, Mr. Employer tells him that work is slack and they have to reduce the force, and that he is compelled to lay him off. He will let him know when to return to work. Jones is let out. The call to return never comes to him. Some other fellow eventually gets the job. But there has been no violation of the law."

"Have you ever gone to one of these employers and put the proposition squarely up to him?" inquired the Colonel.

"I would get nowhere with such stuff. He would laugh me out of his office. These people have no interest in the National Guard or in the National Defense. As far as Company B is concerned, the outfit does not fit into their scheme of things at all—at all. No use for me to waste my time on that line, Colonel. All I could do wouldn't amount to a hill of beans."

The Colonel increased his stack with another blue chip from the Captain's pile. He labeled it "employers," for the want of a better word.

"How many times has your company turned out in the past year? Have you all been in any parades or other community affairs?" questioned the Colonel, in quick succession.

The Captain thought it over for a moment. "As far as I can remember, not once," he answered. "There hasn't been a parade in town, that I know of, for more than a year. Last Armistice Day the Legion had charge of the ceremonies and they did not call on Company B to participate. I did not feel like butting in, because I got out of the Legion two years ago on account of the things they were doing in the Legion Post. I did not like the way they were running things."

Another blue chip to the Colonel's stack. It was dubbed "Legion." It raised the total to six. Here the Colonel stopped his questions. He lighted his pipe before proceeding.

"Captain, we have played the cards. I have lead trumps all the way through. I have acquired six of your chips and added them to my stack. Each one of them represents a thing that is the matter with Company B. I want you to listen to what I have to say about them.

"First, let's consider the matter of the use of the armory. This is a public building—bought and paid for by the people, the tax-payers of the state. I agree with you that it is primarily intended to be used for the military training of Company B and should not ordinarily be diverted from that purpose. But it is a fact that it is not used for military training every night in the week and in my opinion it should be made available to the community when it is available. Let me illustrate.

"Some civic organization needs the armory for a community affair. A committee of citizens come to you and ask you to let them have it on a specified date, which they have so arranged that it does not in the least interfere with your armory drill. In reply to their perfectly reasonable request you say No; maybe in no uncertain terms; maybe you try to give your reasons. They do not get by with the committee. These fellows are influential citizens, else they would not be on such a committee. By your action you have created a group of knockers against Company B. Had you granted their request you would have rendered a service to the community and at the same time made a group of boosters for the outfit. I am sure you see the point I am trying to get over to you," said the Colonel.

"Yes, sir. I see the point. Do you mean to say that I should let these people have the use of the armory without their paying for it?" inquired Captain B.

"That all depends upon what it is to be used for. If it is for a charitable purpose or something of that kind, I would say there should be no rental consideration. If it were a business proposition where some civic organization anticipates deriving a money profit from the use of the building, it would be perfectly all right to make a charge for it. Such organizations are usually ready and willing to pay a reasonable rental. Each case must be considered and decided on its merits.

"Some units have well organized activities in which extensive use is made of their armory and from which they derive money for their organization fund. In those states where boxing is legalized, armories are capable of being made handsome revenue producers under proper management. I have known of instances where one-company armories have made goood profits by conducting roller skating rinks in them. There are individuals who will take over an armory on certain specified nights each week and run it as a skating rink, giving the company a percentage of the gross receipts. They supply the skates and all equipment for the conduct of the business."

"Well, I must admit that I have never looked upon the matter in exactly the way you have put it up to me. Your arguments are convincing. Company B surely needs some boosters and maybe that's one of the ways to get them. It also needs some funds with which to carry on."

"From now on I will depend upon you to consider the use of the armory in the light of what I have said," enjoined the Colonel.

"Very well, sir," said the Captain.

"Now, let's consider the second chip. You say that you do not encourage the townspeople to come to the armory on drill nights. In my opinion you are making a grave error. How do you expect people to take an interest in something of which they know nothing? It's not human nature that they should do so.

"I would turn my policy around in this respect, just 180 degrees. I would encourage people to come to the armory on drill nights and let them see what the men are doing. When practicable I would put on a demonstration of the company activities, have open house, and invite the people to attend. On such an occasion I would have something worth while to show them. Arrange for guides to show them around and explain things to them. By doing these things you will raise the morale of Company B and you will make a lot of friends for the outfit. This open house proposition is no fanciful dream. It is a reality and those organizations which have tried it out have found it all to the good. Besides creating community interest it is

capable of being developed into a big publicity feature for the company which only adds to community interest.

"Again I say, I will depend upon you to proceed along the lines I have been talking about. I am sure you will find it to your advantage to do so."

"Yes, sir," was all that the Captain could say.

"We will now consider the third chip. I noted with interest what you said regarding your position in the Chamber of Commerce and their attitude towards Company B. I am familiar with all of this and the problem is capable of solution. In fact I have started the solution already. I have paved the way for you through my friends in the Chamber and they are ready to let bygones be bygones.

"In your Chamber of Commerce you will find the leaders of business and civic affairs of your city. They are men of influence and prestige in the community. As an organization they can put over anything they set out to do.

"I also happen to know that there is no military committee in the organization of the Chamber of Commerce. The consequence is that there is no organized body whose business it is to consider things military in this city. There should be such a committee, and you being the senior officer of the National Guard, should be chairman of it. I have also talked this matter over with the president of the Chamber and when you have demonstrated to them that you are ready to play the game, they are ready to meet you more than half way. In this connection I may say that your membership dues in the Chamber would be a legitimate charge against your company fund."

"But, Colonel, you are piling up more charges against the company fund than it can stand," said the Captain.

"I was waiting for just that statement. My answer is this. When you get to doing the things I am telling you about, the community will support your company. They will see to it that you have all the money in your company fund that you require.

"All that I have said about the Chamber of Commerce and its relations with you and your company, I now repeat and emphasize, with respect to the Rotary Club. Again I have paved the way for your application to fill the vacancy now existing in the Rotary classification "National Defense, Land," and you will be elected to it in due course. You will have to submit your application and have it acted on by the membership committee of the Club.

"You will find that your membership in these bodies will give you a higher standing and increase your prestige in the community. Incidentally, you will find that it will do no harm to your business in civil life.

"Now, take these third and fourth chips and add them to your stack. Check and double-check them."

The Captain saw the points the Colonel was making. His morale was going up every minute. In his heart he was clamoring for the solution to his other problems.

"Now, for the fifth chip. I want you to win that back, too. These employers of men are hard headed business men, intent upon making profits for themselves, paying their stock holders regular dividends and keeping their establishments out of the red. They have to do these things to get away with their game. Unless they can see some advantage in having their men in Company B, they cannot be expected to give a whole-souled endorsement to the idea of their going off to a training camp every summer. The best you can hope for is absence of antagonism. But you show these fellows where Company B fits into their own scheme of things and how the company may render them a service, and the way is paved for their support to the limit.

"You say some of your noncommissioned officers failed to reenlist because their employers do not want National Guardsmen in their organization. Where were these men employed?" asked the Colonel.

"One of them is with the street railway company, and another is with a manufacturing concern," replied the Captain.

"All right, suppose you go to the corporations with a proposition of rendering them a service in case of fire, flood, storm, or other disaster, show them that Company B is the only organized and equipped body of men in town that is capable of being called into service in an emergency and that can be depended upon to step in and take charge of affairs when the local authorities have exhausted their resources and have their backs against the wall. Tell them that Company B stands ready and willing to do this community service in case of emergency and show them your plans for the mobilization of the company on short notice. In connection with all of this, you propose that you make a military survey of their plants and work out these relief plans to meet any emergency that may arise. Such a survey will include the location of sensitive and vital points in the establishments and your plans for the protecting them with guards and relief parties. You will find these people interested because you are proposing to render them a service.

"At this time you do not have to bring up the employee question at all. They will eventually bring it up themselves and coming from them is better than coming from you. The chances are that they will be encouraging their men to take on in Company B."

"That's all fair enough for the fellow who has nothing to do but command a company in the National Guard. You know I have a living to make, too," argued the Captain.

"Again I was anticipating that remark. You are in the insurance business?" affirmed the Colonel.

"Yes, sir," answered Captain B.

"Can't you see, man, that the contacts you make in connection with the service of Company B will stand you in good stead in the insurance business? Can you get any better approach to a man than the offer of a service to him? Your business depends absolutely upon favorable contacts. I'm pointing out to you the best way in the world to get them. In the game I'm talking about you never know when you may be rustling up a high commission policy. There are dozens of industrial concerns here any one of which may re-

quire the services of Company B any minute. I do not think it is necessary for me to say more on this subject, is it?"

"No, sir," replied the Captain. "I get your points."

"Now, for the sixth chip. A National Guard company needs opportunity to display its goods. If these opportunities do not exist they must be created. An up and going Legion post has occasion to turn out several times each year. They are the logical organization to have charge of the local patriotic affairs. In order for Company B to get in on these, the company must have a standing with the Legion. This all means that you as the Captain of Company B must take a leading part in the conduct of Legion affairs. You can render indispensable service to the Legion, and by working it in the proper way you can be one of the leaders of their activities.

"My advice to you is to brush aside any personal feeelings you may have against the Legion. Get into the organization with both feet and play the Legion game big. You need them for Company B, and they need Company B at every turn of the road. I am sure you see my contentions and how you can work out the solution of the problem to the benefit of the National Guard."

"Yes, sir," was about all the Captain could say.

"I expect to see your activities along the lines I have indicated reflected in the future reports on your company. I realize it is going to take you a while to get these things operating but when you do I am sure you will find them all to the good," said the Colonel.

Captain B thanked the Colonel for his visit. He expressed his sincere appreciation for what he had done for him. He assured him that the day marked a new jump off line for the company and for himself as well. So it proved.

"DUTY with an R.O.T.C. unit, the National Guard, and the Organized Reserve offers an excellent opportunity for living in a civilian community and for obtaining an understanding of civilian thought and processes. Only officers of the highest type should be assigned to these duties. They are under constant observation and they have an excellent opportunity for promoting the welfare of the Army and their own arm. Under our military system, our armed forces, in the event of a great emergency will be composed largely of citizen soldiers. It is essential that officers of the Regular Army understand the psychology of our people. They will command citizen soldiers in war and there is no better way for an officer to prepare himself for future command than to serve with one of the citizen components or an agency such as the R.O.T.C. * * * While not in command, officers will have opportunities of working with large organizations and above all they will have an opportunity of obtaining first hand information of the viewpoint of our citizen soldiers and of what they are accomplishing under very difficult conditions."—*From the address of Major General John W. Gulick, Chief of Coast Artillery, at the Graduation Exercises, C.A.S., 1931.*

Orientation of R.O.T.C. Freshmen

By Colonel P. L. Miles, Infantry

AUTHOR'S NOTE: *The following orientation with such modifications as have been necessary to bring it up to date has been given to freshmen at the University of California for four semesters and has been well received. I believe it has helped to raise the morale of the unit to a high plane and I submit it because I believe it may furnish others on this duty an opportunity to obtain information of methods used at this institution which may have some value.*

It is obvious that at the beginning of the basic course it is desirable to assemble the newly enrolled freshmen to tell them something of the course and the purpose of the training. In the absence of this introduction it is possible that a student might complete the entire basic course without a clear understanding of what it is all about. The following introductory talk is given as if addressed to the assembled students.

IN the first place, I want to say that I do not feel called upon to justify military training in colleges and universities generally nor in this institution particularly. That matter has been settled for us; but I know that if you realized that the matter had been settled logically and sensibly, instruction would be easier and your work more pleasant, intelligent and profitable to you.

The Federal Government goes to considerable expense to maintain this training. It surely expects a return for this expenditure in added security to the nation. The State evidently believes that this training has another value in addition to the one just mentioned. The State, of course, cooperates wtih the Federal Government in the matter of aid to public safety; but, in order to do this, it is not necessary for it to go to the length of requiring all of you to take military instruction. No, the State and university authorities have an independent view of the value of this training quite apart from its value to the country in making you potential officers and noncommissioned officers in time of national emergency. I shall speak of this value to you later.

Let us first take up the Federal Government's point of view.

The R. O. T. C. is part of the nation's plan of preparedness for the possibilities of war. The question immediately comes to the minds of some of you: Why prepare for war? Have we not heard that preparation in itself may lead to war? Some of you may believe that the Kellogg peace pacts and other sincere efforts of a similar nature, designed to aid the maintenance of peace in the world, will serve not only to outlaw war but to eliminate it altogether. If you believe war can be abolished altogether you believe something different from the realization of most of the statesmen of the world and you must remember that the decision for or against war in any particular case is nearly always in the hands of the statesmen. It is only when diplomacy fails that the soldier must step in.

The hope in these peace efforts is to resolve some of the difficulties, to reduce some of the international frictions, to arbitrate whenever we can, to conciliate and therefore to reduce the probabilities of war. You must understand, though, that the undertaking in the Kellogg peace pacts was only to influence the signatory powers to refrain from being the aggressors in war. No nation has agreed nor ever will agree to prostrate itself voluntarily and give up its right to defend itself. And right there is the reason why the practical value of the pacts is so greatly restricted. Opposing nations will never admit being the aggressor in any case. The allies and associated powers believed that the central powers were the aggressors in the World War. The Germans, though forced by the Treaty of Versailles to accept war guilt, have never voluntarily admitted that they were aggressors. On the contrary, many prominent Germans have filled columns of newspapers and periodicals, which some of you may have seen, specifically and emphatically denying any such aggression.

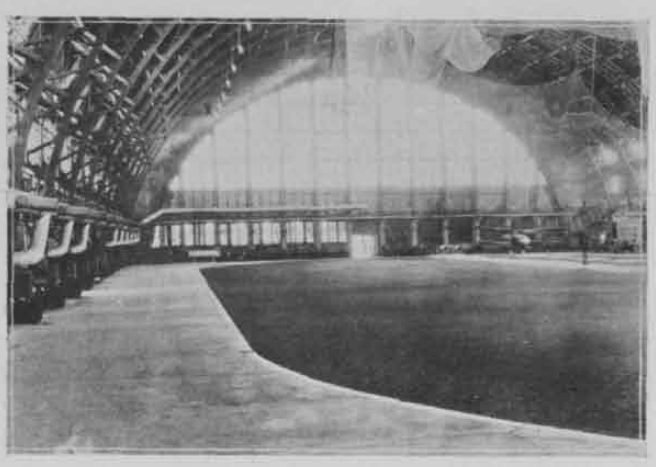
Last year the Manchurian Chinese and Soviet Russia were engaged in open hostilities. They were both sent notes by our Secretary of State calling their attention to the fact that they were signatories of the Kellogg Pacts. They both replied denying responsibility as aggressors. You may remember how curtly Soviet Russia replied to that note telling us in substance to mind our own business, that she was fully aware of her responsibilities under the pact and that in that pact she had surrendered no right to defend herself.

We must not assume that these peoples are sinister or insincere. On the contrary, they nearly always are convinced of the justness of their positions. They have such different backgrounds of belief, such different standards of living and of morals, are likely to have such divergent views of what is right, and are so unconsciously influenced by interest that they can not see any international problem as a disinterested person sees an abstract question. Due to the different point of view the problem is always presented in a different aspect. It has been wisely said that war is not a conflict between right and wrong but between right and right: between right as one people see it against right as their opponent sees it.

For many centuries, men have been seeking ways to eliminate war as a human institution. The most we can hope for is progress. Complete elimination of war can not be expected until human nature undergoes a complete change and human nature has changed but little under the veneer of all the centuries of civiliza-

tion. We have about the same emotions that the caveman had. Of course, we have better control of these emotions than he had, but we are still strongly influenced by love, hate, selfishness, anger, greed, envy, desire, conceit and the whole gamut of emotions.

When we love all men of whatever race or creed as we love ourselves, when we are willing to share everything we have with any pauper without question as to his worthiness, when we are willing to lower our own standards of living to a common level with the rest of the world, when we no longer resent having some one take from us what we believe belongs to us



Interior of Armory, University of Illinois.

and when we are smitten on one cheek and truly turn the other—then the abolition of war will be possible.

War is nearly always caused by the conflict of the economic interests of peoples. The pressure of excessive populations, the emigration from barren or stricken lands, the constant struggle to improve living conditions, the seeking for food and the things necessary for the industrial life of a nation—all of these things have caused many wars in the past.

It is difficult to convince a man who can procure no work in his own country, or who receives there a mere pittance for his toil, of the justice of denying him the chance to work in a more fortunate country where the opportunities for profits from his labor are greater by many fold. On the other hand, while the man in the more fortunate land can well afford to be generous and is usually willing to be so, he is seldom willing to be generous to the extent of sharing his job and his profits with the less fortunate stranger from foreign lands. These fundamental causes still exist and may still lead to war sometimes in spite of every means invented to prevent it.

In this our own beloved country, we have more God-given resources, more wealth, more prosperity, more comforts and luxuries than any people ever had since the world began. We are told by the economists that our prosperity is associated with the questions of high wages that increase the capacity of consumption and elevate the general standard of living, of the consequent increased productivity of the country responding to this power of consumption, and of the power to market our surplus products abroad. The majority of our people seem to believe that these questions are related to certain political policies, immigration restriction and the alertness of our Government to further the opportunities to market our surplus abroad. These are the things that affect our standards of living but unfortunately they are the very things that cause friction with other peoples.

We should ask ourselves, are we willing to give up any of the things which our fortunate citizenship in this country has given us, are we willing to lower our standard of living? If not, then we must be willing some time or other to fight to maintain it. I believe that our people as a whole are disposed to go to the limit required to maintain it. I hope that day will not come in your life times, but one can not predict when that dire necessity may arise. It is therefore only a matter of common prudence to make suitable preparations against that possibility.

The argument is frequently advanced that measures of preparedness in themselves bring on wars. It is true that a feverish preparation at a time of inflamed public feeling might do so. It is also probably true that competitive arming directed against a particular nation may produce such friction amidst the tinder of international sensibilities that the spark of war is ignited and a devastating conflagration is begun. But a moderate and reasonable preparedness never has done so. Arms and ships and airplanes in themselves do not cause war. Men fought with stones and clubs long before arms were invented.

The R. O. T. C. is a cog in the system of moderate and reasonable preparedness which the representatives of the people of this country in Congress have instituted. So much for the Federal Government's point of view.

Now, what do the R. O. T. C. courses offer you personally? What good do you get from them as an individual? What do you get from the R. O. T. C. training that will benefit you in the profession or civil pursuit you expect to follow after graduating from the University?

First, let me mention the most obvious thing you will gain—discipline. The American people and especially American youth are prone to resent that word. It has been said that the American people are the most undisciplined people on earth. If that be so, it is because they think it inconsistent with the fullest measure of liberty. It is because the real meaning of and need for discipline have not been understood.

A very broad definition that will give you an understanding of what we mean by discipline is this: Discipline is that quality that assures the orderly and dependable accomplishment of a deed according to plan. Modern society is congested and complex. Without discipline, it would be in a state of utter confusion and without personal security. No business can run successfully without discipline and the larger the business, the more important relatively becomes the subject of discipline in the organization.

Military discipline is discipline of the highest type,

because it must be so ingrained that it will cause the habit of obedience in the soldier with such promptness and with such automatic force that the deed desired by the commander will be executed as a matter of course. The aim is to have such a habit of automatic obedience that in cases where the soldier is subjected to great personal danger, he will execute the will of his commander before the natural instincts for safety assert themselves in overpowering fashion.

You young gentlemen come here with high aspirations to leadership in some walk of life or other. Dean Rieber, whose philosophy you will come to respect and whose personality you will come to esteem, has said that no man has a right to aspire to leadership who has not first learned obedience. How does any leader know what he demands of his followers if he has never subjected himself to the discipline inherent in the following of a leader? Discipline is sometimes like a disagreeable but effective medicine; perhaps unpleasant in the taking but certainly beneficial in its effects.

I have dealt at some length on the subject of discipline because a great deal of our training here is disciplinary. Close order drill is almost wholly so. It would take but a short time to get sufficient coherence in ranks to permit the placing of men on the battle field. The purpose in the repetition and the strivings for exactness is disciplinary—to get those automatic reactions, those easy relations between mind and body that cause assembled individuals to act as a team.

Some of you gentlemen will find that you are lacking in good coordination between mind and body. You may not think quickly enough; you may be careless in thought and neglect to fix your attention at the right time on the part of the command that tells you what you are to do; or you may be unable to make your body do at the right time what your brain tells it to do. Close order drill will help you to overcome these deficiencies and will bolster up the mind's control of the actions of the body. Good close order drill has also the purpose of developing pride in one's self and in one's organization. There is a satisfaction in knowing that you are an actor in a good exhibition. A student of this university once told me that he felt submerged and of little consequence in ranks until the thought came to him how unfavorably conspicuous he would become and how unfavorably his action would reflect on his organization if some time at parade before critical spectators he should execute order arms when all the rest of his company had executed right shoulder arms. This thought served to impress upon this student his importance in the machine.

We shall pass over by merely mentioning them, the benefits to be derived from physical training and training in punctuality, cleanliness, neatness, exactness and respect of authority. You probably are not fully aware of the physical benefits you get here in this and the Physical Education Departments in one year.

One instance may serve to emphasize the physical advantages of this training. At the beginning of one semester we had a very hot drill day. In spite of all our precautions we had twelve or fourteen cases of minor heat prostrations. It should be of interest to you to know that every one of these cases was a freshman. No man who had a year's training was affected.

We believe that the Military Department offers a training in effective organization and in leadership, including the giving of orders and directions, the necessity of follow-up or supervision and the management of men that will be of value to any of you who become leaders in any walk of life. Moreover, we do not believe that the same or similar opportunities for this training are offered by any other department of the University.

It has been found that for military needs, one leader can not effectively deal with more than eight or ten men. When the number available is greater than eight or ten, there must be a subdivision into two or more parts with two or more subleaders in addition to the leader. This increases the overhead and the apparent number of ineffectives. Nevertheless, the added control and supervision by those who are apparently ineffective more than offsets the loss of men in ranks| The same principle should be applied in business organization. Whether it is always applied with intelligence and economy your training here should help you to determine.

You will learn here that orders are delivered through the chain of command. If you are a superior commander, you should not deal directly with a junior commander's unit, ignoring that commander. That is a principle to apply in business. So is the proper relation of the staff to the command something that should be applied in business but is not always understood or done by it.

Some of the students here have observed that what was apparently thought to be a discovery in the economic organization of labor by an author on that subject has been in use a long time in the Army as a principle of organization. I refer to the requirement that specialists learn other jobs besides their own in order that men may be interchanged and the organization not to be disrupted by casualties. This is an age of specialists in professions, business and industry. In many cases, the pendulum has swung to overspecialization. Industry can learn something from the Army in this respect. Think about this if you take the course in labor economics.

A great many men seem to think that leadership is inherent and God-given, that a leader naturally asserts himself and springs into position without effort or preparation like a child born to the purple. It is true that some men have natural ability as leaders, but it is just as true that leadership can be acquired by an understanding and application of its principles and intelligent training in them.

If you expect to have a thing done as you desire it done, you will learn here how carefully and exactly you must give your directions. You will learn how much explanation of a new matter you can give at one time with a reasonable expectation that it will be absorbed. You will learn that, other things being equal, the length of such explanations must be shorter

for a group than for an individual and shorter for a large group than for a small one. You will learn the method of being forceful without being offensive. You will learn the necessity of follow-up or supervision—that it is not sufficient merely to give an order or direction but that you must follow it up yourself or have an organization to follow it up for you to see that your direction is properly understood and executed as you intended.

Supervision of execution develops your power of observation. You learn to observe a whole group and pick out errors of execution. You learn something about the handling of men and you begin that as soon as you are made a corporal or a lance corporal and get a group to be responsible for.

Your actions as commanders of even the smallest groups must be such as to command respect. The best way to do that is to impress on your group at the outset that you know your "stuff" accurately and fully. There is a way of requiring attention to business without being offensive. There is a way of getting your command to do a thing not only willingly but enthusiastically. There is an excellent opportunity here to learn through practice how to lead other men—to make them do the thing you want them to do, cheerfully, with everything in them. If you acquire that ability here and take it away with you when you leave the University on graduation you will be leaders.

This is by no means a full discussion of the offerings of the Military Department, but it will serve to orient you and perhaps clear up some misconceptions.

Armory, University of Illinois.

Radio Sets for Coast Artillery

By Captain Fred G. Borden, Signal Corps

DISREGARDING the radio sets issued to harbor defense units and to harbor vessels and army mine planters, the new table of basic allowances prescribes the following radio sets for Coast Artillery Corps units:

1 SCR-132 for each brigade and regimental headquarters of railway, antiaircraft and tractor-drawn artillery.

1 SCR-136 for each battalion headquarters and regimental headquarters battery of railway, antiaircraft and tractor-drawn artillery, and per lettered battery of railway artillery.

These two sets have many characteristics in common. Each was designed primarily for communication from ground units to aircraft. Each can transmit and receive the three types of signals in common use, viz., continuous wave telegraphy, tone or buzzer modulated telegraphy, and voice (telephone).

The power supply for the transmitters in the field is ordinarily furnished by means of a gasoline engine driven generator, however provision is made to obtain the necessary power by means of a motor generator at any location where either 110 or 220 volt single phase alternating current is available. The motor generator for the SCR-136 is designed also to operate from a 110 volt DC power supply.

A table showing some of the characteristics of the two sets follows:

	SCR-132	SCR-136
Frequency Range, KC	150-350	330-860
Wave length range, meters	850-2000	350-900
Total weight of set, lbs.	2250	975
Weight of heaviest component parts (power unit) lbs.	900	365
Weight, Transmitter Set Box, lbs.	400	127
Consistent Range, CW, approximate, miles	150	80
Consistent Range, voice, approximate, miles	50	30
Cost of complete set	$5,595.00	$1,675.00

The approximate consistent ranges above given are for ground to ground communication between similar sets under usual conditions but under abnormal conditions they may be considerably reduced by the effect of static or other interference. The consistent ranges between these sets and sets in aircraft are approximately the same as those given above. Under some conditions all of these distances may be greatly exceeded.

Complete descriptions of the sets, including details as to their installation and operation, are contained in the following Technical Regulations:

SCR-132—TR 1210-30 (Now being printed)

SCR-136—TR 1210-20 (Recently printed and distributed).

These sets are exceptionally well built, mechanically, and, considering the necessarily delicate nature of all radio apparatus, will stand fairly rough handling. Due to the considerable weight of the component parts, both types require vehicular transportation. An entire SCR-132 can be transported on one standard Class B truck; two light trucks are however preferable.

All motor vehicles used for transporting radio sets, by all means, should be equipped with pneumatic tires.

The transmitting antenna system of the SCR-132 is of the modified umbrella type, the mast being eighty feet high. The antenna proper is composed of two sets of six wires each arranged in 45 degree fans on opposite sides of the mast. The counterpoise is also composed of two six wire fans directly under the antenna wires.

The antenna system of the SCR-136 is a single fan and consists of three antenna wires each about one hundred fifty-five feet in length on masts thirty feet high, the antenna wires being spaced about twenty-two and one-half degrees apart. There are three counterpoise wires directly under the antenna wires and about four feet above the ground.

Both of these sets represent the highest attainment that has been obtained in the radio art for sets of this character either in our own or foreign armies or by commercial concerns and the SCR-132 is probably the most powerful portable set in common use today. Every effort has been made to keep the weight and size of each set to the minimum consistent with the required ruggedness and the power required to insure long range communication (the power required by the SCR-132 is sufficient to light one hundred 50-watt lamps). Both of the sets are in the intermediate frequency band. The possibility of the use of higher frequencies requiring less power, and hence, permitting a great decrease in the weights of the sets will be discussed later.

All organizational radio equipment should be designed solely from a standpoint of its practicability in war and no characteristics should be sacrificed which would tend to make it less efficient in combat in order to make its operation more convenient in peace. For example, it is possible to permanently build a radio set into a motor vehicle and to operate it therein and for peace-time training and maneuvers the installation is feasible, but when examined from a standpoint of its use in war, many problems present themselves. For example, the vehicle may break down or encounter impassable roads, which would prevent the transportation of the set to the necessary location; due to enemy observation it may be impossible to use roads and all equipment must be transported across country by use of animal-drawn vehicles; due to enemy aerial activity it may be necessary to install all radio sets in dugouts.

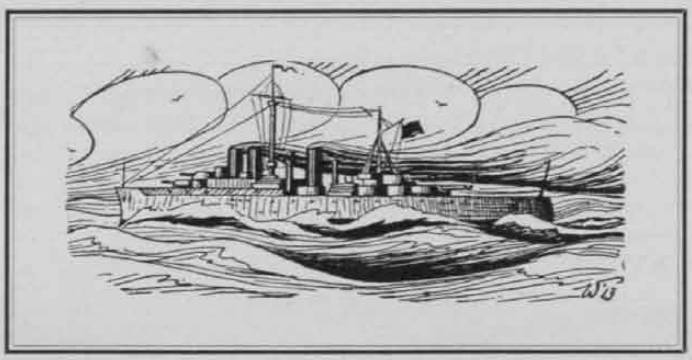
The advantages and disadvantages of such installations must be compared and decisions made as to what is most practicable under such combat conditions as might be considered normal.

Luckily, an opportunity to install and operate both the SCR-132 and SCR-136 under adverse conditions for long periods presented itself in connection with the Nicaraguan Canal survey recently conducted by the Corps of Engineers. Two SCR-132 and two SCR-136 sets were furnished to the engineer battalion in November, 1930 and were in practically continuous operation for several months, the most serious interruption being caused by the breaking of a piston in one of the gasoline engines. It is difficult to imagine a more impassable country over which to transport large and heavy radio sets or a climate offering more difficulties in the proper maintenance of radio equipment. A small detachment of Signal Corps enlisted men was furnished for the installation and operation of these sets. That they performed their duties well is evident from the following—"The Chief of Engineers is pleased to note the exemplary and efficient performance by enlisted men of the Signal Corps attached to the United States Army Engineer battalion in Nicaragua of their duties." In this connection it may be said that reported failures of radio equipment can usually be traced to faulty operation. Radio sets are necessarily complicated, and unless the operation and maintenance personnel are thoroughly competent, successful results cannot be expected.

While the furnishing of high frequency radio sets to the Coast Artillery Corps in the near future as a replacement for the SCR-132 and SCR-136 sets is not contemplated at present, yet, since the tendency of radio development is more and more towards higher frequencies, it might not be out of place to discuss briefly some of the powers and limitations of and some of the problems encountered in connection with high frequency development. The most striking advantage of high frequency sets over intermediate or low frequency sets is the great distance of transmission attainable with a minimum of power and since the weight and size of a radio set are in direct ratio to the power requirement, the great military advantage is immediately evident. A set having a range of one hundred miles need be only about one-fourth as large or as heavy when designed for frequencies of the order of three thousand kilocycles than when designed for those around three hundred kilocycles. On the other hand, high frequency communication contains a lot of quirks, some of which are not yet fully understood, and which are not encountered when using intermediate frequencies such as are those employed by both the SCR-132 and the SCR-136. For example, high frequency sets have a skip distance over which no communication whatever can be carried on. This skip distance is usually greater at night than in daylight and varies with the season, terrain and even from minute to minute. Due to the fact that a radio signal appears to have two components, a ground wave and a sky wave, the former very limited in range, this skip distance will not begin directly at the set but commences at the point at which the ground wave disappears. This distance varies greatly depending upon the frequency used and on many other factors.

Assuming that the ground wave is of sufficient strength to insure continuous communication up to twenty miles from the set, then the skip distance will commence at twenty miles and no communication will be possible until the sets are far enough apart to be within that area to which the sky wave has been reflected. The higher the frequency the greater this latter distance will be. As stated above, the skip distance effect is greater at night because the reflected distance is greater during darkness. Except for very high frequencies, the ground wave and reflected sky areas overlap during daylight, hence communication is continuous.

Since it is evident that for all distances over which the SCR-132 and SCR-136 are designed to work the effect of a skip distance will prevent communication in certain areas, it is evident that, in order to obtain the great advantages of small power and light weight, the frequencies adopted must be those which will insure that no skip distance will normally exist. This is a matter that will require an extended research over various kinds of terrain and at widely separated locations. A comprehensive study of this character is now being made including sets having frequencies as high as fifty thousand to sixty thousand kilocycles involving wave lengths of around five or six meters. Results so far obtained are being examined with a great deal of interest.



Events Overseas

By Lieut. Col. Herman Beukema, Professor, U. S. Military Academy

A LEAGUE "with teeth in it" is proposed once more. France has placed itself squarely behind the project offered September 1 by M. Paul-Boncour, chairman of the Foreign Affairs Committee of its Chamber of Deputies, that the land, air, and naval forces of all League members be pooled to execute the mandates of that body whenever needed. The idea of such an international police force is not new. Brought forward by Leon Bourgeois in 1919 for incorporation in the Treaty of Versailles, it found no support outside his own country.

Judging from the immediate repercussions in Continental capitals, the thesis has small chance of acceptance. Too large the French military establishment, too solid and substantial the bloc of votes in the Council under French control for the mental comfort of rival Powers under such an arrangement. The press of London, Berlin, and Rome see behind the proposal a French hegemony permanently clamped on the Continent. Paul-Boncour has provided an active talking point in the diplomatic parleys preceding February's International Disarmament Conference.

After all, is it safe to hold the Conference? Or would it be wiser to postpone such a major surgical operation until an ailing world has recovered something of its normal health and temper? The prime movers behind the effort scheduled for February 2, 1932, are wondering whether they have not pushed matters so rapidly and at a time so unpropitious as to retard, or possibly to scuttle, every hope of success in this movement for world peace. If the declarations of Paris, London, and Rome over the past two months are to be taken at face value, deadlock already exists, five months before the gavel is raised. The French memorandum of July 21 to Geneva announces briefly that that country has already reduced her armaments to a minimum. Typically Gallic is the added remark that disarmament is a political not a technical question. Ramsay MacDonald likewise finds his country's defense preparations at the lowest point consistent with safety. Mussolini insists on quid pro quo. He will scale down only when and if his rivals do so, and only if he may retain an armament as strong as the strongest. Parity with France in brief. The intransigent tenor of such pronouncements is understandable when we note the fear on the part of Europe's political leaders that for many months at least the Continent will continue to be a boiling kettle of political and economic feuds. In such an atmosphere disarmament would strangle.

In spite of these obstacles, steady progress is made on the draft treaty which will constitute the working text of the Conference. Already it is obvious that limitation of aircraft, will constitute a major difficulty. London and Paris, remembering the Zeppelin raids, wish to limit dirigibles as to number, volume, and horsepower. Military airplanes, under that proposal, are limited as to number and horsepower, and a further check is placed on strength of personnel. Whether there will be any attempt to interfere with that highly variable strength factor, the commercial plane convertible to military use, is doubtful.

The British Empire

United Kingdom. Labor is out. The MacDonald Cabinet which came into power on a tidal wave of votes June 5, 1929, resigned office August 24. Asked by King George to resume his duties as premier and to organize a new government of all parties, MacDonald assented. Within twenty-four hours he had secured the King's approval of a Coalition Ministry, in which Labor and the Conservatives both held four appointments, and the Liberals, two. Philip Snowden remains as Chancellor of the Exchequer. Stanley Baldwin, Conservative leader, and twice a premier becomes Lord President of the Council.

Parliamentary acceptance of the Ministry, when that body convenes September 8, seems a foregone conclusion. MacDonald can count on the solid support of the Conservatives, and probably of all the Liberals. How much more than a handful of the Laborites will follow him out of the Socialist fold is a question. For, note his words in his radio appeal to all classes of Britons: "I have not the Labor Party credentials for what I am doing . . . Be that as it may, I have the credentials of an even higher authority, those of national duty as I conceive it, and I obey them irrespective of consequences." Rank apostasy that, in the eyes of the Trades Union Council, executive committee of Labor. And promptly the four Labor apostates who hold portfolios in the Coalition Cabinet are read out of the party. In short, Labor has so far gone the road to Moscow as to declare that the interests of the proletariat supersede those of the nation. They refuse to see that wide open pit which has opened before British credit, the patent fact that its further depreciation will so strike British commerce and industry as to make intolerable the hard lot of the worker. Whatever Labor's view, England has decided to retain the services of MacDonald and Snowden, who, it seems, will be "kicked upstairs"—into the House of Lords.

MacDonald's economy program awaits detailed announcement, but higher taxes and a slash in expenditures are certain. The dole is apparently due for a ten per cent scale down, not enough by a good margin to bring it in line with the reduced cost of living. A political truce is guaranteed by the tripartite group

in support during its passage, and with that goal achieved, the bludgeons will be taken up again in preparation for a new general election.

An incident of note in this drama appears in the emergence of the Crown from the status of figurehead, to which British politics had relegated it in the past century. It was by the King's "command" that the opposition parties joined MacDonald in the fight for the nation's credit. Not since the emergency of 1915 has the world witnessed such an assertion of the royal prerogative in England.

The reaction in favor of British credit was almost instantaneous. Private banking interests in the United States and France raised $400,000,000 within 36 hours to support the pound. Meanwhile, the Prudential Assurance Association of Great Britain mobilized a half billion in foreign securities for a similar purpose.

The Dominions. Canada alone hold its head safely above water, and even she shows signs of distress. The drought has given her a devastated area over a six hundred mile belt in the prairie region, covering an average depth of 150 miles just north of the international boundary. No merchantable wheat will be harvested there this fall. Relief legislation of all kinds will entail the highest national expenditures in history,— at a time when income is dangerously low.

Australia, having bravely chosen the hard road of honor, is considering the recommendations brought forward by an Economy Committee. If carried through, the Commonwealth will achieve savings for the fiscal year estimated at about a half billion dollars. And Premier Lang, New South Wales' apostle of repudiation and dishonor, ate crow when, hat in hand, he came to his Council for the funds to pay his Civil Service. New Zealand, like Australia, is paring defense appropriations in a drastic manner. The cut involved a complete reorganization of her military forces. Compulsory training is abolished. How difficult her situation has become may be realized from the fact that, requiring an expert trade of £10,000,000 annually to cover the Dominion indebtedness, her exports today are virtually wiped out.

Western Europe

France. Cautious is the word of the hour. The Laval administration looks twice before each step in the snarl of Europe's politics—and strengthens its defenses. It joins hands with Russia,—but how far? We learn one day that a treaty of non-aggression has been concluded between Paris and Moscow, binding each party to neutrality in the event that the other is attacked without provocation by a third power or a coalition. Next day the Ministry of Foreign Affairs denies that any signature has consummated such an agreement. But there is an official communique which speaks of "steady progress" toward a commercial accord with Russia.

Help for Germany? Of course. But French short term credits to her rival are negligible. The risk is too great. Moreover, Premier Laval announces there "can be no credits without confidence", or to translate, France wants political guarantees as to *Anschluss* and the *Treaty of Versailles*. Austria's action in renouncing *Anschluss* September 1 helps clear the way for future credits to Germany.

The "war in the air", Europe's great bogy, has become an obsession. Active preparation for and against it appears in the air budget for the new fiscal year, stepped up by $7,000,000 to a new high of $86,428,000. Hand in hand with these preparations for attack go the anti-aircraft defense measures, Marshal Petain having succeeded in rousing strong public interest spirit to the necessity of constant tests. Following Lyon, Toulon, and Nancy, Dunkirk was subjected in August to a large scale aerial attack. Permanent defense installations for Paris, Toulon, and Metz are expected in the immediate future.

Independence for Syria appears on the horizon as France declares itself ready to abandon its mandate. But there is a string to it. A firm alliance is to unite the new nation to France, blocking any possible appeasement of Italian land-hunger in that quarter. The project is expected to appear before the League Council at its next session.

Franco-Italian negotiations on naval reduction potter along, illuminated from time to time with vague reports of progress.

Spain. Spain zigzags confusedly. Radicalism and regionalism provide pitfalls and barriers to every constructive effort of Zamora's provisional government until the press, in early September, finds Madrid in the "totter" stage. Just what do the Spanish people want? The forced removal of a king, and the curbing of the power of the Church had the support of the vast majority of the populace. From that point forward it has been a bitter tug of war between violently opposed elements, all determined to cut the cloth of the new government to their own pattern. Apparently, a liberal republic will be the offering of the Constitutional Assembly which began its labors in the closing days of July. But how liberal? Syndicalists, Marxian Socialists, Communists, and Republicans contest for the upper hand, showing no mood for compromise. The Socialists boast the strongest single party in the Cortes, but it falls sufficiently short of a majority to necessitate an alliance with the Republicans. And the militant minorities, Communist and Syndicalist, live up to their code of bad manners with strikes, riots, bombs, and what-not.

Disorder has become chronic, in spite of the repressive measures used by the police and army. Barcelona is, as always, the heart and center of extreme radicalism. Under virtual martial law for weeks, it neverthless became on September 3 the scene of the most serious efforts to date toward violent overthrow of established government. Sindicato Unico, violently radical labor organization, succeeded in paralyzing all commercial and industrial activity by means of a general strike. After two days of hard fighting in which artillery was used on the Syndicalists' headquarters and arsenal, the strike appears to be broken, although

the Anarchists now order its continuance. An earlier and similar effort at Seville was nipped when the troops struck hard, arriving just in time to rescue the bakers who were being browned in their own ovens by their Moscow-minded employees.

Catalonia's referendum, August 2, on the question of autonomy for that province, indicates that only a minor fraction of one per cent of its population is opposed to that step. As a result, Madrid faces a demand, which, if granted, will leave the Catalans practically independent of that capital. Encouraged by Catalonia's action, the Basques and Galicians have also taken up the independence cry.

Central Europe

Germany. "This is an illiquidity convulsion, not an economic collapse," declared one of the financial experts called in to examine the Reich on its sickbed. The others agreed, and it became a question of diet and medicine rather than surgery. Today, the patient shows encouraging signs of convalescence. But there have been terrible sinking moments. Witness:

July 13—The Darmstaedter and National Bank, one of five largest in Germany, closes its doors. Several great industrial firms crash. Mark drops to 21 (par is 23.82).

July 14—All banks closed by decree over the 15th, trading on security exchanges prohibited.

Aug. 9—Fascists and Communists seek in referendum to dissolve the Prussian Diet, and ssecure new elections.

In each case remedies were found. Germany bravely chose the method of self-help,—reduced expenditures, more taxes. The financial representatives of the United States, Great Britain, France, Italy, and Belgium, backed by the Bank of International Settlements, provided means to further extend the short-term credits previously granted Germany. And the Fascists fell short by more than 3,500,000 votes of the number needed to topple the Prussian Diet. On that occasion the Communists, even more ugly than usual, were clubbed and shot into quiescence after two days rioting.

The immediate danger was over by the end of July. The mark again approached parity, German bonds rose in all foreign exchanges and the Reichsbank rediscount rate, raised to 15% at the height of the crisis, was dropped to 10%. Late in August a 7% rate became general throughout the country. Not till September 3, the day of reopening of exchanges, which had been closed for seven weeks, was German faith in the nation's stability put to a full test. Stocks were dumped at a sacrifice as high as forty per cent of their previous values, with few takers to be found. Foreign buying the following day ended the calamitous drop for the time being, but the future appears dubious.

Germany and Austria saved face, and little else, when on September 3, they publicly renounced their customs union. The announcement anticipated an unfavorable decision by the World Court, which has had the legalistic aspect of the matter under consideration. No bar to German action in that direction was found by the Court, but Austria was found estopped by her commitments under the contract entered into by Vienna, when in 1922, she secured a loan from a group of Powers, members of the League. Schober, Austrian Minister of Foreign Affairs announced bravely that this is but a temporary setback, not ultimate defeat. Of greater importance than the Court decision was the fact that France, strongest opponent of the proposed union, today holds the whiphand over European finance, a fact which the impoverished Teutonic would-be partners cannot hurdle.

Italy. Bluster is no new element of Italian pronouncements. Senator Scialoja, Italy's representative at the Permanent Court of International Justice at the Hague, making his plea for Italy in the Austro-German Customs matter, stated bluntly that the decision might mean peace or war. Mussolini, speaking to his Blackshirts at Ravenna, declared in part, "We are ready to overthrow and destroy everything which may impede the march of the Fascist revolution." Repeatedly and from the outset he has denounced the international conferences at Geneva and elsewhere which are seeking a way out of Europe's economic morass. And he has so far abandoned hope of any desirable outcome of the approaching General Disarmament Conference, if we are to accept his statements at their face value, that he suggests a one year international truce on all armaments as a palliative. Finally, he proposes to give the League one more chance to solve the problem of Europe's economic rehabilitation. Failing in that he demands a free hand for Italy's quest of "harmonious relations" to avert the split of Europe into two hostile camps.

The mobilization of the Fascist Army is scheduled this year to take place in an area north of Venice, between the Piave and Tagliamento Rivers, not far from the Austrian and Yugoslav borders. No significance is attached by the Italian press to the site selected, even though the recent French maneuvers on the Franco-Italian border are taken into consideration. However, the ability of the Fascist auxiliaries to mobilize promptly and effectively for any emergency is to be made clear to the world. The annual air maneuvers, beginning August 26, in the vicinity of Spesia, involved the assemblage of about 1,000 planes, the largest air fleet ever brought together in Europe.

At this writing, the Fascist-Vatican controversy, Mussolini's most difficult domestic problem since May, seems to be over. Under the agreement forecast, the Vatican will be assured of full control over the religious education of Italian youth. In all other spheres the Fascist government will have direction.

Eastern Europe

Russia. Opportunist Stalin again startles the world with one of his lightning changes of policy. Briefly, the "class war" is over, and the Russian people are a united whole, if we are to believe his announcement. In particular, Stalin is making overtures to his skilled engineers responsible for the management of the gi-

gantic industrial establishments which are being set up under the Five-year plan. Invidious distinctions between the highly skilled personnel inherited from Czarist days and the younger dyed-in-the-wool Communists are swept aside. The reason for it all lies on the surface. Communist efforts to build a gigantic industrial plant have thus far been a history of one calamitous failure after another, except in those cases where foreign engineers (usually American) have had complete control. And the successive trials of the Czarist engineers for sabotage of these efforts have failed even to provide the necessary goat for the appeasement of national wrath. Hence the olive branch and cooperation—for a spell. At the same time, the foreigners are to be given a free hand, while the ignorant Commissars who can boast no merit beyond high-powered Communism, are pulled into the background in the administration of industry.

The coming winter worries Moscow. At no time since 1927 has the populace shown more severely than now the unremitting strain of close rationing, war psychology and ever-increasing "tempo." There are promises of a greater food supply for internal distribution, but on the other hand average prices have mounted a full fifty per cent under decrees whose object is to bring more ready cash to the Treasury. Looking beyond the winter, Stalin has recognized the need of a permanent increase in the supply of basic commodities,—in short, a higher standard of living. A new Five-year Plan accordingly takes shape, with the agronomists in charge. Production of live stock is to be increased by from 20 to 60% within the first year. Canning and dehydrating plants are to be erected. A distinct fillip is given by prospects of another record-breaking harvest this fall, increase in acreage having more than counterbalanced the damage incurred from severe drought.

Threats and blandishment alternate in Russo-Polish diplomacy. Large scale Russian maneuvers during mid-July in the vicinity of Minsk, near the Polish frontier are counterbalanced in a measure by Moscow's invitation to Poland for an exchange of information on armaments, as a preliminary to the approaching conference at Geneva. A rapprochement would greatly ease the road for the Franco-Russian treaty of non-aggression. But there are embarrassments. The discovery that Major Piotr Demkowski, brilliant Polish General Staff officer, was a Communist in Russia's service and was keeping Moscow informed of Poland's war plans is a case in point. His summary execution was ordered, and one Bogoboj, Russia's acting military attaché, hastily left for home.

Russian efforts toward armament production are pushed at a feverish pace, though with many a hitch. The new model guns turned out under German management were pronounced very pretty, but the steel refused to stand up under firing conditions. Inferior steel likewise puts a blight on tank production. Better success is reported in the output of aircraft, as signalized by the flight over Moscow August 15, of the ANT-14, the first Soviet-built five-motored plane. Only the DO-X and the Italian bomber KA-90 surpass it in size. It has a speed of 135 miles an hour.

The Balkans and the Near East

Rumania. Bank crashes which speak for themselves alternate with reports of dictatorship, of military alliances (affirmed and denied). The blossoming of the defensive alliance with Poland into a joint bulwark against Russia, under French direction, awaits full confirmation. Sizable orders for armament have been placed by Bucharest with Polish arms factories. Of equal interest are "Pravda's" reports that Rumania is establishing a naval base on Pascel Island, north of Constanza. Russia sees a threat from Great Britain and France, who are charged with inspiring this development to secure a base for future joint naval operations against Russia. Nor is Russian suspicion allayed by the material increase in strength of the Rumanian navy as a result of recent French and Italian deliveries.

Growing communistic infestation of the Rumanian populace is being dealt with drastically. Mere membership in the Communist Party is punishable by imprisonment from six months to three years. Active participation in propaganda is resulting in five to ten year sentences for the culprits. Military authorities have concurrent power with the police in arrest of offenders, and trial is by court-martial.

Bulgaria-Greece. The eleven-year old controversy over the repatriation of the nationals of both countries is coming to a head. Bulgaria has arbitrarily ordered all Greeks to leave the country within thirty days, reprisal according to Sofia for the earlier Greek action in expediting the departure of reluctant Bulgars from Greek territory. The special committee appointed by the League some years back to settle the quarrel has thrown it up as a bad job. Another problem for the World Court.

Turkey. The appearance of 25 Italian hydroplanes in the Black Sea for maneuvers in July has brought a prompt protest from Angora to the Straits Commission. A violation of the Treaty of Lausanne is charged, in that it prohibits passages of the Straits by a force greater than that of the most powerful fleet of the littoral powers of the Black Sea. Rome blandly protests that fourteen of the planes came overland.

Hungary. The retirement of Count Bethlen, "because of ill health" according to his own statement, coming hard on the heels of the loan of $25,000,000 granted the Hungarian government by Paris, occasioned a flurry in the Continental press. Briefly, the premier's head was a part of the price charged by Paris, according to the German version. And with no end of glee these observers discover that Count Julius Karolyi, the new premier, sees "eye to eye with his predecessor," and that his Cabinet is at least a "shadowgraph" of the Bethlen Ministry. Whether the change will put an end to the growing influence of Italy and Germany in the affairs of Hungary is a question for the future.

The Foreign Military Press

Reviewed by Major Alexander L. P. Johnson

CANADA—*Canadian Defence Quarterly*—July 1931.

This issue contains an editorial on the Caribbean policy of the United States. Although the author regards that policy as essentially defensive in character, with security of the trans-isthmian canal route or routes as its sole basis, he, nevertheless, holds that in its practical application it is a contradiction of the Pan-American policy, albeit the two regulate the relations between the United States and Latin America. The methods employed in giving effect to the Caribbean policy, particularly in its economic and political aspects, have aroused serious apprehensions and misgivings, and so reacted against Pan-Americanism. That the underlying motives have been misunderstood is beside the point. The fact remains that the actions of the United States have had the most unfavorable repercussions throughout Latin America.

The Clark Memorandum on the Monroe Doctrine, and more recently, the course of action adopted in Nicaragua and Honduras suggest a definite change, not in the Caribbean policy, but rather in that phase of its application which was productive of much recrimination and misunderstanding. It is still too early, the author believes, to gauge the Latin American reaction to this change and, by way of conclusion, he whimsically observes, "We can not help wondering whether the application of this new 'policy of restraint' was not hastened by the recent British Empire trade drive in South America."

BELGIUM—*Bulletin Belge des Sciences Militaires*—April, 1931.

"The Infantry Regiment in Defense," by Lt. Col. Lesaffre and Capt. Fraeys.

A very interesting and instructive illustrative problem in troop leading, in which the authors cover progressively reconnaissance, preparation and occupation of a defensive position by a regiment of infantry. Appropriate field orders for each phase of the problem form part of the text. The dispositions provide two successive defensive lines in fairly close proximity; the second line is garrisoned by the regimental reserve. The study affords an excellent insight into Belgian defensive combat tactics and principles.

COLOMBIA—*Revista Militar del Ejercito*—Sept. 1930.

"The Work of the Chilean Military Mission in Colombia," By Colonel Jorge Mercado.

The last civil war in his country, writes Colonel Mercado, accredited Military Attaché of Colombia in Washington, had reduced the Colombian Army to the state of a barbarous horde. Organization, as far as there was such, depended upon the whim of revolutionary leaders rather than upon military reason or necessity. Recruiting became more or less of an organized manhunt. Corporal punishment was the basis and means of maintaining and enforcing discipline. The Chilean Military Mission, invited to Colombia by General Rafael Reyes while President of the Republic, changed all that completely. Some of the ablest officers of the Chilean Army were assigned to that interesting and important duty of rehabilitating, reorganizing and training Colombia's army, which, thanks to the unselfish and devoted services of these instructors, has become an effective and efficient military organization as well as an institution for the propagation of practical patriotism and good citizenship. The Chilean officers who participated in this work, the author writes, have earned for their country the everlasting gratitude and loyal friendship of every citizen of Colombia.

FRANCE—*La Revue d'Infanterie*—April, 1931.

"Tactics and Armament," by General Challéat.

The author, an experienced artilleryman, analyses the military properties and firepower of modern weapons in their relation to offensive and defensive combat tactics. Applying his deductions specifically to the weapons of the French army and their proper tactical use, he develops existing deficiencies in materiel as well as in tactics and technique, and points out the needs of the future.

The machine gun, light and heavy, is an effective weapon for defensive warfare. In offensive action, however, it is of little value against personnel under cover or against materiel. Because of its great mobility the machine gun is an effective weapon against assemblies of reserves and for harassing hostile troop movements behind the front. The author recommends the development of a special 30-mm. antiaircraft machine gun which should be subject to the regimental commander and for that reason located near his P. C.

General Challéat believes that the infantry's greatest need is an effective antitank gun. He regards the 75-mm. field piece as poorly adapted for that rôle. Unlike the machine gun it cannot lay down a continuous band of defensive fire to stop an advancing tank. Hence, it must continue systematic fire until it scores a disabling hit. That, the general believes, is largely a matter of luck.

Present infantry weapons, the author believes, are inadequate against an enemy in an intrenched position. The difficulty of keeping up the ammunition supply during an attack which has reached close proximity to the enemy, further complicates the problem. There are also serious difficulties in the way of close and effective cooperation between infantry and supporting artillery. This suggests to him the growing need for an "accompanying gun." Again, he regards the 75 as ill-suited for that purpose because of its weight. The author recommends the development of a 37- or 47-mm. cannon

capable of serving the need of the infantry against tanks and against intrenched personnel both in offensive and defensive combat.

Artillery armament, the author believes, leaves little to be desired. Such deficiencies as do exist he discussed in an article published in the April, 1930, number of the "Revue d'Artillerie". He advocates a more extensive use of shrapnel in lieu of H. E. shells for certain classes of interdiction and harassing fires and a more extensive employment of 75's for counterbattery work. He also believes in the desirability of adapting the 75-mm. ammunition for the use of reducible charges to permit a more effective adjustment of trajectories at short and mid-ranges.

Since the antitank gun is the tank's most formidable enemy, General Challéat suggests the necessity of developing a new, specialized artillery for tank support. This proposed organization he labels "armored regiment", because of the protective armor he believes each gun should carry against frontal and enfilade fire. General Challéat offers a simple plan for the tactical handling of this artillery. A gun accompanies each tank to the cover from which the tank is to debouch for the attack. The gun is emplaced in a suitable position previously selected and the gunners follow alertly the progress of the tank, and are prepared for immediate action against any hostile antitank gun which may open fire. He visualizes the tank and supporting gun as an inseparable team, with the tank advancing from cover to cover, awaiting at each halt the forward displacement of the supporting gun.

HUNGARY—*Magyar Katonai Szemle* (Hungarian Military Review).

By direction of the Minister of Defense, the various Hungarian military publications were consolidated, and have appeared, since January 1, 1931, as a united service monthly. The text, averaging 300 pages, is arranged under nine headings, each forming a separate section with its own editor. These sections are: 1. General Military Information; 2. Publications of the Infantry and Cavalry School of Musketry; 3. Technical Section: Engineers and Aviation; 4. Supplies and Administration; 5. Medical Section; 6. Publications of the Military Historical Archives; 7. Veterinary Section; 8. Sport Items; 9. Miscellaneous: Items of General Interest—Reviews of the Professional Press—Book Reviews. The table of contents is printed in Hungarian, German, Italian and French.

This excellently edited magazine is a publication of the Royal Hungarian Military Historical Archives, Budapest, and is under the general editorship of Colonel vitéz Stephen Berkó. Annual subscription 12 pengös (about $4.00). All officers of the active list and militarized officials of correlated services are required to subscribe to this publication, and provision is made for deduction of the fee from the officers' pay in monthly instalments.

GERMANY—*Militär-Wochenblatt*—July 18, 1931.

"Mounted Pistol Practice".

Mounted pistol practice has not received the serious attention in European cavalry organizations that is the case in the American service. It is, therefore, interesting to note that our system of training in the mounted use of the pistol is beginning to command attention abroad. The *Wochenblatt* acquaints its readers with the details of the course of instruction for mounted pistol practice prescribed by Training Regulations in force in the U. S. Army. Sketches showing the mounted pistol course illustrate the text of this article. By adopting the well-tried and successful American method of training, the author believes, the German army will be able to place its mounted pistol practice upon a broader and better basis.

INDIA—*Journal of the United Service Institution of India*—April, 1931.

"Aircraft and Internal Security in India," by "Constabeel."

The employment of armed forces for internal security must be governed by the following principles:

1. Object: To restore normal conditions with the least exercise of force.

2. Forces of law should take and maintain the offensive.

3. Prevention is better than cure: hence arrest leaders, break up hostile organizations and quell disturbances in their initial stages.

4. Use force only against disorderly elements.

5. Action taken should leave neither bitterness nor resentment.

Aircraft may be used in case of civil disorders for reconnaissance, communication, moral effect, offensive action, and transportation. Conditions in India are such that the author is inclined to believe that aircraft will render most effective services in the field of transportation, effecting both economy of force and a saving in ultimate cost.

NATIONAL GUARD NOTES

Observation of Machine Gun Fire

By Captain Robert M. Campbell, 145th Infantry (Ohio National Guard)

THE ideal thousand-inch machine gun range, should have the sky for a background and should face the east so that the morning sun shining through the holes in the "E" target will give more perfect observation

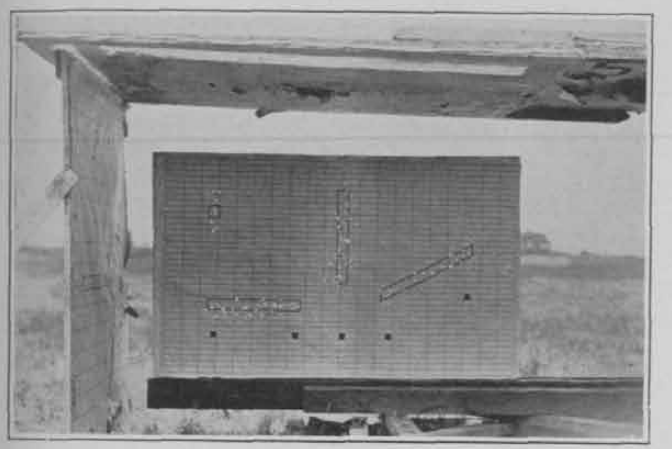


Plate 1.

This shows the greatly increased visibility of bursts when the reflector and target shade are both used.

and enable the gunner to rapidly adjust his fire and cover his target.

Not all army posts and camps are so fortunately situated that they can take full advantage of these ideal conditions as it is often impossible to site the guns facing eastward and also have the necessary background and safety angles. Even where it is possible to face the range eastward the best results are obtained only during the early morning hours, and then the gunner is sometimes handicapped by having the sun in his eyes.

Camp Perry, Ohio, the field training camp of the Ohio National Guard, has one of the finest rifles ranges in the world, but for the construction of a machine gun thousand-inch range conditions were decidedly unfavorable. The range could only be faced directly northward and a field of heavy green underbrush furnished the background, giving absolutely no reflection of light. Consequently, observation of fire has been very poor and it was often necessary to have a coach, using field glasses, inform the gunner of the position of each burst. Under these conditions the gunner learned to depend more on his coach's "Right two, Up one," etc. than on his own observation and thus one of the most important phases of instruction provided by the "E" target, that of rapid adjustment of fire, was lost.

Several of the machine gun officers of the 145th Infantry, (Ohio National Guard,) decided that it was time to devise some scheme to improve observation. They did, and after considerable experimenting developed the light reflector and target shade shown in the accompanying photographs.

A target frame covered with pure white unglazed paper was placed at an angle of about 30 degrees from the perpendicular directly in rear of the "E" target. The white paper reflector should be placed about four feet back of the "E" target to give the best results.

The white background increased observation considerably early in the morning but as the sun mounted higher in the sky it was discovered that the sunlight directly on the face of the "E" target minimized the amount of light reflected through the bursts in the target. We then had the happy idea of shading the front of the target from the direct sunlight, and the combined results of the reflector and target shade were very satisfactory.

The target shade was constructed with two pieces 2″x4″x12′, fastened at a height sufficient to clear the tops of the targets, as the targets on the car ran in under the shade. The frame was covered with target cloth and paper to prevent any sunlight from leaking through. In other words, the target shade is simply a shed with covered roof and ends, open front and back,

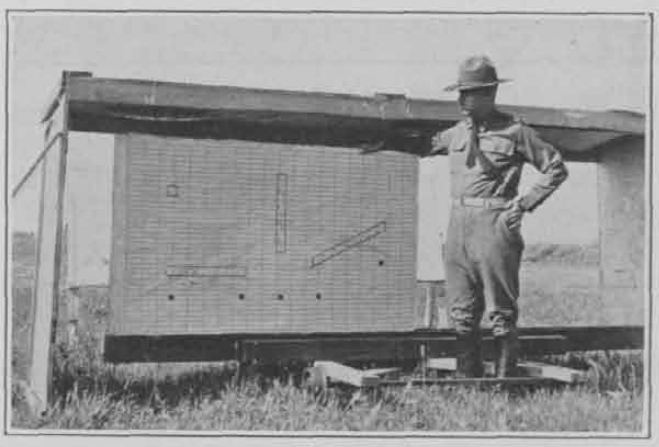


Plate 2.

This shows the target shade and reflectors in place. When this photograph was taken the car was pulled forward just far enough to allow the sun to shine directly on the face of the target. Comparing this with Plate 1 it shows the great value of the target shade.

so placed at the thousand-inch point that the car bearing the two "E" targets runs right through it. It is not advisable to stake this shed to the ground as it will

have to be shifted occasionally as the season changes. It is suggested that the shed be constructed on a base of fairly heavy timbers to make moving easy and to prevent the wind from tipping it over.

The light reflector holder should also be constructed on a movable base as it may be advisable to shift the angle of the reflector slightly at times. The reflector itself may be an "E" target frame with the white paper pasted on it, and hooked upon the reflector holder. Provision should be made to quickly remove the reflector frame from its holder and replace it with a new one occasionally, as it is necessary to replace the white paper after about eight or ten targets have been fired, in order to maintain a good reflecting surface.

Any grade of pure white, unglazed paper may be used as a reflector. White blotting paper gives the best diffusion of light, but as it is difficult to obtain in sheets 3′ x 5′ we used a white "Drug Bond" which is inexpensive, costing approximately $1.50 per hundred sheets of this size. One hundred sheets are sufficient to fire two hundred men thru the "B" course if the reflectors are renewed about every eighth target fired.

Bright sunlight is not necessary to insure good results, as it has been found that even when the sky was heavily overcast, enough light was reflected through the target to provide good observation.

This installation is easily and cheaply made, as all of the necessary materials can usually be picked up around any camp. It is necessary to clear all guns on the line after about eight targets have been fired, in order to carry a new reflector forward and place it on the reflector holder, and return the shot-up reflector back of the line to be repasted with a new sheet of white paper.

Use of this equipment does not conflict with Marksmanship Regulations, and it surely solves the problem of securing proper observation at any post where the natural terrain features do not permit maximum use of the sky line and sun as a background during firing hours.

The results obtained by the machine gunners of the 145th Infantry during their 1931 field training period, from the standpoint of the higher percentage of qualifications have proven the merits of this installation beyond question.

Administrative Function Pay

THE question of administrative function pay for officers of State detachments has been presented to the Chief of the Militia Bureau for action. General Everson's decision in the matter was as follows:

"Administrative function pay, in the case of state detachments, is not authorized by existing regulations.

"A state detachment is authorized as an aid to the state authorities in handling the affairs of the National Guard and for the specific purposes set forth in NGR 15. It is not an organization in the sense of being a company or similar organization, but has only such organization as may be given it locally by the state to which it belongs.

"The Militia Bureau is of the opinion that there are no administrative functions in connection with a state detachment which would make it advisable or which would warrant putting it in a class with tactical units which are organized in accordance with definitely prescribed tables of organization, and equipped as provided for in existing equipment tables."

Extension Course Lessons

THERE are thousands of officers and enlisted men of the National Guard taking advantage of the opportunities afforded for military study through the medium of the Army Extension Courses. They find that this is the best and most appropriate way of earning credits towards the qualification for appointment and promotion in the National Guard.

In some instances there has grown up a custom on the part of the student in retaining possession of his completed lessons and waiting until he completes a subcourse before sending them to the instructor who handles the course. This has proved to be a disadvantage to the student. The particular phase of the subject covered by the lesson is crowded out of his mind by other things and when the papers come back with the notes of the instructor there are so many of them that they are skimmed over. This leaves a jumbled impression of the whole subject and the student does not have the advantage of the principles applied in various lessons.

It is suggested that the methods adopted by the leading correspondence schools be applied to the Extension courses. These provide that completed lessons are forwarded to the instructor as soon as they are finished. If a student completes more than one lesson at a sitting they should all be forwarded at once in order that the comments of the instructor may be available for succeeding lessons.

With the new regulations governing extension course work, there will be an added incentive to pursue the courses. It is expected that these will be in operation by the first of July. The National Guard appointment and promotion subjects will parallel those included in the extension courses and when an officer or enlisted man completes a subcourse, the subject included will be waived on his examination for appointment or promotion. All he will have to do is present his certificate covering the subcourse to the examining board and that will exempt him from examination in the subject.

COAST ARTILLERY BOARD NOTES

Communications relating to the development or improvement in methods or materiel for the Coast Artillery will be welcome from any member of the Corps or of the Service at large. These communications, with models or drawings of devices proposed, may be sent direct to the Coast Artillery Board, Fort Monroe, Virginia, and will receive careful consideration. J. C. Ohnstad, Colonel, C. A. C., President.

Projects Completed During July and August, 1931

No. 764. Reminder List for Antiaircraft Artillery Target Practice.—In this project the Coast Artillery Board submitted a new reminder list in which the recording details are regimental details, and the battery is relieved from keeping records. This procedure has been found to be by far the best method since it assures that well trained recorders will be available for all practices and that the battery will not be handicapped by a loss of personnel or by being forced to engage in any other operation except firing the practice.

No. 824. Trichel Fuze Setter for 3-inch Antiaircraft Guns.—In the continuous fuze setter now in use the setting of the fuze is affected if the operator holds the round or attempts to turn it while in the fuze setter. In the fuze setter proposed by Lieutenant Trichel the setting of the fuze is not affected if the round is turned while in the fuze setter. The Coast Artillery Board recommended that a Trichel Fuze Setter be constructed for service test.

No. 859. Test of Marine Corps Type of Meat Can Top.—The Marine Corps type of meat can top is much deeper than the one now issued to Army personnel. In order that the hinged handle of the meat can may fold over to hold the top in place, the top is provided with a groove running down the middle, thus dividing the top into two compartments suitable for fluid or solid foods. As a result of the tests and recommendations by local troops, the Board recommended the following changes in design of the Marine Corps type: (1) place straps across bottom of top to allow it to be carried by placing handle of meat can or a separate handle; (2) use of a telescoping handle; (3) provide rings through which the handle of the meat can could be inserted for carrying; (4) provide a hinged handle on the top which would fold under the handle of the meat can when not in use. The Coast Artillery Board recommended that the experimental type of meat can top, modified as above, be adopted as standard for issue.

No. 862. Test of Experimental Message Center Carrying Case, Type CS-42-T1.—The Chief Signal Officer submitted to the Coast Artillery for test an experimental message center carrying case, Type CS-42-T1. As a result of this test by the Coast Artillery Board, the Board is of the opinion (a) that this type of message center carrying case serves the needs of Antiaircraft and Tractor Drawn Artillery; (b) the Harbor Defense Artillery has no need for such case; (c) the following changes are essential; (1) increase depth of map case; (2) reinforce corners and exposed seams with leather; (3) install pocket on inside of righthand flap; (4) provide more room in case to eliminate tight fitting of flaps; (5) provide straps to hold case in folded position. The Board recommended that the Message Center Carrying Case, modified in accordance with the foregoing suggestions, be adopted as standard and issued to Antiaircraft and Tractor Drawn organizations.

No. 844. Painted Bullets for Identification of Hits on Tow Targets.—A suggestion had been submitted to the Coast Artillery Board that in Antiaircraft Artillery machine gun practices the bullets be painted in order that the hits from different courses be distinguishable and thus avoid the necessity for changing targets between courses. This method is in use by the Air Corps. It was learned, however, that painted bullets are not completely successful in all cases and the Board recommended that the use of painted bullets be limited to those localities where the target cannot be changed for each course.

No. 858. Shelter for Communication Equipment.—Tables of Basic Allowances now in effect provide one tent, wall, small, per radio transmitting set when not provided with other shelter. No provision is made for sheltering switchboards. The Coast Artillery Board recommended that the same sort of shelter should be provided for switchboards and recommended that, pending revision of Tables of Basic Allowances, one tent, wall, small, complete with fly, pins and poles, be made available for issue per battalion, regiment and brigade of railway, tractor and antiaircraft artillery.

No. 868. Motion Picture Analysis of Seacoast Firing.—The Coast Artillery Board photographed the splashes of a considerable number of target practices held at Fort Monroe using the Antiaircraft (motion picture) Spotting Cameras. In the case of the 155 mm. guns the cameras were not able to photograph the splash at long ranges. In the case of the other calibers; namely, 8-inch railway guns, 12-inch railway mortars, and 10-inch seacoast guns, the cameras were highly successful and it was possible to plot the fall of

each shot without arbitrarily matching the deviations as is prescribed in target practice regulations. Complete and accurate information was thus available as to the range and lateral deviations, spotting errors and differences between guns. The Coast Artillery Board recommended that (a) studies and tests be made leading to the use of the spotting cameras with 155 mm. guns, (b) the spotting camera be used with all major caliber firings where the cameras are available and ranges are such that the splashes can be photographed, (c) cameras be used for all salvo and rapid fire to determine accurately the point of fall of the shots, (d) length of tow line be measured by the spotting camera, and (e) length of tow line, in all cases, be measured by the horizontal base plotting system.

No. 869. Universal Impact and Trial Shot Chart for Antiaircraft Artillery.—The present method of analyzing trial shots in Antiaircraft Artillery, while general and accurate, is at the same time so laborious that the need for a simpler method has long been manifest. The present method requires the preparation of a trial shot chart which gives a great deal of information not essential in the analysis of any particular trial shot problem and also requires a plotting chart which must be remade in its entirety for every change in the position of the distant observing station. A method which does not possess these disadvantages and which is much more convenient for field use has been proposed by Captain J. T. Lewis, Coast Artillery Corps. The proposed method is called the "Horizontal Plane Method," as all linear quantities are projected upon the horizontal plane. The horizontal plane method is based on a universal impact and trial shot chart which is independent of the direction or length of the base line. Hence, these charts can be prepared and issued by some central agency, such as the Coast Artillery Board, thereby relieving the batteries of the necessity of preparing plotting charts. The new charts (they are really four sections of a single chart) consist of a family of curves plotted against an angle and a side of a triangle, the third side of the triangle (the baseline) being assumed to be unity. By a simple operation the chart solves the triangle for any baseline. For any particular trial shot problem, only one section of the chart is required. The corrections to be applied as a result of trial shots are also completed much more rapidly under the new method than under the old.

The Coast Artillery Board recommended that the horizontal plane method proposed by Captain Lewis be adopted as standard to supplement the vertical plane method now in use, that use of the plotting chart described in Bulletin OCCA "Trial Shot Solution for Antiaircraft Artillery" be discontinued; that use of the trial shot chart described in this bulletin be authorized when the results of a series of trial shot problems are to be analyzed; that the Horizontal Plane Method proposed, together with a description of the construction and use of the trial shot chart given in the mentioned bulletin be included in the revision of C. A. Field Manual, Volume II; that trial shot charts for use with the Horizontal Plane Method, together with conversion chart, be prepared and issued by the C. A. Board; and that instruction pamphlets be issued immediately in order that this method may be employed before the revised copies of the Coast Artillery Field Manual are distributed.

No. 870. Aerial Position Finder.—Recommended that a pilot model of an Aerial Position Finder based on the principles outlined in this project be manufactured at Frankford Arsenal for test during the Long Range Firings in Hawaii.

Projects Under Consideration

No. 681. Test of Fast Towing Targets.—Target was subjected to a towing test from 8 to 10 miles per hour on August 31. Target submerged several times, probably due to the fact that the target was water-logged. The target had been allowed to stay in the water since last December in order to determine whether water-logging would effect its buoyancy. Further tests will be conducted during the fall tests at Fort Story.

No. 727. Standard Single Conductor Mine System.—A continuing project.

No. 800. Test of Radio Direction Finders.—Under study.

No. 814. Illuminating Device for 12" Barbette Carriage Model 1917.—Awaiting result of test at Fort Hancock.

No. 815. Comments on Target Practice Reports, Fiscal Year 1931.—Comments submitted as reports are received.

No. 817. Time Interval Apparatus for Mobile Artillery.—Under test.

No. 820. Confidential.

No. 827. Temperature Tests of Height Finders.—Test in progress.

No. 850. Military Characteristics of an Intermediate Caliber Automatic Antiaircraft Cannon.—Under study.

No. 853. Tangential Observation of Antiaircraft Machine Gun Tracers.—Under study.

No. 860. Test of Air Corps Machine Gun Pedestal Mount, Type A-3.—Awaiting receipt of ammunition.

No. 863. Test of Army Hoisting Vessel, M-1.—Under test.

No. 864. Organization and Functions of Fort Signal Stations.—Under study.

No. 865. Test of Buzzers, Type T3-5-T1.—Under study.

No. 866. Test of Field Service Folding Tables.—Under test.

No. 867. Test of Charging Slides for Browning Machine Gun, Caliber .50.—Awaiting receipt of material.

PROFESSIONAL NOTES

Leveling Base Rings at Fort Sumter

By Maj. R. T. Gibson, Coast Artillery Corps

ON July 1, 1930, when harbor defense commanders took over the maintenance and repair work on fortifications from the U. S. District Engineers, the duties of the caretaking detachments increased in importance and interest with each new project that was undertaken. The engineering work in the Harbor Defenses of Charleston, manned by Battery D. 13th Coast Artillery, reached its peak at the beginning of the fourth quarter when the major project of leveling the base rings at Fort Sumter was commenced.

Fort Sumter, still a modern fort in every sense of the word, is built on a man-made island in Charleston harbor. Battery Huger, a major caliber battery, was constructed on one side of the old casemates. The increased weight had evidently caused the island to settle to such a degree that the base rings were seriously out of level. This was perceptible when water or rain fell on the outer portion of the base rings, as it flowed toward the point of lowest depression.

An estimate data sheet for this project had been prepared some two years before. The project was estimated to require six months to accomplish, using troop labor and expert ordnance supervision, and to cost approximately three thousand dollars. It was not anticipated that the work was to be done during the F. Y. 1931, when suddenly instructions were received that the funds would be available on April 1 and the work would have to be completed by June 30.

Work was started immediately to take over all available maneuvering material to Fort Sumter from the ordnance storehouse at Fort Moultrie. This was accomplished by troop labor before the funds become available. By the cut in time from six months to three, half the funds for expert supervision became available for the hire of common labor. Troop labor was entirely out of the question, due to the absence of the 8th Infantry, and the additional burden thrown on the Coast Artillery personnel.

Figure 1. Showing Number 1 gun, 12-in B. C., before base ring leveling operation was commenced.

Work began on April 1 with the following crew: supervisor, ordnance machinist, foreman, who was an expert rigger, and six husky colored laborers. The original plan contemplated the dismounting of No. 1 gun, a barbette carriage, by raising the gun and sliding it forward on the parapet. The carriage would be raised sufficiently to get at the base ring for releveling and regrouting. While the grout was hardening, the crew would dismount No. 2 gun, a disappearing carriage, and follow the same operation as with No. 1 gun. The crew would then remount No. 1 gun and No. 2 in turn.

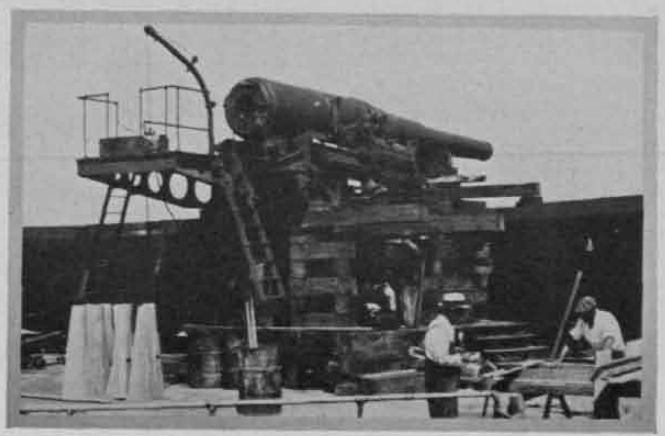


Figure 2. Number 1 gun, carriage and base ring raised as separate loads to a directly vertical position. The gun trunnions were about ¾-inch above the trunnion beds.

This plan seemed simple and workable, but at this point the Corps Area Ordnance Foreman, Mr. Oensel, offered a new innovation in dismounting which was adopted. This method consisted in raising the gun, carriage and base ring in separate loads, directly vertical, each resting on independent supports, thus saving the time lost in sliding or rolling the gun onto the parapet.

Figure 1 shows No. 1 gun before the work was commenced. Figure 2 shows the gun and carriage resting on separate skids, each load separate from the other, the gun trunnions being about ¾-inch above the trunnion beds. The base ring, with bolts released, had been raised sufficiently to cut out the old grouting, releveled, and preparations made for regrouting.

After some delay in securing maneuvering material work was started on No. 2 gun. No. 2 gun is mounted on a disappearing carriage and proved to be the biggest problem of the project to solve. Another snag was encountered when it was found that the base ring of No. 2 was in two pieces, bolted together on oppo-

site sides with lugs going deep into the concrete. This caused much chipping of concrete away from the lugs before the ring could be raised sufficiently to chip off the old grout and prepared for leveling.

Figure 3 shows a side view of No. 2 gun carriage and ring, each on separate supports, independent of the other. An overhead trolley is shown, rigged to

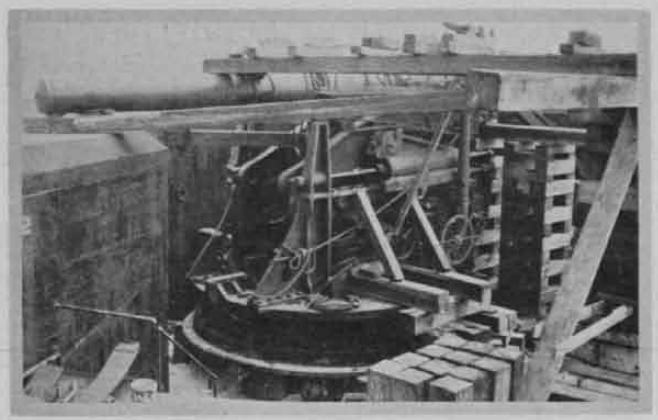


Figure 3. Number 2 gun, 12-in. D. C., with gun, carriage and base ring raised on separate supports. The overhead trolley was used to remove excess counterweights.

remove enough of the counter weight to facilitate raising of the base ring and for the leveling operations.

Figure 4 shows a rear view of No. 2 gun with its cribbing and bracing, which gives the impression of a maze of timbers and a wonder as to how the base ring could be leveled in the little space left.

The base ring of No. 1 gun was grouted in by building forms around it both outside and in, and then pouring neat grout cement through eight 5-ft. headers, equally spaced about the ring. In this manner, the grout was forced under all parts of the ring under pressure at the same time. Incor Cement was used, requiring only three weeks for setting. Leveling screws were then loosened and foundation bolt nuts were given one turn each.

Three weeks after the grouting of No. 1 gun base ring had been poured, the forms were removed, and the gun and carriage were lowered to their proper positions. This part of the project was officially completed on June 15. Opportunity had been taken while the parts were elevated, to scrape and paint the underside of the parts raised.

At this time it became apparent that due to delay in securing additional maneuvering material and the difficulty of releasing No. 2 gun base ring from its bed, that the project would run beyond the limiting date of June 30. No. 2 ring could be leveled and grouted before this date, but the requirement of waiting three weeks to set would carry the work over into the next fiscal year. This was the best that could be done, however, so the ring was actually leveled and grouted in by the last day of the fiscal year.

Three weeks after the grouting had been poured, the work of letting the gun down to its proper position commenced, using the services of the foreman, an ordnance machinist and six or eight of the regular colored laborers who had been employed on fortification engineer work throughout the fiscal year.

The base ring leveling job was officially completed by August 1, 1931, and thereafter the work consisted of returning the maneuvering material to Fort Moultrie, and putting the battery into active condition.

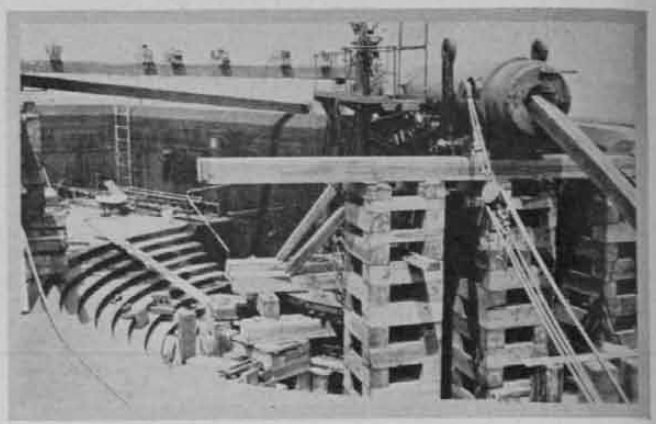


Figure 4. Rear view of Number 2 gun with its cribbing and braces. This gun presented the most difficulties.

The latter was accomplished by the artillery personnel. A final clinometer test of the guns showed that No. 2 gun, which was the most troublesome of the two, turned out to be more accurately leveled than No. 1 gun.

The satisfaction derived from completing the base ring leveling job at Fort Sumter, in a limited time and with only a handful of men, will not be complete until the guns are fired and the work stands up under this service test. There is only a remote possibility that the battery will be fired in the future, but this will be looked forward to as a final test of the job.

War Department Training Directive, 1931-1932

THE War Department training directive for the present training year is brief and contains few detailed instructions. The following points were emphasized or are believed particularly applicable to the Coast Artillery:

All garrison and armory training will be directed toward preparing units for field service. Readiness of units to leave stations for field service on short notice will be a requirement of exercises. Training in the field will be entirely practical.

Particular attention will be paid to the command and tactical training of battalions and higher units, using only communication and intelligence personnel. Initiative of junior officers will be fostered, opportunity being offered to exercise command in the next higher grade.

Training of all units in the use of smoke and in defense against toxic gases will be stressed.

Situations involving smoke and gas will be injected into exercises.

Mobile units will hold field exercises annually and will make at least one march of not less than one hundred miles and a duration of not less than one week. In favorable weather one night each month will be spent in camp.

Harbor defense units will man installations to which assigned for a continuous period of at least one week—this period, preferably, being coincident with battle practice exercises or joint exercises with the Navy.

Offensive measure will be stressed in the training of all ground troops to combat aircraft.

Tactical inspections will be regarded as tests of the unit rather than the ability of the commander in making tactical decisions. Consistent with the current training program, Regular units will assist Reserve units and individual officers at all times. During Regular and National Guard unit field training periods as many Reserve units and officers will be attached as funds and circumstances permit.

Latest Radio Sets for Coast Artillery

THE nomenclature shown below has recently been assigned to radio sets now under development by the Signal Corps. The frequency assignments, output and working ranges are tentative and subject to change as development progresses.

Radio set, type SCR-177; intermediate frequency (333 to 857 kilocycles); range up to 50 miles telephone and 100 miles telegraph, receiving and transmitting; for use by Air Corps and *Antiaircraft Artillery* units to provide air-ground and ground-to-ground communication.

Radio set, type SCR-178; high frequency (3,000 to 4,000 kilocycles); 7½ watts output; range up to 15 miles; receiving and transmitting, telegraph only, for use by Field Artillery units to provide air-ground fire control communication. It is arranged for wagon transportation.

Radio set, type SCR-179, same as SCR-178 except to be arranged for pack animal transportation by pack artillery units.

Radio set, type SCR-180; high frequency (3,000 to 4,000 kilocycles); 50 watts output; range 40 miles; receiving and transmitting, telegraph and telephone; for use by Air Corps, Cavalry, *Antiaircraft Artillery, General Headquarters Reserve Artillery,* and signal companies and signal troops to provide air-ground communication where distances are normally greater than the SCR-178 or SCR-179 can handle.

Radio set, type SCR-181; high frequency (3,820 to 4,180 kilocycles); range up to 40 miles; receiving and transmitting, telegraph only; for use of signal troop at Cavalry division headquarters to provide communication within the division with radio sets, type SCR-163. It is essentially same as the latter set except that the power is obtained from storage batteries and dynamotor instead of from a hand generator.

Radio set, type SCR-182, high frequency (3,000 to 4,180 kilocycles); range, telephone 5 miles, telegraph 10 miles; receiving only; for use by Cavalry units to provide ground reception from observation aircraft.

Radio set, type SCR-183; high frequency (6,200 to 7,700 kilocycles); 7½ watts output, range up to 15 miles; receiving and transmitting, telephone only, weight without power equipment not to exceed 50 pounds, for use by pursuit, bombardment, and attack aircraft to provide interaircraft command net communication. Both receiver and transmitter are of the remote control type.

Radio set, type SCR-184; high frequency (3,000 to 4,000 kilocycles); range at least 40 miles; receiving and transmitting, telegraph only, weight without power equipment not to exceed 50 pounds; for use by corps and division observation aircraft to provide liaison with high frequency sets of Air Corps, Cavalry, Field Artillery and Infantry.

Radio set, type SCR-185; intermediate frequency; range up to 250 miles; receiving and transmitting, telegraph only; weight without power equipment not to exceed 100 pounds; for use by Army and general headquarters observation, bombardment, and cargo airplanes and lighter-than-air craft to provide air-ground liaison communication.

Radio set, type SCR-186; for use as a direction finder; range up to 500 miles; receiving only, both telegraph and telephone; for lighter-than-air craft.

Radio set, type SCR-187; high frequency; long range to cover any distance greater than 500 and less than 2,000 miles; receiving and transmitting, telegraph only, weight without power equipment not to exceed 150 pounds, for lighter-than-air craft to provide air-ground liaison communication.

Radio set, type SCR-188; high frequency; range up to 50 miles; transmitting only, telegraph signals only, for ground use by Air Corps pursuit units to provide air-ground liaison communication.

Radio sets, types SCR-177 to 182, inclusive, are being developed at the Signal Corps Laboratories, Fort Monmouth, N. J., while the remainder are being developed at the Signal Corps Aircraft Radio Laboratory, Wright Field, Ohio. Preliminary models of the SCR-177 have been built and tested and the SCR-183 and 186 have been flight tested.

Antiaircraft Artillery in the Field

IN the July number of the *Journal of the Royal Artillery* (British) appears an article by Major D. J. R. Richards, D.S.O., M.C., R. A., under the above title which should be read by every Coast Artillery officer because it gives a slant which, perhaps, has not been emphasized sufficiently in our service.

Major Richards devotes considerable attention to the mobility of antiaircraft artillery in connection with other elements of the ground forces. To understand his view point it may be necessary to mention the fact

that the British Army has gone "mechanized." While, in this country, we are giving consideration to mechanized forces and at the present time are maintaining an experimental force it can hardly be denied that our efforts are predominantly pioneering. In our service the paramount interest in mechanization seems to be with the Cavalry whereas in the British Army it permeates the entire structure. As mechanization comes more and more to the front, Major Richards points out, concealment becomes more difficult and aerial attack may be conducted with greater profit. As aerial activity becomes more common, especially against mechanized forces, in the front lines, on the march, in bivouac, in the attack and in defense antiaircraft artillery reaches a higher importance in defense against the activities of hostile aviation.

It is not intended to intimate that our own aviation will not participate in defense. However in the final analysis of the *close* defense of any *area* whether occupied by troops in the field, corps establishments, seacoast fortifications, industrial plants or any other establishment of military importance the antiaircraft artillery is the only defensive element which can even approach a positive denial of a certain definite area to hostile air forces.

It is not desired to detract from the efforts which will be made by the Infantry, Cavalry, and Field Artillery to use their own weapons to defend themselves against hostile aviation. It is to be expected that in actual contact or combat these arms will be sufficiently occupied with targets more natural to them. It will not be possible for them to maintain the additional fire control equipment, the intelligence system, the communications or even the special ammunition which would be necessary to conduct a really effective defense. It is a job for specialists—for trained antiaircraft artillerymen whose methods and weapons are more certain than eye shooting and pot shots.

The operations of antiaircraft artillery with troops in the field especially when these troops may be mechanized brings us to a more serious consideration of tactical mobility including movements in conjunction with troops capable of 100 mile per day marches instead of 15 mile marches; setting up a continuous defense while this fast moving force is on the march; advancing by bounds to defiles, to river crossings, to bivouac areas. The rate of march of a column of antiaircraft artillery on the road is one of the lesser matters affecting its tactical mobility. There will be other troops occupying the same road. It will be necessary to leap frog them which brings us deep into march logistics. The length of time for an antiaircraft unit to effect a "set up" is also a consideration. Ammunition supply will certainly affect tactical mobility. Suitable defensive positions or congestion of roads may require cross country movements. Major Richards visualizes the mission of the antiaircraft artillery as furnishing continuous "cover" for other ground troops, and at the same time causing no interference with any of their operations due to its presence.

Something of the difficulties of the operation of antiaircraft troops with other troops was experienced by Colonel F. H. Smith and the 69th Coast Artillery (AA) during the joint minor maneuvers at Fort Benning. He complained that trucks and tanks played havoc with his communications; that the "set up" required too much time; that rough traveling did not improve the accuracy of the director and the electrical transmission system; that the signal communications system might be improved; that there was a lack of coordination with troops of other arms. He stated the whole matter in a nut shell when he said we were inexperienced in operating with other ground troops.

By deduction from Major Richards' article it is believed that in many ways our antiaircraft artillery is ahead of the British. They are just now getting prime movers for their guns which furnish a satisfactory road speed. They have a follow the pointer system on their Vickers "predictor" which is new this year. They depend a great deal on eye shooting when first engaging a target, gradually working in other corrections. 8000 feet is about the limit of accuracy with their two-meter height finder but this is discounted by the usual hazy condition of the atmosphere over Great Britain. Their machine guns are Lewis guns mounted on separate "music stands." It is stated that with an arrangement of "four of them together it is hard to ensure that the whole quartette is playing the same tune and that the trombone isn't shooting into the cello's ear." They have tried the four-gun mount and hope to get them with a new sight which, it is claimed, is very efficient.

There are two antiaircraft brgiades in the British service. Both are units of the "1st Defence Brigade." One of these is intended for home defense. The other is an expeditionary brigade. Each brigade corresponds closely to our antiaircraft regiment for administration and tactical control although their brigade has three batteries of *eight* antiaircraft guns with a machine gun section of eight guns. Our regiment would have twelve antiaircraft guns compared to twenty-four in their brigade; our regiment, sixty machine guns, their brigade twenty-four. It should be noted that they have no separate machine gun batteries and that the searchlight battalion is a part of the Air Defense Brigade but not the A. A. Brigade.

Major Richard's conception of air defense shoves antiaircraft artillery far to the front and tips the scale to forward area defense. He reasons that mechanized forces, prior to ground contact, can be reached only by aviation until gun range is reached. Therefore the elements of antiaircraft defense must be well forward to take care of the situation and insure an unimpeded march. The targets for antiaircraft artillery in order of importance are stated as bombardment, reconnaissance, and fighting aviation. (There is no attack aviation in the Royal Air Force).

It is considered that one AA Brigade will be sufficient for an expeditionary force of one corps. Tactical control of the AA brigade remains in the hands of the brigade commander. He makes the assignment of batteries to position and decides upon the vital ele-

ments of the Corps to be covered. Batteries (or perhaps sections of a battery) are attached to divisions only when serving alone. In this case the battery commander stands in the same relation to the division commander as the brigade commander stands to the corps commander. Antiaircraft information is passed back through the normal communications—otherwise by messenger (or dropped message). The machine gun sections are intended for the protection of supply routes rather than fighting troops although in case of the passage of a defile or river crossing the situation may demand the concentration of all available machine guns.

It appears that the British are inclined to split up their batteries into sections although this practice is not looked on with favor in all quarters. This procedure is not contemplated in our service. However it would be more reasonable with the British battery since their battery has twice our number of antiaircraft guns. The deduction is drawn that additional fire control equipment must be available to make a division into sections practicable.

It appears that our antiaircraft artillery is much better provided for in the way of communications. The British brigade commander has no radio or wire communication with his batteries. Major Richards advocates the provision of three radio sets for each battery to be furnished by the Air Defence Brigade Signals. Apparently the British have no personnel to compare to our excellent specialists trained at the Coast Artillery School.

There is one respect in which we are certainly behind the British and that is participation in joint exercises. It is obvious that Major Richards' article is the result of actual participation with troops of other arms in annual exercises. It is regretted that our own antiaircraft artillery has had only limited opportunity to participate in exercises with troops of all arms. The annual exercises at Aberdeen have been of immense value in solving some of the technical problems and, to a less extent, minor tactical problems. Now that our technical efforts are bearing fruit it is probable that more attention will be paid in the future to tactical considerations. The exercises to be held at Camp Knox during the fall of 1932 should offer an opportunity to bring other arms into the picture and to discover the difficulties which are bound to exist. The antiaircraft regiment is a corps unit. The antiaircraft officer should have the view point of the corps commander and the corps staff and be able to handle his own unit at the same time. It is only by practical experience that this broader knowledge will be impressed.

NOTE: *The* COAST ARTILLERY JOURNAL *can use a good article on Antiaircraft Artillery in the Field.*

Historic Powder Laboratory Moved

THE experimental laboratory of the Smokeless Powder Department of the du Pont Company, heretofore known as the Brandywine Laboratory, located at Henry Clay, near Wilmington, Delaware, has been moved to Carney's Point, New Jersey, the location of the du Pont smokeless powder plant.

New buildings have been erected for the Smokeless Powder Laboratory at Carney's Point, including a new ballistic building, a chemical laboratory and the necessary units for the semi-works plant. The new laboratory will be known as "Burnside Laboratory" in honor of Mr. Charles F. Burnside, deceased, who was one of the pioneer smokeless powder makers of America.

Although only experimental samples of powder have actually been made in the Brandywine mills for a number of years, the testing of powders has been continued on the site where E. I. du Pont de Nemours established the original du Pont mills in 1802. It is explained that the change has been made in the interest of convenience and efficiency, as all du Pont smokeless powders are produced in the Carney's Point plant, said to be the largest manufactory of the smokeless type of powders for sporting uses and for military purposes in the western hemisphere.

In striking contrast to the simple single piece of equipment used for testing black gunpowder more than a century ago are the highly scientific instruments with which the new du Pont laboratories are equipped. For many years after the making of explosives in the little water mills on the Brandywine began, the sole means of testing the "strength" of gunpowder was the eprouvette, a small mortar, into which a measured charge was loaded together with a solid iron cannon ball. Firing was done by means of a red hot rod placed on the touch hole. The index to the strength of the powder was the distance the ball was shot by the charge.

Some measure of the advance in the manufacture of smokeless powder can be had when this old method of testing is compared with the precise measurements made today on apparatus such as is installed in the present du Pont laboratories. There are super-accurate chronographs for measuring velocities, pressure gauges which measure the pressure with utmost exactness, the gun for measuring recoils, the oscillograph for making time-pressure curves and many other instruments used as gauges of the various qualities which a good powder must possess.

The production of propellent powders is an exact science which calls for the most minute care because of the qualities which must be developed in the product. The du Pont laboratory has developed a system of accurate chemical control, the result of the many years' experience of the Company, which aims to make a product whose stability, propellent and keeping qualities will meet all demands.

Air Corps Develops Gasoline Segregator

DUE principally to the inventive genius of Master Sergeant David Samiran, the Air Corps has developed at the Materiel Division, Wright Field, Dayton, a gadget called a Segregator which removes dirt and water from gasoline. The device has been adopted as standard in the Air Corps and can be made suit-

able for installation on gasoline service trucks, gasoline storage and distribution systems, hand refueling pumps, or even in the fuel system of the motor.

The well known system of eliminating water and dirt from gasoline by straining through chamois is slow and inefficient. It is also dangerous due to static electricity. The Segregator is a great improvement over this system. In its operation, it takes advantage of the natural tendency of water and gasoline to separate due to difference in specific gravity. This separation is facilitated by the special design of the interior of the fluid chamber which directs the liquid flow so that the water is delivered to the bottom with a minimum of turbulence, while the gasoline is drawn off through an outlet at the top after passing through an efficient sediment screen. The accumulated water is discharged automatically by the operation of a simple float valve mechanism operating on the principle of "differential buoyancy." Only one moving part is employed.

Dirt and water in gasoline is undoubtedly of more importance to the pilot than the operator of a motor truck. It is none the less annoying in the latter case and may be the cause of traffic jams and failure to reach the destination at the prescribed time. Any device which eliminates dirt and water from gasoline is well worth investigation by all arms.

Strength of the Officers Reserve

THE following table released by the Reserve Officers Association of the United States shows a very healthy increase in the strength of the Officers Reserve Corps for the year ending June 30, 1931:

Reserve Officers Not Members of the National Guard

Active

	1930	*1931*	*Increase or Decrease*
Major General	1	1	
Brigadier General	28	27	1 minus
Colonel	688	742	54 plus
Lieutenant Colonel	2,383	2,570	187 plus
Major	6,013	6,002	11 minus
Captain	11,321	11,625	304 plus
1st Lieutenant	20,001	21,501	1,500 plus
2nd Lieutenant	37,379	37,931	552 plus
Total	77,814	80,399	2,585 plus

The table which follows is not so encouraging because it shows a gain in the number of officers on the inactive list. A comparison of the two tables indicates that the number of officers passing to the inactive list (from the active list) is greater than the net gain for the active list. It may be too early to estimate the effect of the new regulations for promotion and reappointment in connection with the inactive list. It is certain that there will be a normal flow to the inactive list but any considerable increase in the number of inactive officers is undesirable. While not impossible to receive an active reappointment after having once been placed on the inactive list it is so difficult that few will make the effort.

Reserve Officers Not Members of the National Guard

Inactive

	1930	*1931*	*Increase*
Major General	....	...	
Brigadier General	..	....	
Colonel	81	98	17
Lieutenant Colonel	290	296	6
Major	1,253	1,317	64
Captain	4,537	4,812	275
1st Lieutenant	5,616	6,460	844
2nd Lieutenant	10,855	13,037	2,182
Total	22,632	26,020	3,388

First Use of Term "National Guard" in United States

ON August 16, 1824, the Eleventh Regiment, New York Artillery, was, with other troops, waiting at the Battery for the arrival of the Marquis de Lafayette to escort him to the City Hall, the Fourth Company of the Regiment having been designated the Guard of Honor.

The Eleventh Regiment, at that time, was composed of both artillery and rifle companies, but the latter were dissatisfied and planned to withdraw and form a separate infantry organization. A group of officers interested in the proposed change was in earnest discussion when Major John D. Wilson referred to Lafayette's connection with the "National Guard" of France and suggested that name for their new corps. The response from both officers and men was immediate and favorable.

On the 25th of the same month at a meeting of the officers the name was formally adopted and from then on was in general use. The rifle companies were transferred to the Second Regiment of Artillery January 27, 1825, and it was not until October 1, 1825, that the order was issued making the "Battalion of National Guards" a separate organization. May 6, 1826, the battalion was redesignated the Twenty-seventh Regiment of Artillery and although it was in no sense an artillery organization, it was not until 1847 that the name was changed to the Seventh Regiment and the misleading artillery designation dropped. A change in the numerical designation was objected to by the regiment but was finally compromised and "Seventh" accepted. The regiment continued for 70 years under this designation, serving as such on three tours of duty during the Civil War, until it was redesignated the 107th Infantry in 1917 for the World War and is now the 107th Infantry, 27th Division, New York National Guard.

In approving the regimental coat of arms in 1923 the War Department recognized this claim and authorized the inclusion of "the cipher of the regiment of 1824 (the script monogram "NG") as a charge on the shield."

COAST ARTILLERY ACTIVITIES

Office of Chief of Coast Artillery

Chief of Coast Artillery
MAJOR GENERAL JOHN W. GULICK

Executive
COLONEL W. F. HASE

Personnel Section
MAJOR G. F. MOORE
MAJOR S. S. GIFFIN

Materiel and Finance Section
MAJOR R. E. HAINES
MAJOR J. H. COCHRAN
CAPTAIN F. J. McSHERRY

Organization and Training Section
MAJOR J. B. CRAWFORD
CAPTAIN J. H. WILSON

Plans and Projects Section
MAJOR G. R. MEYER
MAJOR R. V. CRAMER

Reorganization of Chief of Coast Artillery's Office

COINCIDENT with the arrival of three new officers for duty in the office of the Chief of the Coast Artillery the office organization has been altered somewhat as appears above. With the departure of Colonel Steele, Colonel Hase has assumed full charge of the executive's office. Major R. E. Haines has assumed his duties as head of the Materiel and Finance Section. This section is concerned with the development of all new materiel for Coast Artillery and visits organizations in the field to inspect materiel in the hands of troops. It reviews the recommendations of the Coast Artillery Board which pertain to materiel. The section also is concerned with the preparation of Coast Artillery appropriation estimates and the allotment of funds appropriated. Major G. R. Meyer has been assigned to the Plans and Projects Section which studies war plans and the installations established at harbor defenses. Major Crawford's section devotes its attention to tables of organization, training methods and texts including courses at the Coast Artillery School and civil institutions. It also studies target practice reports and the results of target practice. Inspections are made to observe the manner in which training is conducted in the field. The Personnel Section under Major Moore assigns personnel, keeps track of mileage funds, and maintains a record of efficiency reports. Coast Artillery assignments of officers are made by the Adjutant General's office upon recommendation of this section. This section also includes intelligence matters. This office is most popular with officers visiting Washington. Officers who visit Washington for any purpose are welcome in any of the offices at any time. The Chief of Coast Artillery is always glad to see them and welcomes the opportunity afforded for personal contact.

Inspections by Chief of Coast Artillery

Fort Sheridan

General Gulick, accompanied by Major R. V. Cramer, arrived at Chicago on July 17 to inspect Coast Artillery activities in the vicinity of Chicago. He was met by Colonel C. C. Dawes, commanding the 202d C.A. (AA) (Ill. N. G.), Lieut. Col. J. A. Green, commanding the 61st C. A. (AA), and Lieut. Col. G. A. Wildrick, G-1, Sixth Corps Area. At Fort Sheridan General Gulick was received by a guard of honor furnished by Battery B, 61st C. A., commanded by Captain Frank Richards. General Parker, commanding the Sixth Corps Area, was present at Sheridan when he arrived.

General Gulick noted great progress in the 61st since his last inspection, especially in connection with transportation sheds, motor parks, and trucks. The regiment is comfortably housed with ample barrack space provided.

After the inspection of the 61st the Chief met Colonel Loy and the officers of the 203d C. A. (Mo.N.G.) then in camp at Sheridan as well as the Reserve officers present for active duty and the Regular officers on duty with the R.O.T.C. Later the new firing point was inspected where the R.O.T.C. were engaged in target practice. The inspection at Sheridan was completed by a review of the 203d C. A. (Mo.N.G.) under Colonel Loy's command. This regiment presented an excellent appearance.

Upon leaving Fort Sheridan General Gulick proceeded to Chicago where he was met by Major J. L. Homer and Lieut. C. O. Bell, instructors on duty with the 202d C. A. (Ill.N.G.) and escorted to the 202d Armory where he was welcomed by the regimental commander Colonel C. C. Dawes and his father, Mr. Rufus Dawes. Dinner, at which all officers of the regiment were present, was served in the recently completed

Officers Club in the Armory. Mr. Dawes in presenting General Gulick to the officers of the regiment expressed for the regiment its appreciation of the visit of the Chief of Coast Artillery. General Gulick addressed the officers on the value of antiaircraft artillery and is progress in development.

After the dinner the 202d was reviewed and inspected by General Gulick in the Armory. Later the Armory was inspected throughout, notice being taken of a recently completed indoor rifle range and swimming pool. The finely equipped instruction room used by Major Homer is especially deserving of comment. In fact, after a complete inspection of the entire regiment the general impression obtained is that the 202d C. A. (Ill.N.G.) is decidedly progressive and on the up-grade in every respect.

General Gulick was favorably impressed with Chicago as a training center for antiaircraft artillery of all three components. Week-end training activities conducted at Fort Sheridan by the 202d C. A. (Ill.N.G.) is not only an indication of the close liaison existing between this regiment and the 61st but is also an indication that a friendly spirit developed through personal contact can bring results in increased efficiency.

H. D. of Sandy Hook

On August 11 the Chief paid a visit of inspection to the Harbor Defenses of Sandy Hook, accompanied by Major J. B. Crawford. The most important activity taking place at this time was the C. M. T. Camp conducted by reserve officers of the Second Corps Area. A guard of honor was furnished by the C.M.T.C. After an inspection of the C.M.T.C. training activities General Gulick was a guest at the C.M.T.C. mess for luncheon. He expressed himself as well satisfied with the conduct of C.M.T.C. training in general and especially with the performance of their duties by reserve officers assigned to the camp as instructors.

H. D. of Long Island Sound

Arriving at Fort Wright on August 12 General Gulick and Major Crawford spent two days inspecting the H.D. of Long Island Sound. Two national guard regiments were in camp in this harbor defense. The 241st C. A. (Mass.N.G.) Col. G. M. King, Comdg., was in training at Fort Wright, while the 242d C. A. (Conn.N.G.), Colonel Philip Hurley, Comdg., trained at Fort Terry. General Gulick was the guest of Colonel King and the officers of the 241st at luncheon and afterwards received a review. The showing of the regiment was excellent.

Upon arrival at Fort Terry the General was met by a guard of honor furnished by the 242d. An inspection of the entire post was made. Colonel Hurley and his regiment are to be congratulated upon the excellent spirit of cooperation shown in the selection of Fort Terry for their field training. It is well known that Terry is ungarrisoned and that it is more or less isolated. Nevertheless the Connecticut regiment was willing to give up a more desirable location in order that the guns at Terry could be fired and a battle practice could be conducted in conjunction with the armament at Wright. Due to miserable weather the battle practice was never held. The spirit of Colonel Hurley and his officers under these circumstances was admirable.

Dedication of Wilson Park

ON June 11, 1931, the antiaircraft firing point north of the mortar batteries at Fort Monroe was formally named "Wilson Park" and dedicated to the memory of the late Major William Pegram Wilson, Ordnance Department. A bronze tablet suspended from the railing surrounding the director platform was

Major W. P. Wilson.

unveiled by Miss Helen Wilson, daughter of Major Wilson and Colonel Charles M. Wesson, O.D., representative of the Chief of Ordnance, in the presence of Mrs. Wilson; Major General John W. Gulick, Chief of Coast Artillery; Brigadier General S. D. Embick, Commandant, Coast Artillery School; and the assembled garrison of Fort Monroe. The tablet carries the inscription "The Designer of the First American Antiaircraft Artillery Director."

Although a member of the Ordnance Department at the time of his untimely death, Major Wilson will always be claimed by the Coast Artillery Corps as its own. He was educated at Michigan State College and graduated with honors from the Mechanical Engineering Course. He entered the Coast Artillery Corps shortly thereafter. He graduated with distinction from the Coast Artillery School and served on its faculty as an instructor. During the War he reached the temporary grade of colonel and served as a member of the Heavy Artillery Board in France at the close of the War.

It was in France that Major Wilson first came in contact with the French system of fire control for anti-

aircraft artillery. He was not satisfied with the French system and early disclosed his ideas for a more accurate method to the Chief of Coast Artillery. To better fit him for his investigation of the subject he spent four years on detail with the Bureau of Standards in Washington. At the end of this detail he was well qualified to undertake the design of the instrument which was to make his name well known throughout the world.

In order that he might devote his entire time to the work for which he had trained himself he was transferred to the Ordnance Department and spent the next four years in the laboratories and shops at Frankford Arsenal. In the fall of 1926, the Wilson Director had its first practical test at Aberdeen Proving Ground and at this time demonstrated its superiority over any other known director. Major Wilson was not satisfied with his first director. He had many improvements in mind. When this writer last talked with him he was full of his ideas as to what could be done to make the second instrument still better. Others were to carry out his ideas. He died suddenly in November, 1927. His death was due, in large measure, to the tireless energy which he gave to the development of the Director. His real monument is the present standard Director M2 in which many of his ideas are consummated.

It is fitting that recognition should be taken of the service which Major Wilson has rendered. There is sentiment in this. But without regard to sentiment it is probable that officers entering Wilson Park hereafter, upon reading the bronze tablet placed there in his memory, may be inspired to emulate his devotion to duty and his consecration to an ideal.

The Coast Artillery School

THE Coast Artillery School began the school year 1931-32 on September 12 with the opening exercises. The Commandant, Brigadier General S. D. Embick, delivered the opening address. There are a few changes in the list of students, Battery Course, which was published in the last number of the JOURNAL. Captain James Troupe, recently transferred to the Coast Artillery School from the Chemical Warfare Service, has been added to the list. The names of First Lieutenants Edward A. Dolph and Grayson Schmidt have been removed. It is also noted that the following foreign officers are present for the course.

1st Lt. Atif Tevfik, Turkish Navy.
1st Lt. Ismail Jevat, Turkish Army.
2nd Lt. Hung Chao Chou, Chinese Army.

We are glad to have these officers with us but after the drubbing which the Turkish Coast Artillery gave the Allied Fleet at the Dardanelles we can't imagine what Lieutenants Tevfik and Jevat can learn from us.

The Special Course for National Guard and Reserve officers which began on September 21 and will end on November 13 opened with twenty-six officers of both components attending. In the Special Course for Field officers the following are students.

Major John C. Henagan, Jr., 263rd C.A. (S.C.N.G.)
Major Claude B. Washburne, 249th C.A. (Ore.N.G.)

The Special Course for Battery officers is being attended by the following:

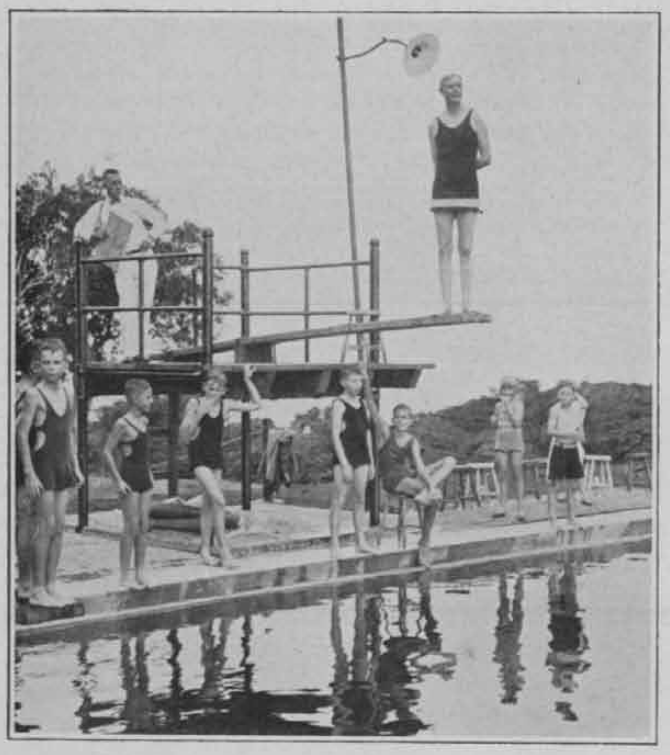
Captain Oscar C. Bohlin, 211th C.A.(Mass.N.G.)
Captain Thomas F. Byrne, 244th C.A.(N.Y.N.G.)
Captain James H. Fish, 197th C.A.(N.H.N.G.)
Captain John W. Squire, 246th C.A.(Va.N.G.)

Officers' Beach Club, Fort Monroe.

Captain George W. Tillery, 206th C.A.(Ark.N.G.)
Captain Dayton E. Van Vactor, 249th C.A.(Ore. N.G.)
1st Lieut. Roland S. Abrahams, C.A.-Res.
1st Lieut. James B. Averett, 264th C.A.(Ga.N.G.)
1st Lieut. Willard R. Bloxton, 252d C.A.(N.C.N.G.)
1st Lieut. Frank L. Coleman, 245th C.A.(N.Y.N.G.)
1st Lieut. Ralph W. Cooper, Jr., 265th C.A.(Fla. N.G.)
1st Lieut. Neil M. Dow, C.A.-Res.
1st Lieut. Frank A. Droms, C.A.-Res.
1st. Lieut. Harold R. Heminger, C.A.-Res.
1st Lieut. Charles G. Hewett, 240th C.A.(Me.N.G.)
1st Lieut. Francis L. McFarren, C.A.-Res.
1st Lieut. Walter R. McGee, 213th C.A.(Pa.N.G.)
1st Lieut. Stanley M. Shindel, C.A.-Res.
1st Lieut. Norman F. Tubessing, C.A.-Res.
2nd Lieut. David A. Benson, 198th C.A.(Del.N.G.)
2nd Lieut. Bryant Kearney, 251st C.A.(Cal.N.G.)
2nd Lieut. Charles M. Sherfesee, C.A.-Res.
2nd Lieut. Winton G. Tracy, 203d C.A.(Mo.N.G.)

Corregidor Swimming Pool

THE Corregidor Swimming Pool was opened on July 6. General Kilbourne, shown on the diving board, formally opened the pool with a speech of one



sentence, our correspondent informs us. Unfortunately, he did not let us in on the speech. We would have been glad to quote it in full. (About the right length for speeches, we should say). General Kilbourne was urged to make the first dive and when he had done so the Great Deluge ensued. The General reports he had great difficulty getting back to the surface because by that time the entire pool was filled with the very young generation.

A program of aquatic events then was given including all manner of contests. It terminated with a bath-

ing beauty contest wisely limited to those representatives of female pulchritude under the age of 14 years. We take pleasure in publishing the likeness of the winner, Miss Lorraine May Lowder, age 4. This is the first occasion on which the COAST ARTILLERY JOURNAL has every published the picture of the winner of a bathing beauty contest. Incidentally we are informed that Miss Lowder is a real *bathing* bathing beauty and does not hesitate to dive from the highest board.

The pool is finished insofar as actual use is concerned

but there is still some financing to be done. The cost is between 1300 and 1400 pesos greater than the amount so far received. The $3.00 donations coming from the states are still received with gratitude.

The 61st Coast Artillery (AA)

Fort Sheridan

STARTING in with the R. O. T. C. in June the 61st has had an extremely busy summer. For the first time the Coast Artillery R. O. T. C. camps for the Fifth, Sixth and Seventh Corps Areas were held at Fort Sheridan. About 300 students attended.

Lt. Col. J. A. Green arrived shortly after July 1 relieving Major Cunningham as regimental commander. During July and August Coast Artillery Reserve officers from three corps areas were present for training, about 300 attending altogether. The 203d C. A. (AA) (Mo. N. G.) was also in training at Sheridan during July. During July the Chief of Coast Artillery, General Gulick, inspected all Coast Artillery activities at Sheridan, as noted elsewhere in the JOURNAL.

This is the first year that antiaircraft firing has been conducted at Fort Sheridan. Before firing could be held is was necessary to construct a firing point on the lake front and a road leading thereto. The firing held during the summer was very satisfactory and it is expected that it will be better next summer under improved conditions. The cooperation and efficient work of the Air Corps detachment sent from Scott Field was a material factor in the successful completion of the antiaircraft firing program.

The training camp period ended on August 28 with the departure of the reserve officers from the Seventh Corps Area. On August 31 the regiment departed for a 25 days march and tactical training. Some of this time was spent in camp at Camp McCoy, Wisconsin, a welcome relief to the intensive summer period.

The 62d Coast Artillery (AA)

Fort Totten

THE training camp and target practice period of the regiment ended on August 3 when it returned to Fort Totten from Fort Tilden. During the summer training period the 502d, 513th, 909th, and 910th Coast Artillery reserve regiments were associated with the regiment. The interest, cooperation and results obtained in the training of these regiments were not only a source of satisfaction but was one of the most pleasant duties of the year.

Battery A conducted its searchlight practices at Mitchell Field during the month of July. July is not considered an ideal time for searchlight practice due to poor atmospheric conditions in this locality. Much time was wasted standing by for a clear night so that a high altitude could be obtained. The battery used the Searchlight Unit Model M-VI, Acoustic Corrector M1, Sound Locator M1 E1 and the oscillator ("Wobbillator" the men call it) designed by Captain Jackson and described in the July-August number of the JOURNAL. The greater part of this equipment was assigned temporarily to the battery to be taken to Humphreys for test.

The oscillator was used on one light with excellent results. The proof of the efficiency of this device is that the light with which it was used was responsible for picking up the target on 50 per cent of the courses flown. The device will undergo further test at Fort Humphreys.

On August 12 Battery A moved to Fort Humphreys and was engaged in tests of searchlight and sound locator equipment until October. It will rejoin the regiment on October 8.

On August 13 a detachment of the regiment moved to Aberdeen for tests of height finders. The remainder of the regiment will move to Aberdeen in time to take part in the Army Ordnance Day demonstration to be held on October 8. In view of the trip to Aberdeen the scheduled march to Plattsburgh Barracks has been called off.

Fort Barrancas

THE 264th Battalion C. A. (Ga. N. G.), Major LeRoy Cowart, Comdg., completed its field training at Fort Pickens during the summer. Both Batteries A and B fired their first seacoast target practice with very creditable results.

The 69th Coast Artillery (AA), Lt. Col. F. H. Smith, Comdg., furnished a detachment of 85 men which was present during the summer training period. The presence of the 69th was an immense advantage since it is provided with the latest antiaircraft equipment. It furnished reserve officers an opportunity to see and use this equipment. It was the first time that reserve officers of the Fourth Corps Area were permitted to use the Vickers Director during active duty training.

A reserve officer training at Barrancas is particularly complimentary to Captain McMorrow, Captain Griggs, Lieut. Goff, and Lieut. Pape of the 69th. He states that in his opinion these officers should be rated "excellent" as instructors. He does not fail to mention the enlisted personnel of the 69th and seems somewhat surprised that the Coast Artillery has soldiers which are capable of such fine instruction. (That's the way we train 'em.)

Brigadier General William S. McNair, Commanding the Fourth Coast Artillery District, visited Barrancas during the reserve training period and was presented to the officers by Colonel F. H. Lincoln, the Harbor Defense Commander, at a reception in his honor.

The training program followed was reported to be a distinct departure from the old system of unit training—more individual effort being required from each officer. As an example of one feature each officer was required to thoroughly understand the construction and use of the trial shot chart as well as to put into actual practice the principles involved.

Some of the results of the antiaircraft gun firing were as follows:

504th C. A., Major Charles S. Gardner, Comdg.
23 shots—4 hits

524th C. A., Major Charles M. Boyer, Comdg.
26 shots—1 hit

922d C. A., Major Harry W. Porter, Comdg.
26 shots—5 hits

An Infantryman at Barrancas

By Captain Alston Deas, Infantry

EVERY officer is, or should be, proud of his own branch of the service, esteeming it above others, and devoting to it his best efforts. He should not forget, however, that it is just what its name implies; a *branch*, that is, a *part* of the whole. Protracted lack of association with members of other branches is apt to induce a mild intolerance for any but his own. Fortunately, such isolation is year by year becoming more rare, what with contacts gained at divisional posts, on school duty and at summer camps.

A very happy situation obtained at Fort Barrancas this year, when the writer, together with three other infantry officers, reported for duty with the CMTC Quarters and barracks were ready for occupancy. Everything shone with fresh paint. Mess halls had been equipped with the latest mechanical sanitary and labor-saving devices. The Hostess House was new. Drill material was in excellent condition, and available for immediate use. Two fine swimming beaches had been developed.

Everything went smoothly from the start, with the minimum of interference, and maximum of supervision on the part of those in authority. Reserve officers, as well as Blue trainees with the CMTC were given the greatest possible latitude in the exercise of their duties. New second lieutenants were designated as adjutants in rotation for parades and formal guard mounting. This was as much effective as anything else in overcoming diffidence, although a painful initial dose for the principal performers. All officers, whether assigned or attached, were required to attend all ceremonies, either as participants or observers. The firing of the 155 G. P. F's., 10-inch D-C rifles and anti-air-air-craft machine guns by ROTC students from Mississippi A. & M. College, Georgia Tech, University of Alabama and the Citadel was observed with much interest by visiting regular and reserve officers, most of whom see little or nothing of such things in the ordinary course of events.

Fort Barrancas, to those who have not seen it before, comes as a surprise. Situated as it is on a high bluff, overlooking the waters of the Gulf of Mexico and Pensacola Bay, it catches a good breeze, and is very comfortable. Numerous live-oaks lend beauty to the post, as well as hundreds of such planted shrubs as oleander and crepe myrtle. During the spring and until the second week in June, the parade ground and forward slopes were a mass of color with purple phlox, which is allowed to stand until the seeds have fallen, in anticipation of the following year's bloom.

Old world reminders of the early occupation are particularly interesting. The Spanish fort of San Carlos, dating from 1781, which was twice captured by Andrew Jackson, is noteworthy, as is also the large American fort known as Old Fort Barrancas, rising directly above. This later was built in the thirties and forties of the past century. Across the channel, on Santa Rosa island, where are also located the modern seacoast guns, is located Fort Pickens, built during the same period. Pickens was occupied during the entire Civil War by Union troops, whom the Confederates, occupying Barrancas on the mainland, were unable to dislodge with the artillery of the time.

Much more could be written, but this is not intended to be an exhaustive article. The contact gained by the visitors has, as has been indicated, a valuable one. The hope arises that more intermingling among the branches will continue, with beneficial results to all

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69th Coast Artillery (AA)

Fort McClellan, Ala.

BATTERY A (Searchlights) left Fort McClellan on August 10 with 74 enlisted men under command of Captain D. M. Griggs assisted by 1st Lieut. J. L. Goff for its 816 mile run to Fort Humphreys, Va. It arrived at Fort Humphreys on August 15 via Gainesvills, Ga.—Spartanburg, S. C.—Greensboro, N. C.—Farmville, Va., having covered the entire distance in five days—an average of 163 miles per day or 16.2 miles per hour for the running time.

The following vehicles (all pneumatic tired) formed the convoy:

2 Sterling Prime Movers
6 G.M.C. ¾ ton trucks
1 G.M.C. ¾ ton ambulance
2 Cadillac Searchlight units (less searchlights)
1 White 1½ ton truck
4 Duplex Searchlight Units with sound locator trailers

Six private cars belonging to personnel making the trip accompanied the convoy. At least four of these were found indispensible for the successful operation of the convoy—no government light vehicles being available. The absence of a water cart and rolling kitchen facilitated the movement considerably. Each vehicle carried a five gallon can of water, a five gallon can of gasoline, and a one gallon can of oil. In addition two fifty-gallon drums of gasoline and a drum of oil were carried on a truck. These supplies enabled the convoy to make a full day's march without replenishing on the road. Cooking was done on a field range supplemented by an experimental gasoline stove which proved highly efficient.

Captain Griggs states that two officers are not sufficient for a convoy of this size. Three officers are needed: one who should precede the column to make arrangements for police escorts through cities, for camps, for procurement of gas, oil, and subsistence supplies; a second officer should be with the convoy to set the pace and supervise the conduct of the convoy; the third officer should follow the convoy supervising repairs to disabled vehicles and maintaining liaison with the head of the column.

The convoy came through without serious incident although one truck (a Sterling prime mover) had to be left by the roadside to await the arrival of a connecting rod bearing from Holabird. This truck arrived in Humphreys two and one-half days behind

schedule. The convoy made a rather slow day's march on August 11 due to rain and twenty miles of bad dirt detour near Gainesville. The police were very helpful in all cities, furnishing motorcycle escorts.

The civil authorities, where over night stops were made, showed the warmest and friendliest interest in the convoy and equipment. In every instance the authorities made arrangements for parking areas, shelter with shower baths and toilets for the men, running water and wood for the kitchen. Searchlight demonstrations were requested and given at each overnight stop.

There were a number of repairs to be made on the road or at night in camp after the day's run. They included:

Governor and carburetor trouble
Tires running off the rim .
Headlight broken
Tire punctures
Steering gear collar broken
Spark plug trouble
Clutch trouble
Gas filter bowl trouble
Pump spring trouble
Connecting rod bearing burning out
Broken spring bracket on sound locator trailer
Universal pin dropping out

In reading Captan Griggs report it appears that carburetor trouble and tire trouble caused the greatest number of delays. In the replacement of broken parts considerable difficulty occurred several times causing resort to acetylene welding.

Battery A participated in the searchlight exercises held at Fort Humphreys during the period August 15-September 30.

The 245th Coast Artillery (N. Y. N. G.)

THIS regiment, the only harbor defense regiment in the National Guard of the state of New York, under the command of Colonel B. H. Pendry, was in training at Fort H. G. Wright during the period August 16-30. To many the regiment is better known as the old 13th New York. The regiment arrived in camp with 100 percent of its officers and 96 percent of its enlisted personnel.

On August 20 the twenty-four hour War Condition Period began as a preparation for the battle exercise which was conducted later. From the battle exercise the batteries proceeded to the firing of service target practices. In all, twelve target practices were fired, analyzed and turned over to the instructor before the regiment left the post. The latter part of the training period was marred by rain and caused some hurry to complete the last three practices on August 28.

Brigadier General John J. Byrne, Commanding the New York Coast Artillery Brigade, was present during the practices as was Brigadier General Henry J. Hatch, Commanding the Second Coast Artillery District. The inspection board reporting on the manner in which the field training was conducted was composed of Lieut. Col. Allen Kimberly, Major L. B. Weeks, and Major O. C. Warner, the instructor of the 245th.

The 246th Coast Artillery (Va. N.G.)

BATTERY D of the 246th is especially proud of the record made in target practice during the period August 9-23 which it spent at Fort Monroe. The members of this battery are all from the Allegheny Mountain section of Virginia but this is no handicap to gun pointer Carlos N. Counts whose eye sight may have been somewhat improved by the high altitudes of that region.

Captain Randolph McG. Cabell commanded the battery and was assisted by 2d Lieut. Joseph H. Carpenter, Jr. The battery was allowed only eight record rounds of service ammunition. All shots were fired from No. 1 gun, Battery DeRussy, 12″ DC, at a range of approximately 11000 yards. The first shot was over 38 yards; the next and the next were short but the fourth shot completely demolished the small pyramidal target.

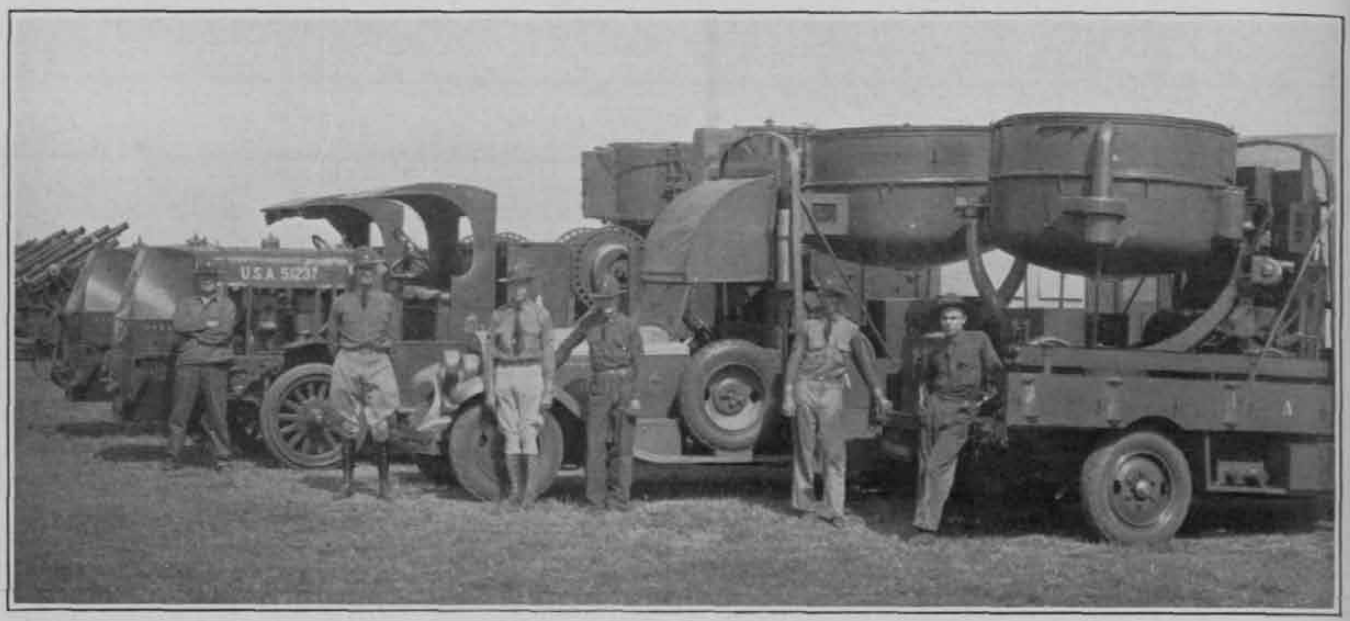
Colonel A. E. Wood, the regimental commander was especially pleased at the record of the battery and commended the officers and men highly.

The 202d Coast Artillery (AA), (Ill. N. G.) Chicago

THE 202d Coast Artillery is one of the few Coast Artillery National Guard Regiments located in the interior of the country. When the breeze is right it catches the odor from a sea of growing corn rather than the tang of salt water. But there is nothing peculiar in this when one remembers that this is an antiaircraft regiment and that the Coast Artillery's development of this arm has opened a wide area to its activities.

The regiment is located in Chicago and housed in the Broadway Armory, one of the most complete and up to date armories in the country. Colonel Charles C. Dawes commands the regiment. Although we have never asked him about it, it seems likely that he is a name-sake of his uncle, General Charles G. Dawes, whose name is not only well known but favorably known by all red blooded Americans. The regiment is fairly well equipped although, with the exception of two Sperry 60-inch searchlights, none of its equipment is of the very latest type. It has no sound locators. Due to its proximity to Fort Sheridan it overcomes this deficiency to some extent through its close association with the 61st C.A. (AA). Firing is also conducted at Sheridan at times.

On August 1 the annual field training period of the regiment began. Under its own motor power it moved out in three sections for Camp Grant, Illinois, where it was associated with the 33d Division for the camp period. The first section under command of Major George F. Gorey consisted of the searchlights, guns, and G.M.C. trucks. Major Arthur C. Osborn com-



Maintenance Personnel, Battery A, 202d C. A. (AA) (Ill. N. G.).
Left to Right: Sgt. Van Bosch, Lieut. Crowder, Mast. Sgt. Gilson, Staff Sgt. Spencer, Staff

manded the second section which transported the personnel. The third section, commanded by Captain D. C. Sweeney carried baggage.

The Camp Grant program of training consisted mostly of tactical problems, solved in the field during the exercises by platoons, batteries, battalions, and the regiment. Camp Grant has no facilities for antiaircraft fire so no target practice was possible. Artillery drill was limited to service of the piece and daylight tracking of towed aerial targets. The availability of the 33d Division Aviation (108th Observation Squadron) rendered tracking and searchlight drill practicable. Some machine gun firing on the 1000-inch range was conducted.

Although it is not possible to fire at Camp Grant the regiment obtained tactical experience in training with troops of other arms. The value of this form of training is considerable and an opportunity not often presented even to regular army units. It is noted that the regiment devotes considerable attention to the preparation of field orders. A sizeable pamphlet of model field orders, in attractive form, was recently received from the unit instructor, Major J. L. Homer.

The return to Chicago was made in accordance with schedule and without incident.

The 203d Coast Artillery (Mo. N. G.)

THIS regiment, known as The Hound Dawg Regiment, from its regimental insignia, was originally organized as infantry and became coast artillery only in 1920. During the war it was organized into three machine gun battalions. Colonel G. H. Loy, the present regimental commander, commanded one of the battalions. Most of the officers have served in the A. E. F. and many of the enlisted men.

The field training this year was devoted principally to antiaircraft service practices and was conducted at Fort Sheridan during the period July 12-26. The use of Fort Sheridan for the conduct of this training was popular with the regiment. The bathing beach on Lake Michigan was one of the main attractions and the proximity of the post to Chicago appealed to many men with its opportunity to go places and see things.

The regiment feels that the training received at Sheridan was valuable and well worth the long trip. The Chief of Coast Artillery, General Gulick, inspected the regiment during the period.

The 243d Coast Artillery (R. I. N. G.)

THIS regiment, commanded by Colonel Cyril L. D. Wells, was particularly unfortunate in the weather conditions existing at Fort Wright during its field training period which began on July 18. During the entire first week fog and rain prevented drill while only on two days of the second week (Monday and Friday) was the visibility such that the target could be seen.

On Monday of the second week Captain James A. Murphy, commanding Battery F, decided to seize the opportunity to fire his record practice. Governor Norman Case of Rhode Island and Brig. Gen. Alston Hamilton, Commanding the First Coast Artillery District, were present to witness it. This is the same battery which fired such an excellent practice last year with a score of 137. This year the previous score was exceeded. Sixteen half hits out of 8 shots were fired with a score of 150. The scores of the other batteries follow:

Battery D—Captain Raymond Fletcher	116
Battery C—Captain Albert A. Moren	91
Battery B—Captain Joseph F. Frappier ..	86
Battery A—Captain Walker F. Parker	60
Battery E—Captain Elvin J. Andrews	45

Not including the score of Battery A, which was fired

under adverse weather conditions which made it impossible to analyze the practice, the average score of the regiment is about 98. Last year the average score of the regiment was 52 and the preceding year it was 44. This improvement Colonel Wells ascribes to several innovations which he adopted on the recommendation of Major A. E. Rowland, the instructor. They include the following:

Analysis of armory drill discontinued—This can be done where canned courses are used. The time devoted to analysis can be spent on drill.

Drill on miniature targets discontinued for all except observers—This also permitted more time to be devoted to drill more nearly corresponding to service conditions.

Trial fire delivered on the moving target—Resulting in better deflection corrections.

In the Field Inspection Report prepared by the board composed of Major E. K. Smith, C. A. C., Major A. E. Rowland, C. A. C., and Captain M. G. Armstrong, C. A. C., the regiment was rated satisfactory in all factors considered. The regimental commander, Colonel Wells, was highly commended as were Lt. Col. John J. Collins, Major J. L. Daneker, Captain James A. Murphy and Captain Henry F. Moore.

Upstate New York Reserve Units

Major Joseph C. Haw, Unit Instructor, Schenectady

513th C.A. (AA), Col. J. P. Young, (Ithaca), Commanding
514th C.A. (AA), Major N. E. Devereux, Jr. (Utica), Commanding
522d C.A. (AA), Lt. Col. F. W. Gilchrist, (Kenmore), Commanding

THE 513th was the only regiment attending camp during the summer, the other regiments having attended the previous year. This camp was conducted at Fort Tilden, L. I. The regiment was under the command of Major Clarence E. Doll, Kew Gardens, R. I., during the period. The 62d C.A. (AA), commanded by Colonel Edward Kimmel, was associated with the 513th in its training. The experience of the 62d in reserve training was invaluable. It is stated that this year's camp was superior to any conducted over a period of the past six years. Captain Morris C. Handwerk earned the admiration of the officers of the 513th during a course in gunnery which he conducted during camp.

Reserve officers performed the duties of key men of the gun crew in firing the 3-inch AA guns. Each reserve officer was also given an opportunity to act either as range officer or battery commander. Each pair (range officer and battery commander) was allowed to fire ten shots. One gun only was used. After the first four shots, spotters reports were received and adjustments based thereon were made. The range officer adjusted for vertical and lateral deflections and the battery commander adjusted for range. All corrections were removed after each course. Using this method, 130 shots were fired at towed targets in a period of little over one hour.

On the second day of firing the battery fired as a unit. All guns were fired using about 70 rounds of ammunition. There were two shifts of battery commanders and range officers.

The advantage claimed for this system of training is that the reserve officers obtained experience in a wide variety of positions which not only added to their knowledge but added to the interest in the firing.

The 211th Coast Artillery (AA) (Mass. N. G.)

First Corps of Cadets

WE owe the frontispiece of this number to Lt. Col. Harry L. Spencer and the First Corps of Cadets who held their encampment this year at Camp Edmands, Peters Pond, Sandwich, Mass., during the period July 25-August 8. The officers of the regiment are 100 percent subscribers to the Journal and in addition 11 noncommissioned officers are subscribers. Lt. Col. James S. Dusenbury and Lieut. S. E. Willard were with the regiment on temporary duty during the encampment. Colonel Dusenbury claims there are no finer National Guard regiments than the 1st Maine and the First Corps of Cadets. (He *had* to include the 1st Maine. It is his regular assignment.) The Journal will vote for them so far as subscriptions are concerned. They are *both* 100 per cent.

An interesting feature of the encampment was the Veterans' Day held on August 1 at which over 1000 veterans of the First Corps of Cadets were guests. This is a fine idea and assists the regiment to maintain its esprit, high efficiency, and traditions. It also has its effect in recruiting active members of the highest type.

The 252d Coast Artillery (N.C.N.G.)

THE 252d, which is all the Coast Artillery National Guard of the State of North Carolina, held its annual field training during the period July 12-26 at Fort Moultrie, S. C., under the command of Colonel Royce I. McClelland. Colonel McClelland is a graduate of the C. & G. S. School and the G-1 course at the War College.

This regiment, originally organized as a separate battalion, is now a full fledged regiment and assigned to 155 GPF's. It arrived at Moultrie by special train, the Service Battery transporting the baggage by trucks. The firing this year was considerably improved over former years. The scores made during target practice are sufficient indication of the regiment's efficiency.

Battery D—Captain E. L. Faulconer	149.6
Battery A—Captain F. H. Bailey	104.3
Battery F—Captain W. L. Poole	89.3
Battery C—Captain O. I. Wrenn	72.4
Battery B—Captain F. E. Wishart	60.0
Battery E—Captain J. L. Raper	41.3

COAST ARTILLERY ORDERS

Colonel John T. Geary, Comd'g H. D. of San Francisco, to Philippines, sailing San Francisco, February 4.

Colonel W. F. Hase detailed member of the W. D. decoration board, vice Colonel Steele.

Colonel Percy M. Kessler from Org. Res., Seattle, to Panama, sailing San Francisco, November 3.

Colonel Robert B. McBride, retired, July 31.

Colonel Harry L. Steele, Executive, Office Chief of Coast Artillery to Hawaii, sailing New York, October 2.

Colonel Samuel C. Vestal two months' leave with permission to visit foreign countries.

Lt. Col. Robert C. Eddy, R. O. T. C., Mass. Inst. Tech., Cambridge, retired at his own request, September 30.

Lt. Col. Fulton Q. C. Gardner, from Hq. Detachment, Eighth Corps Area to G. S. C., Eighth Corps Area (Manchu Maneuver).

Lt. Col. John P. Terrell, from 3d, Fort Rosecrans, to 14th, Fort Worden, sailing New York, July 17.

Lt. Col. George L. Wertenbaker, G. S. C., Washington, to 52d, Fort Monroe, March 27.

Major Henry H. Allport, C. A.–Res., to active duty, Army War College, Washington, Sept. 30–Oct. 25.

Major Eurique M. Benitez, student, C. and G. S. School, Fort Leavenworth, to Panama, sailing New York, August 7.

Major Reginald B. Coeroft, Org. Res., Milwaukee, to Army War College (Historical Section), Washington, Sept. 15.

Major Richard Donovan one month five days' leave.

Major Charles R. Finley detailed to G. S. and to Panama.

Major Avery J. French from Panama to 63d, Fort MacArthur.

Major Ira B. Hill to sail from New York for Hawaii September 23 instead of August 12. Two months' 20 days' leave July 1.

Major Kelley B. Lemmon, 3d, Fort MacArthur, to Panama sailing San Francisco, August 29.

Major John H. Lindt, Hq. Seventh Corps Area, Omaha, relieved from detail G. S. to 13th, Fort Barrancas, September 25.

Major Hugo E. Pitz, R. O. T. C., University of New Hampshire, Durham, detailed to Q. M. C. and to Mitchel Field, July 1. Previous orders revoked.

Major Willard K. Richards from instructor, Coast Artillery School, Ft. Monroe, to San Francisco, sailing New York November 4.

Major Harold E. Small from Panama to instr., Conn. N. G., Bridgeport. One month 15 days' leave.

Major Rodney H. Smith, G. S. C., one month's leave, August 3.

Captain William T. Andrews, resigned.

Captain Ernest R. Barrows, 12th, Ft. Monroe, to R. O. T. C., University of Alabama.

Captain Louis J. Bowler, 52d, Ft. Monroe, to 12th, Ft. Monroe.

Captain William G. Brey, 6th, Ft. Winfield Scott, to student, C. A. S., Fort Monroe, sailing San Francisco July 25, instead of as previously ordered.

Captain Mario Cordero from Philippines to 11th, Fort H. G. Wright.

Captain Leonard L. Davis, Coast Artillery Board, Ft. Monroe to Coast Artillery School, Ft. Monroe, as instructor, August 1.

Captain Donald L. Dutton, 5th, Fort Totten, to 62d Fort Totten, Nov. 1.

Captain Nelson H. Duvan, R. O. T. C., Miss. Agric. & Mech. College, to 52d, Ft. Hancock.

Captain Valentine P. Foster to sail from New York for Hawaii August 12 instead of July 17. Two months' seven days' leave, June 12.

Captain Manly B. Gibson from Hawaii to 9th, Fort Banks.

Captain Norman E. Hartman from student, University of Michigan, Ann Arbor, to Panama, sailing New York, October 22.

Captain William Hesketh, from pilgrimage of mothers to 8th, Fort Preble, Sept. 15.

Captain Daniel W. Hickey from Panama to student, Adv. Eng. Course, C. A. S., Fort Monroe.

Captain Lewis A. Hudgins, 62d, Fort Totten, to instr., Del. N. G., Wilmington, September 1.

Captain Willard W. Irvine, 52d, Ft. Monroe, to 51st, Ft. Monroe.

Captain James P. Jacobs from Hawaii to 12th, Fort Monroe.

Captain Thomas E. Jeffords from Panama to 14th, Fort Worden.

Captain Parry W. Lewis student, University of Michigan, Ann Arbor, to Panama, sailing New York August 28.

Captain Samuel L. McCroskey from Hawaii to C. A. B., Fort Monroe.

Captain Oscar D. McNeely from Hawaii to 61st, Fort Sheridan.

Captain Albert Mossman, Letterman General Hospital, to home and await retirement.

Captain Harry E. Pendleton, 51st, Fort Monroe, to Panama sailing New York October 22.

Captain Joshua D. Powers from Panama to student, C. A. S., Fort Monroe, September 7.

Captain Earl R. Reynolds, 11th, Fort H. G. Wright, to Panama, sailing New York, December 11.

Captain Caroll G. Riggs from Hawaii, to 8th, Fort Preble.

1st Lt. Ben E. Cordell, to 6th Ft. Winfield Scott, instead of C. A. S., Ft. Monroe, September 13.

1st Lt. John C. Delaney, to Panama, sailing San Francisco, October 10, instead of September 25.

1st Lt. Joseph V. deP. Dillon, instr., Conn. N. G., Bridgeport, to Hawaii sailing New York, December 1.

1st Lt. James L. Harbaugh from student, C. A. S., Fort Monroe, to J. A. G. Dept. and to N. Y. University as student, September 21; previous orders to Fordham University revoked.

1st Lt. Donald B. Herron, 69th, Ft. McClellan, to R. O. T. C., V. P. I., Blacksburg, July 1.

1st Lt. John A. McComsey from New York to student, C. A. S., Fort Monroe, September 7.

1st Lt. William C. McFadden from Ord. Dept. and from student, Ord. School, Watertown, Ars. to Panama, sailing New York, August 28.

1st Lt. Ernest A. Merkle from student, C. A. S., Fort Monroe to R. O. T. C. Fordham University, New York, July 23. Previouts orders revoked.

1st Lt. Benjamin S. Mesick, jr., transferred to the Ordnance Department, July 2.

1st Lt. Philip H. Raymond, 13th Ft. Barrancas, to Panama, sailing New York, December 11.

1st Lt. Joseph S. Robinson from pilgrimage of mothers to C. G., Second Corps Area, New York, for temporary R. O. T. C. duty, Sept. 15.

1st Lt. Joseph H. Rousseau, jr., from Hawaii to temporary R. O. T. C., University of Alabama.

1st Lt. John C. Smith, from Hawaii, to 12th, Ft. Monroe.

1st Lt. Andrew P. Sullivan from Panama to 61st, Fort Sheridan.

1st Lt. James L. Whelchel, Walter Reed Hospital from detail in S. C. to student, Q. M. C. School, Philadelphia.

1st Lt. Charles M. Wolff one month four days' leave, June 15.

2d Lt. Dana S. Alexander, 6th, Fort Winfield Scott, to Panama sailing San Francisco, November 3.

2d Lt. Charles R. Bard, (U. S. M. A., 1931), detailed in Air Corps, and to Randolph Field, Texas, Sept. 11.

2d Lt. Albert S. Baron, 13th, Ft. Barrancas, to Hawaii, sailing New York, December 1.

2d Lt. Frederick T. Berg, (U. S. M. A., 1931), detailed in Air Corps, and to Randolph Field, Texas Sept. 11.

2d Lt. Gordon A. Blake, (U. S. M. A., 1931), detailed in Air Corps, and to Randolph Field, Texas, Sept. 11.

2d Lt. Gaspare F. Blunda, (U. S. M. A., 1931), detailed in Air Corps, and to Randolph Field, Texas, Sept. 11.

2d Lt. Frank A. Bogart, (U. S. M. A., 1931), to 13th, Ft. Barrancas, Fla.

2d Lt. Lawrence A. Bosworth, 63d, Fort McArthur, to Panama, sailing San Francisco, August 29.

2d Lt. Joseph F. Carroll, (U. S. M. A., 1931), detailed in Air Corps, and to Randolph Field, Texas, Sept. 11.

2d Lt. Marshall S. Carter, (U. S. M. A., 1931), to 12th, Ft. Monroe.

2d Lt. Albert F. Cassevant, (U. S. M. A., 1931), to 11th, Ft. H. G. Wright.

2d Lt. George A. Chester promoted to 1st Lt. August 8.

2d Lt. Norman A. Congdon from Panama to Fort Monroe, June 29.

2d Lt. Earle F. Cooke, (U. S. M. A., 1931), to Panama sailing New York, Sept. 23.

2d Lt. Harry B. Cooper, jr., (U. S. M. A., 1931), to Hawaii.

2d Lt. Frank P. Corbin, jr., (U. S. M. A., 1931), to 12th, Ft. Monroe, Va.

2d Lt. Lucius N. Cron, (U. S. M. A., 1931), to Hawaii, sailing New York, October 2.

2d Lt. Robert E. Cron, jr., from Q. M. C., Ft. Monroe, to student, Carnegie Inst. Tech., Pittsburgh, Sept. 10.

2d Lt. William A. Davis, jr., (U. S. M. A., 1931), detailed in Q. M. C. and to Ft. Monmouth, N. J., Sept. 11.

2d Lt. Theodore J. Dayharsh from Panama to 52d, Fort Monroe.

2d Lt. Pierre B. Denson promoted 1st Lt. June 1.

2d Lt. M. S. Dickson, (U. S. M. A., 1931), detailed in the Q. M. C. and to Ft. George G. Meade for duty with constructing Q. M.

2d Lt. Chester J. Diestel, (U. S. M. A., 1931), detailed in Air Corps and to Randolph Field, Texas, Sept. 11.

2d Lt. Charles B. Duff, (U. S. M. A., 1931), to 69th, Ft. McClellan.

2d Lt. Marcellus Duffy, (U. S. M. A., 1931), detailed in Air Corps and to Randolph Field, Texas, Sept. 11.

2d Lt. John J. Earle, jr., from the Philippines to 13th, Ft. Barrancas.

2d Lt. Walter F. Ellis (U. S. M. A., 1931), to the Philippines, sailing San Francisco, November 25.

2d Lt. Edward C. Franklin promoted 1st Lt., September 1.

2d Lt. Robert F. Fulton, (U. S. M. A., 1931), detailed in Air Corps and to Randolph Field, Texas, Sept. 11.

2d Lt. Alfred C. Gay, (U. S. M. A., 1931), to 61st, Ft. Sheridan.

2d Lt. Burgo D. Gill, promoted 1st Lt., August 18.

2d Lt. Arthur D. Gough, (U. S. M. A., 1931), to 12th, Ft. Monroe.

2d Lt. Carl E. Green, (U. S. M. A., 1931), to Panama, sailing San Francisco, September 25.

2d Lt. William A. Hampton, (U. S. M. A., 1931), detailed in Air Corps and to Randolph Field, Texas, Sept. 11.

2d Lt. Allison R. Hartman from Panama to 63d, Fort McArthur.

2d Lt. Clarence J. Hauck, jr., (U. S. M. A., 1931), to 12th, Ft. Monroe.

2d Lt. Eugene W. Hiddleston, (U. S. M. A., 1931), to Panama sailing New York, September 23.

2d Lt. Howard W. Hunter, (U. S. M. A., 1931), to 62d, Ft. Totten.

2d Lt. Michael M. Irvine, (U. S. M. A., 1931), to the Philippines, sailing San Francisco, Nov. 25.

2d Lt. John R. Lovell, 12th, Fort Monroe, placed on flying duty vice 1st Lt. Charles W. Gettys, August 17.

2d Lt. Herbert W. Mansfield, (U. S. M. A., 1931), to 14th, Ft. Worden.

2d Lt. Paul G. Miller, (U. S. M. A., 1931), detailed in Air Corps and to Randolph Field, Texas, Sept. 11.

2d Lt. Elmo C. Mitchell, (U. S. M. A., 1931), detailed in Air Corps and to Randolph Field, Texas, Sept. 11.

2d Lt. Ernest Moore, (U. S. M. A., 1931), detailed in Air Corps and to Randolph Field, Texas, Sept. 11.

2d Lt. Roger W. Moore (U. S. M. A., 1931), to 62d, Ft. Totten.

2d Lt. David N. Motherwell, (U. S. M. A., 1931), detailed in Air Corps and to Randolph Field, Texas, Sept. 11.

2d Lt. Clifton L. MacLachlan, (U. S. M. A., 1931), to Ft. Winfield Scott. Calif.

2d Lt. William F. Niethamer promoted 1st Lt. September 1.

2d Lt. William L. Parham, (U. S. M. A., 1931), detailed in Air Corps and to Randolph Field, Texas, Sept. 11.

2d Lt. Pasquale F. Passarella, (U. S. M. A., 1931), to 52d Ft. Hancock.

2d Lt. Arthur C. Peterson, 62d, Ft. Totten, to Panama sailing New York, December 11.

2d Lt. Marion G. Pohl, from Hawaii to 11th, Ft. H. G. Wright.

2d Lt. Grosvenor F. Powell, (U. S. M. A., 1931), to 14th, Ft. Worden.

2d Lt. Jermain F. Rodenhauser, (U. S. M. A., 1931), to Panama, sailing New York, September 23.

2d Lt. Peter Schmick, (U. S. M. A., 1931), to 6th, Ft. Winfield Scott.

2d Lt. Wilbur M. Skidmore, (U. S. M. A., 1931), to 51st, Ft. Monroe.

2d Lt. Donald H. Smith promoted 1st Lt., July 18.

2d Lt. Richard S. Spangler, (U. S. M. A., 1931), to 13th, Ft. Barrancas.

2d Lt. Tom V. Stayton, (U. S. M. A., 1931), to 51st, Ft. Monroe.

2d Lt. Philip B. Stiness, (U. S. M. A., 1931), detailed in Air Corps and to Randolph Field, Texas, Sept. 11.

2d Lt. Robert A. Stunkard, (U. S. M. A., 1931), detailed in Air Corps and to Randolph Field, Texas, Sept. 11.

2d Lt. Jesse H. Veal, (U. S. M. A., 1931), detailed in Q. M. C. and to Ft. Humphreys, Va., September 11.

2d Lt. Donald B. Webber, (U. S. M. A., 1931), detailed in Q. M. C. and to Mitchel Field, N. Y., Sept. 11.

2d Lt. Milan G. Weber, (U. S. M. A., 1931), to 11th, Ft. H. G. Wright.

2d Lt. William A. Weddell, promoted 1st Lt. August 1.

2d Lt. Norton B. Wilson, (U. S. M. A., 1931), to Panama, sailing San Francisco, September 25.

2d Lt. Millard C. Young, (U. S. M. A., 1931), detailed in Air Corps and to Randolph Field, Texas, Sept. 11.

2d Lt. Layton A. Zimmer orders from Panama to 14th, Fort Worden, revoked.

Warrant Officer Louis A. Denicoly, band leader, 11th, Ft. H. G. Wright, to Hawaii, sailing New York, November 4.

Warrant Officer John E. Robinson, Master, A. M. P. S., Fort Monroe, to Harbor Defenses of Cristobal. Previous orders revoked.

Master Sgt. John C. Dunn, 59th Ft. Mills, retired, August 31.

Master Sgt. George High, 64th, Ft. Shafter, retired, August 31.

Master Sgt. Walter F. Willis, 52d, Fort Hancock, retired.

Master Sgt. Joseph A. Zeeler, 8th, Fort Preble, retired, August 31.

1st Sgt. Frank Costello, 52d, Ft. Monroe, retired, July 31.

1st Sgt. Lawrence E. Heckel, 14th, Ft. Worden, retired, July 31.

1st Sgt. Matthew Jarboe, 14th, Ft. Worden, retired July 31.

1st Sgt. William A. Kay, 14th, Ft. Worden, retired, July 31.

1st Sgt. William Stephens, 13th, Ft. Crockett, retired, August 31.

Staff Sgt. Samuel T. Edwards, 3d Ft. McArthur, retired, July 31.

Sgt. Fred R. Reeves, 14th, Ft. Worden, retired, July 31 .

Maj. Gen. Lytle Brown, Chief of Engineers, addressing the C. M. T. C. during the ceremony attending the Oath of Allegiance, Fort Barrancas.

BOOK REVIEWS

DIE ORGANIZATION DES HEERES (Organization of the Army), by Paul Schneider, 276 pages. E. S. Mittler & Son, Berlin, 1931. Price RM 8.50 ($2.25).

The author, a privy councillor of war, presents a comparative study of the present German Reichswehr and the old Imperial Army. The "leitmotif" of this interesting study is the maxim, that the basic principles of army organization are immutable, hence the factors, which made the old imperial army a model for all the world, are also valid and applicable to the organization of the new republican establishment. He skillfully places the two organizations side by side, and focuses attention upon the limitations and restrictions imposed by the treaty of Versailles. The protest against these is implied but nevertheless obvious.

The book is a valuable compendium of information regarding the present organization, composition and functioning of the army of republican Germany.

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LE DANGER AERIEN ET L'AVENIR DU PAYS (The Air Peril and the Future of the Country), by Lieut. Colonel Vauthier. Foreword by Marshal Lyautey. 380 pages and 17 sketches. Berger-Levrault, Paris, 1930. Price 25 francs.

In 1930 the author published a series of articles in the *Revue Militaire Francaise,* on the subject of national defense against the aerial danger. These articles, materially expanded, form the basis and central portion of this interesting analysis of the problems incidental to the emergence of aviation from the experimental stage of a novelty, in which the last war found it, and its rise to a position of tactical and strategic importance, which undubitably place aviation as an equal alongside the two senior military services.

Considering the factors of speed, lifting power and radius of action, the author points out, that all frontiers of France are vulnerable to an hostile attack by air. A single hostile plane, operating either from land or sea, could carry two tons of pay-load to the point in France farthest removed from its operating base. Continued improvement in planes, increased speed and lifting power will augment the effectiveness of this modern engine of warfare. Vauthier illustrates graphically these factors in their strategic application to France. Basing his conclusions upon World War experiences, when all aerial attacks were made under cover of darkness, he draws a number of equidistant curves parallel to the German frontier, the assumed origin of the attack. He determines for each zone enclosed within these curves the probable hours of attack. Thus, for the 200 km. zone the danger period extends from sunset plus 1 hour to sunrise minus 1

hour. Within the 600 km. zone, which embraces practically all of France, the danger period is limited to the hours between sunset plus 4 and sunrise minus 4.

Among the means of destruction employed by airplanes, the author enumerates the high explosive, incendiary, gas and microbe carrying bombs. He regards the incendiary bombs as potentially the most dangerous. The "elektron" bomb, a missile weighing about two pounds, consists of an "elektron" or almost pure magnesium casing, which contains a powder charge of magnesium or aluminum base and oxide of iron. These bombs, casing and charge, will ignite at a temperature of 2000-3000 degrees. Once ignited by the fuse, they cannot be extinguished. This bomb possesses sufficient penetrating power to go through the average modern roof. A fleet of 100 airplanes, each carrying one ton of these bombs may cause 17,000 conflagrations. This effect will obtain even though 50 per cent of the missiles fail to ignite or to strike a roof. Applying these figures to Paris, the author states, that if only five out of 100 airplanes succeed in actually flying over the city, they still could drop 5000 of these bombs and produce 800 conflagrations. Under favorable wind conditions such attack will tax the best equipped and most efficient fire department to its limits. Inevitably entire quarters of Paris would go up in smoke and loss of life on a large scale would be inescapable.

A gas bomb containing 500 kilos of phosgene would kill everyone within a building penetrated by such missile in spite of protective gas masks. In the open, near the point of impact, there would be a danger space 100 meters long, 30 meters wide and 35 meters high, within which phosgene would retain a sufficiently potent concentration to render a gas mask useless. Favorable winds may extend this danger space considerably. The accidental explosion of phosgene containers in Hamburg, on May 21, 1928, demonstrated the possibilities of an effective gas attack. On that occasion gas casualties occurred at a distance of 18 km. from the scene of the accident.

The use of gas projectors by airplanes has its champions as well as opponents. Objection is largely based upon the fact that its effectiveness depends too largely upon atmospheric conditions, character of terrain and vegetation. The necessity of low flying with a correspondingly increased risk to plane and pilot, is another argument against the use of these appliances. On the other hand it is argued, low flying is unnecessary; that gas projected from higher altitudes will reach the ground in sufficiently effective concentrations to cause anxiety in rear areas, and to affect the morale of civil populations.

Toxic smoke screens may also be used with considerable effect. A single plane can lay down a smoke screen 180 meters high and 1600 meters long in one minute. It will prove particularly effective for the intimidation of civilian populations.

Estimates differ as to the amount of gas necessary

to produce toxic effect within a given area. Thus, one estimate calls for 9 tons of gas bombs for each square kilometer of area; another puts this figure at 15 tons, while still another places it as high as 40 tons. The gassing of a city of the size of Berlin (300 square kilometers), it is estimated, would require 2500 airplanes carrying 2 tons of gas bombs each.

Opinion is divided as to the possibility of employing bombs containing disease-carrying microbes. This menace no doubt exists, but it is held, that at the present time it is impossible to deal with it in concrete form.

The use of explosives is sufficiently known. A single plane may carry more than 2 tons of such bombs. Large bombs contain three times the quantity of high explosive matter in an artillery shell of the same weight. Thus a 1000-kilo bomb contained during the World War 680 kilos of explosives. Against important installations, towns, railway stations, bridges, and the like, airplanes will employ bombs weighing about 50 to 500 kilos, while 10 kilo bombs with about 10 per cent explosive contents will prove effective against personnel.

Colonel Vauthier sums up the air peril as follows:

"The danger from the air is a terrible one, perhaps decisive and mortal to the nation which fails to prepare against it. It is a new danger. We may go so far as to say that it scarcely existed in the last war . . . It . . . employs the factor of surprise in the highest degree . . . tactical . . . and technical surprise, by the employment of new gases, against which we shall not be protected. The answer to the danger of the air is difficult."

Among the usual countermeasures, Colonel Vauthier enumerates preventive offensive against hostile airdromes; reprisals; defensive aviation; ground defense with a well organized intelligence service. As passive measures of defense, Colonel Vauthier mentions the possibility of evacuating civil populations, provision of adequate shelter and gas masks with peacetime training in their use. All these, however, he believes, are still inadequate. As to the general organization of the country against the air peril, Colonel Vauthier believes, that towns must be completely rebuilt. Buildings, he says, must be higher and fireproof. In his opinion, the upper stories of buildings afford greater protection against poisonous gases and the effects of bombs. Of course, he anticipates serious objections to this proposal on aesthetic, historic and financial grounds, but he proposes educative propaganda and legislative action to overcome opposition. Colonel Vauthier also suggests, that tunnels housing water, gas and electric power conduits should be so constructed as to provide adequate bomb and gas proof shelter in case of an emergency.

This very interesting analysis of the aerial danger and the possible counter-measures fully sustains the opinion expressed by Marshal Lyautey in his Foreword, that "the novelty of the last war . . . is the agonizing unknown of the next war," and that protection of the

country against this danger is the most urgent problem; a problem that will require a long time for its solution.

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SOCIAL AND ECONOMIC HISTORY OF THE UNITED STATES, by Harry J. Carman, Ph.D. Vol. I. 616 pages. D. C. Heath and Co., New York, 1930. Price $4.00.

Unlike traditional types of histories, which recite the succession of political events in the life of a nation, and devote their brightest pages to brilliant deeds of the battlefields, Dr. Carman undertook to trace the events of our national history in the light of social and economic factors which had a determining influence upon the shaping of its course.

The first volume of this scholarly treatise covers the period of our history between 1500 and 1820, and traces the transition from the age of handicraft to the development of the modern factory system. The chapters dealing with the founding of our federal republic give a markedly different picture of those historic transactions, than we are wont to read, and Dr. Carman's narrative will shatter some of our traditional notions, notably the one which holds that the fathers of our republic were actuated by the sublime desire to establish and ordain a government of the people, by the people and for the people. The author states, that the constitutional convention "contained the cream of leadership of the propertied-business group, the representatives of the conservative wing of the old Revolutionary party. Fiery radicals of the Patrick Henry, Samuel Adams and Thomas Paine type were conspicuous by their absence. Small farmers, mechanics and laborers were in reality not represented. It was, therefore, natural, the author holds, that the predominant desire should have been, to erect a government controlled and operated, as far as possible, by men of means and standing. Responsible leaders manifested a distinct fear and dislike of democracy, to which they attributed all the evils of their day. Representative men, like Gerry of Massachusetts, William Livingston of New Jersey, Alexander Hamilton of New York, Charles Pinckney of South Carolina, and Roger Sherman of Connecticut, agreed in their denunciations of "the turbulence and folly of democracy." "Accompanying these expressions of popular distrust," writes Dr. Carman, "were all sorts of proposals for restraining the masses by means of property qualifications for voting and office holding."

Dr. Carman has produced a valuable piece of work which provides a broader basis for a better appreciation of our nation's history by focusing the spotlight of research upon the underlying causes of which the usually recorded and generally known events were but outward manifestations. Numerous maps and illustrations enhance the interest of the well presented narrative.

Dr. Carman's book is indispensable to the student of American history, and should find a place in every officer's professional library.

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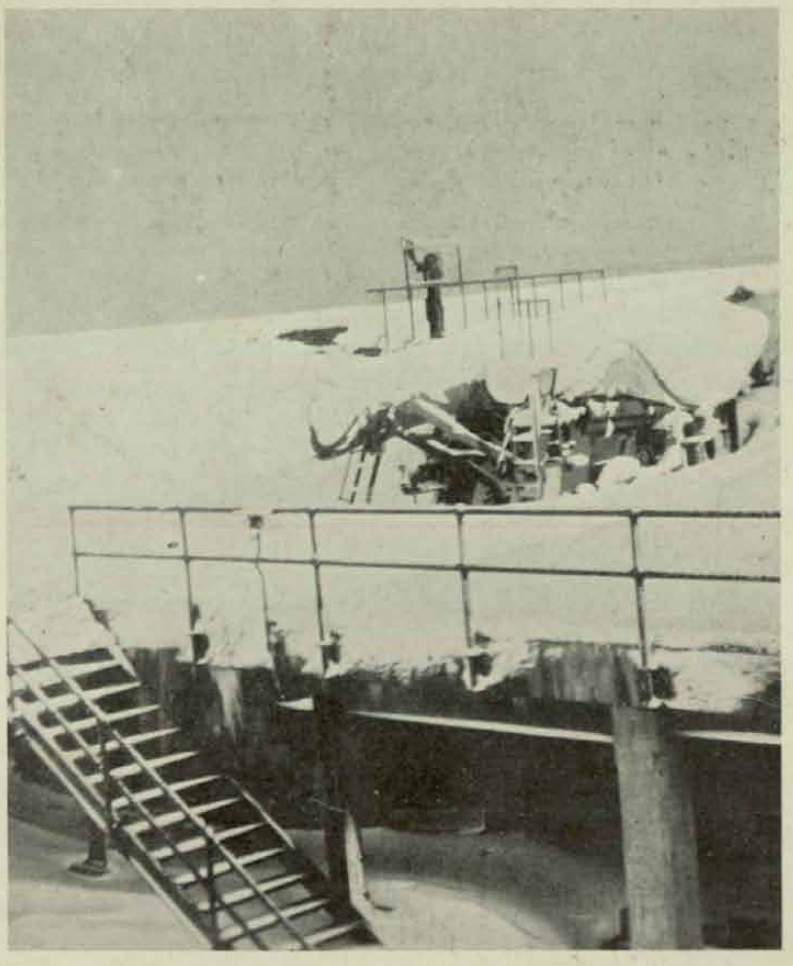

November-December, 1931